Project document

Information and Communication Technology (ICT) for development of small and medium-sized exporters in Latin America: Brazil

Antonio José J. Botelho

Paulo Bastos Tigre

This document was prepared by Antonio José J. Botelho from the Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio) and Paulo Bastos Tigre from the Federal University of Rio de Janeiro (UFRJ). Both authors are consultants of the International Trade Division of the Economic Commission for Latin America and the Caribbean (ECLAC). This is the complete version of his summary paper, which forms part of the book “Information Technology (IT) for Development of Small and Medium-sized Exporters in Latin America and East Asia”, compiled by Mikio Kuwayama, Matsatsugu Tsuji and Yasushi Ueki, 2005.
The authors thank Felipe Silveira Marques for his invaluable research assistance in this project. His unwavering enthusiasm, diligent research and coherent writing made this report possible.

United Nations Publication

LC/W.44

Contents

Abstract

Whereas small and medium-sized enterprises (SME) export promotion policies in Brazil (BR) are entering a second-generation, those for information technology (IT) are still in their infancy. We are still only beginning to gain an understanding of individual SME IT needs and uses. Nonetheless, we have not yet fathomed the possibilities for IT use in SME networks. Beyond the basic goal of achieving widespread dissemination, there has been little policy development in this area. In regard to broad dissemination, the new government initiative to develop cheap computers could be part of the answer, but that remains to be seen. Moreover, SMEs will still be faced with the problem of obtaining adequate software and, most importantly, qualified IT staff aware of the organizational and strategic challenges facing SMEs.

On the other hand, export promotion policies are becoming more sophisticated and tailor made. The recent emergence of local/regional networks of exporting firms such as the High Technology Association (HTA) consortium, and the support given to them by Brazilian Export Promotion Agency (APEX), as well as easier use of export portals such as that of Banco do Brasil and export facilities such as those provided by Correios, are a few signs of gradual and important changes in policy. The scope of APEX support for these networks needs to be expanded to include development of IT tools to promote meaningful collaboration and to allow for interactive export activities. This would increase the supply of complete platforms in the case of high-tech sectors, thus capturing greater value-added and providing increased sustainability. Export sustainability is a critical problem that continues to plague SME exports. This has been correctly identified but still remains to be diagnosed, above and beyond the lure of the domestic market once the local economy recovers. Guidance and sustainability by anchor firms appears to be a promising avenue for both SME export capacity building and sustainability. Care is needed, however, to prevent a strong dependency relationship from developing. In this regard, experimentation could be pursued to involve first-tier suppliers in this support and learning network for export-oriented SMEs.

The full potential of Internet-based instruments has not yet been fully grasped by promotion agencies. Full interactivity and high-quality graphical interfaces are critical for breaking into an overcrowded export market. Marketing is often weak or export capability lacking in exporting SMEs, either because of the type of specialized training needed, in the case of high-tech firms, or because of a lack specialized training in the case of traditional industry clusters. Internet tools can be employed effectively in building the capacities that are lacking.

I. Introduction

This aim of this study is to analyze the nature and scope of IT applications used by SMEs and examine the potential of IT as an instrument of trade promotion and industrial development among SMEs. Brazil's recent export drive has produced positive results, partly as a result of renewed trade efforts by SMEs. From 2000 to 2003, Brazilian exports grew from 9.1% to 14.8% of GNP to represent 1% of exports worldwide. In contrast, Brazil accounts for 1.7% of total global IT expenditures.

In 2004 (up to August) Brazilian exports have been growing at the rapid rate of 58% to reach a cumulative total of US$ 58.5 billion, generating a surplus of US$ 20.1 billion. Export growth in 2003 (January-June) was 31%. The trade surplus (over a similar period) increased sevenfold between 2002 and 2004. Manufactured (53%) and basics products account for over 80% of total exports. Transport materials, products in the soybean complex and metallurgical goods are the main export items (table 1). The top five regional export markets are: the European Union (26%), the United States (20%), Asia, Latin American Integration Association (LAIA) and Mercosur (9%). The top five countries for Brazilian exports (United States, Argentine, China, Netherlands and Germany) absorb almost 45% of the total. In contrast, service exports in 2003 amounted to just US$ 10 billion, producing a US$ 4.6 billion deficit (Vastine 2004).

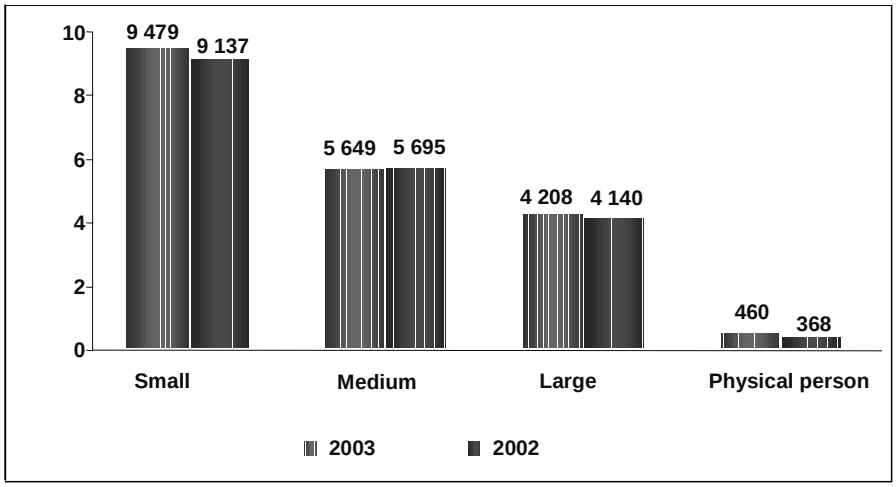
TABLE 1
MAIN PRODUCTS EXPORTED, JAN-JUN 2004

		Value	Δ %2004-2003	% Share
1	Transport material	6 529	35.4	15.1
2	Soybean complex	5 460	45.4	12.6
3	Metallurgical products	4 444	33.3	10.3
4	Meat	2 768	57.0	6.4
5	Chemicals	2 707	21.1	6.3
6	Oil and fuel	2 676	12.7	6.2
7	Machinery and equipment	2 426	42.8	5.6
8	Ores	2 201	27.9	5.1
9	Footwear and leather	1 575	18.0	3.6
10	Paper and pulp	1 438	4.1	3.3
11	Electric and electronic appliances	1 409	3.9	3.3

Source: Ministério do Desenvolvimento, Indústria e Comércio Exterior (MDIC), Summary version of the Brazilian trade balance http://www.desenvolvimento.gov.br/arquivo/secex/balanca/balComBrasileira/semanal/NovaBalanca.ppt, consulted on August 23, 2004.

The number of exporting firms grew by 5.1% from 13,312 in 2002 to 13,996 in 2003 (the growth rate accelerated to 6.8% in 2004/2003); the number of exporting micro, small and medium-sized enterprises (MSMEs) grew by just 3.7%, whereas the number of medium-sized enterprises remained virtually constant (figure 1). In 2003, MSMEs jointly represented 76% of the total number of exporting firms, but accounted for less than 11% of total exports by value.

FIGURE 1
BRAZILIAN EXPORT BY ENTERPRISE SIZE, 2002-2003
(In thousands of firms)



Source: Ministério do Desenvolvimento, Indústria e Comércio Exterior (MDIC), Summary version of the Brazilian trade balance http://www.desenvolvimento.gov.br/arquivo/secex/balanca/balComBrasileira/semanal/NovaBalanca.ppt, consulted on August 23, 2004.

II. Current situation of the IT market and IT use by SMEs

A. Market estimates

As the world's fifth most populated country with over 180 million inhabitants, Brazil ranks among the top 20 global IT users, although in per capita terms it lags well behind advanced countries and a number of emerging economies, because of its highly skewed income distribution. Table 2 shows estimates of IT market development, according to different sources. For comparison the last column shows the world total or average.

From 1999 to 2002, while IT spending (in US dollars) decreased, it grew in real terms, since the exchange rate suffered a major devaluation during the period. As a percentage of GDP, Brazil's IT spending rose from 3.9% in 1999 to 4.7% in 2002, to represent 1.6% of global IT spending.

The evolution of IT infrastructure in Brazil reveals a rapid dissemination of PCs and Internet services, although in many respects at a slower pace than the global average. The number of PCs per 1,000 inhabitants has grown by about 30% per year between 1999 and 2002. Nonetheless, the per capita ratio of 7.48%, compared with the world average of 9.91%, shows that there are still untapped opportunities for growth. In 1999, there were relative few Brazilian Internet hosts — just 3 per 1,000 habitants. By 2002, this number had multiplied fourfold, but it still represents half of the world average. The number of Internet users has also increased fourfold, thereby closing the gap with respect to the global average. Broadband access is still limited, reaching only 0.5% of the population. IT hardware, software and related services have grown by about 10% per year, to jointly represent about US$ 14 billion or 1.4% of global spending.

TABLE 2
IT MARKET ESTIMATES
(In millions of US$)

IT Market	Brazil			World	Brazil as% of global spending
	1999	2002	CAGR[a] (%) 1999-2002	2002	
IT spending	16 300	14 900	-2.95	899 000	1.66
IT as% of GDP	3.9	4.7	6.42	2.8	-
PCs [b]	36.3	74.8	27.25	99.1	-
Internet hosts [b]	2.7	12.8	69.13	25.9	-
Internet users [b]	20.8	82.2	58.10	97.2	-
Broadband subscribers [b]	-	4.5	-	-	
IT Hardware spending	5 782	6 891[c]	9.17	376 119[c]	1.83
IT Software spending	1 635	1 863[c]	6.75	196 237[c]	0.95
IT Services spending	4 349	5 368[c]	11.10	425 660[c]	1.26
Telecommunications spending	30 339	31 703[c]	2.22	1 037 877[c]	3.05
Main phone lines [b]	165.4	223.2	10.51	404.0	-
Cell phone subscribers [b]	89.3	200.6	30.97	190.7	-
B2B trade	165.0	36 500	504.79	916 000	3.98
B2C trade	77.7	1 400	162.16	251 000	0.56
B2G trade	-	1 200	-	-	-

Source: E-Consulting Corp. (2003). Internet Indicators. http://www.e-consultingcorp.com.br/insider_info/indicadores.htm. E-Consulting does not provide definitions. International Telecommunication Union (ITU). World Telecommunication Indicators, Geneva: ITU, 2003. World Information Technology and Services Alliance (WITSA). Digital Planet 2002: The Global Information Economy. WITSA, 2002.

[a] CAGR (compound annual growth rate) is computed by the formula: [(Pv/P0) (1/n)]-1, where Pv = Present value; P0 = Initial value; n = Number of periods. The result is multiplied by 100 to obtain a percentage.
[b] As per 1,000 inhabitants.
[c] 2001 data.

Notes:
ITU definitions:
- PCs per 1000 population: is the estimated number of personal computers (PCs), obtained from a annual questionnaire supplemented by other sources;
- Internet hosts: refers to the number of computers directly connected to the Internet, data were obtained from the Internet Software Consortium and RIPE (Réseaux IP Européens);
- Internet Users: is based on nationally reported data;
- Main telephone lines: refer to telephone lines connecting a customer's equipment (e.g., telephone set, fax machine) to the Public Switched Telephone Network (PSTN), and which have a dedicated port on a telephone exchange (most countries also include public payphones);
- Cellular mobile telephone subscribers: refers to users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology providing access to the PSTN.

WITSA definitions:
- IT Hardware: servers, personal computers, workstations, data communication equipment and add-ons purchased by a corporation, household, school or government agency from a external agent or corporation;
- IT Software: includes the purchase of all software products and external customization of computer programs; excludes expenses related to the internal customization of computer programs (e.g. wages, rent); includes system software and utilities, application tools, and application solutions;
- IT Services: IT service provided to a corporation by an external agent or corporation, above and beyond the services provided by an internal IS team; includes IT consulting, implementation services, operations management, IT training and education, processing services, and IT support services;
- Telecommunications: encompasses expenditures by business, household, Government, and education on public network equipment, private network equipment and telecommunications services.

In terms of telecommunications infrastructure, Brazil has experienced an investment boom since 1998 when the telecom system was privatized. By the end of 2002 there were 223 fixed lines per 1,000 inhabitants, compared to 165 in 1999, a 10% increase per year. More importantly, mobile phone use has spread must faster (30%), above the world's average. The boom in telecommunications infrastructure investment in Brazil is now over, however, since Telecom Operators (TELCOS) could not find clients that could afford to pay their monthly bills. Future expansion will have to occur mainly in lower-income urban population groups where paying telephone bills is obviously a secondary priority compared to buying food, electricity and paying transport fares to get to work. The Brazilian case illustrates the challenge of universalizing telecommunications services in developing countries that face persistent poverty and a skewed income distribution.

In short, both the potential and limits of IT development in a large developing country environment need to be recognized. In industry sectors and regions where there is effective demand, basic and sophisticated services such as corporate high-speed networks and broadband Internet services are widely available and prices are declining. Telecom infrastructure does not seem to be a major problem for B2B diffusion in Brazil anymore, since the relatively large absolute size of the market has encouraged sufficient private investments.

As elsewhere in the world, e-commerce has spread very rapidly in Brazil. In 2002, according to E-Consulting Corporation, e-commerce transactions amounted to US$ 39 billion, representing 3.9% of the world total. Considering the relatively larger global share of Brazil as compared to other ICT indicators, this total may be overestimated. B2B accounts for the vast majority of transactions in value terms (US$ 36.5 billion), but B2G is growing fast and is now almost on level terms with B2C.

B. Penetration of IT and e-commerce among small and medium-sized enterprises (SMEs)

Figures published by E-Consulting show that electronic transactions in Brazil (B2B, B2C, B2G, m-commerce and online retail) amounted to US$ 47.2 billion. The 2003/2004digital enterprise survey, carried out by the Industrial Federation of the State of São Paulo (FIESP) in São Paulo, Brazil's most economically advanced state, reveals that half of all SMEs surveyed did not foresee participation in electronic transactions via Internet (Internet-based Electronic Data Interchange (EDI)) and 20% did not even have a website. In contrast, 72% of the large firms had already implemented electronic transactions via Internet or plan to do so in the near future. Among micro-enterprises, only 8% make use of B2B for sales; 16% use this for purchases, and just 8% engage in B2C. Among small enterprises, 15% use B2B, for both purchases and sales and 11% engage in B2C. Despite these relatively small numbers, they are significantly higher than in 2003, when only 15% of enterprises claimed to use e-commerce, a figure that had jumped to 26% by 2004.

Another survey carried out by Sebrae-SP covering a sample of 1,163 firms representing the universe of SMEs in the state of São Paulo across different sectors — industry, commerce and services — revealed that: 47% of the sampled enterprises make use of IT (*informatizadas*), compared to 31% in 1997; 54% of entrepreneurs have access to the Internet; half of all IT users have only one microcomputer, and IT use is greater in older firms, in the industrial sector and in larger SMEs. By contrast, IT use is less frequent among SMEs in the commerce and service sectors, in traditional activities and in smaller and newer enterprises.

The main uses made of Internet access are: (i) Banking services; (ii) Government services; (iii) News; (iv) Communications (e-mail); (v) Research on business opportunities, prices and suppliers, and (vi) Website to publicize business.

Furthermore, most SMEs that are IT users are satisfied with their level of IT use and have a relatively up-to-date ensemble of software and hardware. By contrast, SMEs that do not use IT do not perceive clear benefits in its use, or else find it expensive in relation to their current revenue level. As a result, few SMEs are willing to invest more in IT (19%). In general, those opting not to invest in IT in the short term are divided between those that see no need, those that already have the required IT resources, and those that are happy with their current level of IT use.

Between 2000 and 2002, the rate of expansion of IT use in the sample grew by 5% per year, and the proportion of IT users jumped from 42% to 47% of the total. This slower dissemination rate is partly influenced by the unfavourable conjuncture, but in any case it is still higher than the overall economic growth rate.

The foregoing analysis of e-commerce dissemination draws on previous research on the e-commerce environment, policy and dissemination in Brazil. It uses data compiled from a ten-country survey by the Centre for Research on Information Technology and Organizations, of 200 business establishments in Brazil, encompassing large and small firms in the financial, manufacturing and retail/wholesale distribution industries (Tigre, 2003).

Large Brazilian firms display clear leadership in adopting IT and e-commerce, since they are better able to achieve economies of scale and scope that enhance the perceived benefits of adoption and lead to higher levels of dissemination. As information is costly to produce yet very cheap to reproduce, the cost of information is dominated by the costs of the first copy (Shapiro and Varian, 1999). The launching of e-commerce may require a considerable investment in licenses, design, organizational linkages, and data security at the outset, but the costs of adding new users can be very low. As a result, larger firms that can take advantage of scale economies, and those with resources to facilitate implementation can be expected to be more aggressive in adopting technologies such as e-commerce (Tornatzky and Fleischer, 1990). In some cases, however, small firms may be more agile and flexible in adopting new technologies and exploiting new business models, unencumbered by IT legacy systems and past organizational and network rigidities.

1. Adoption of e-commerce technologies

Among Brazilian firms, large establishments have a higher level of use of the Internet technologies (table 3). All surveyed small firms use e-mail, and roughly 70% have a website. However, when more advanced applications such as Intranet and Extranet (accessible by suppliers and business partners) are involved, large firms display twice the level of adoption of small firms. For electronic fund transfer and call centres, the difference between SMEs and large firms is less.

The adoption of e-commerce technology can be measured by the degree to which Internet applications are integrated with internal information systems and those of suppliers and customers. Table 4 shows that large firms are well ahead of small ones in both internal and external integration. It also shows that the percentage of Brazilian firms that have integrated internal databases and information systems is larger than the global average (29.6% compared to (23.9%). Integration with suppliers and business customers, however, is below the global average.

TABLE 3
USE OF E-COMMERCE TECHNOLOGIES
(In Percentages)

	Size[a]		Total	
	SME	Large	Brazil[b]	Global[c]
E-mail	100	100	100	98.5
Website	70.4	80.8	70.7	74.1
Intranet	36.8	71.7	37.7	63.6
Extranet	32.9	44.6	33.2	32.7
Accessible by suppliers/business partners	10.1	33.7	10.7	20.9
Accessible by customers	15.5	28.6	15.9	17.8
Electronic Data Interchange (EDI)	35.7	71.9	36.7	44.3
Over private networks only	7.0	25.8	7.5	19.4
Internet-based only	6.9	10.4	7.0	8.4
Both	21.8	35.7	22.2	15.9
Electronic Funds Transfer (EFT)	52.0	66.5	52.4	43.4
Call centre	45.6	62.5	46.1	32.3

Source: Centre for Research on Information Technology and Organizations (CRITO) Global E-Commerce Survey, 2002.

[a] SMEs are those with 25-250 employees; large firms are those with more than 250 employees.
[b] Responses were weighted in terms of the total number of establishments and employee size within the sector for each country. Survey sample sizes for Brazil by sector are: 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size 98 establishments are classified as SME and 102 as large.
[c] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan (Province of China), China and Japan.

TABLE 4
ENTERPRISE INTEGRATION STRATEGY, 2002
(In Percentages)

Extent to which Internet applications are electronically integrated with …	Size[a]		Total	
	SME	Large	Brazil[b]	Global[c]
Internal databases and information systems[d]				
Little to none	58.9	42.0	58.4	52.5
Some	12.0	10.3	12.0	23.6
A great deal	29.1	47.7	29.6	23.9
Those of suppliers and business customers[e]				
Little to none	90.0	70.2	89.4	72.1
Some	8.5	16.1	8.7	18.3
A great deal	1.6	13.7	1.9	9.6

Source: Centre for Research on Information Technology and Organizations (CRITO) Global E-Commerce Survey, 2002.

[a] SMEs are those with 25-250 employees; large firms are those with more than 250 employees.
[b] Responses were weighted in terms of the total number of establishments and employee size within the sector for each country. Survey sample sizes for Brazil by sector are: 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size 98 establishments are classified as SME and 102 as large.
[c] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan (Province of China), China and Japan.
[d] Exact wording of question: Using a 5-point scale where 5 is “a great deal” and 1 is “not at all”, please rate the extent to which your Internet applications are electronically integrated with your internal database and information systems. Scores of 1 or 2 are categorized as “little to none”, a score of 3 as “some” and scores of 4 or 5 as “a great deal”.
[e] Exact wording of question: Using a 5-point scale where 5 is “a great deal” and 1 is “not at all”, please rate the extent to which your company’s databases and information systems are electronically integrated with those of your suppliers and business customers. Scores of 1 or 2 are categorized as “little to none”, a score of 3 as “some” and scores of 4 or 5 as “a great deal”.

The survey shows that large firms perceive greater external pressure to adopt e-commerce as a result of competitors being online, and because of the requirements of suppliers and customers (table 5). They also are somewhat more likely to perceive the opportunity to reduce costs or expand markets. Nevertheless, smaller firms attach greater importance than larger firms to the role of government online procurement. In Brazil, the launching of the federal government procurement site, *Comprasnet*, greatly increased the number of SMEs participating in government procurement. This suggests that Government could contribute to IT dissemination through its own use of the technology.

TABLE 5
DRIVERS OF INTERNET USE
(In Percentages)

% indicating driver is a significant factor …[d]	Size[a]		Total	
	SME	Large	Brazil[b]	Global[c]
Customers demanded it	44.4	56.3	44.7	36.9
Major competitors were online	26.3	48.8	26.9	31.3
Suppliers required it	23.7	45.1	24.3	22.3
To reduce costs	60.5	71.6	60.8	35.7
To expand market for existing product or services	59.1	67.5	59.3	47.9
To enter new businesses or markets	53.8	64.1	54.1	42.0
To improve coordination with customers and suppliers	60.8	66.6	60.9	43.7
Required for government procurement	25.6	18.5	25.4	15.2
Government provided incentives	14.3	21.5	14.5	8.3

Source: Centre for Research on Information Technology and Organizations (CRITO) Global E-Commerce Survey, 2002.

[a] SMEs are those with 25-250 employees; large firms are those with more than 250 employees.
[b] Responses were weighted in terms of the total number of establishments and employee size within the sector for each country. Survey sample sizes for Brazil by sector are: 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size 98 establishments are classified as SME and 102 as large.
[c] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan (Province of China), China and Japan.
[d] Exact wording of question: Using a 5-point scale where 5 is "a very significant factor" and 1 is "not a factor at all," please rate how significant each of the following was to your organization's decision to begin using the Internet for business. A score of 4 or 5 was classified as "a significant factor".

2. Barriers and difficulties

Information technology dissemination can involve profound changes in business organization, government regulation and human experience. Since these changes are of an institutional nature, they are usually more difficult and time consuming to overcome than those involved in the introduction of new equipment and software. Table 6 shows that in Brazil, major obstacles are imposed by government regulations, including worries about data privacy or security issues (48.6%); lack of business laws for e-commerce (31.6%); and inadequate legal protection for Internet purchases (41.4%). Concern over Internet taxation was also cited by 26.8% of Brazilian firms, compared to just 16.5% of the global sample.

Another finding is that small firms face more barriers than large ones. The only exception is the prevalence of credit card use, which was considered to be more of an obstacle for large firms. The use of credit cards for e-commerce was the lowest reported obstacle overall. Brazilian consumers are now the largest users of credit cards in Latin America, and the country ranks

eighth worldwide, with about 30 million cards issued and over 1 billion transactions a year. In 2000, total credit card purchases amounted to US$ 26.5 billion, equivalent to 7% of total private domestic consumption in Brazil (Gazeta Mercantil L. A., 2001, p. 26).

TABLE 6
BARRIERS AND OBSTACLES TO E-COMMERCE ADOPTION
(In Percentages)

Percentage indicating statement is a significant obstacle[d]	Size[a]		Total	
	SME	Large	Brazil[b]	Global[c]
Need for face-to-face customer interaction	32.6	30.2	32.5	33.8
Worries about data privacy or security issues	48.4	55.1	48.6	44.2
Customers do not use the technology	48.5	20.0	47.6	31.4
Finding staff with e-commerce expertise	34.3	32.2	34.2	26.5
Prevalence of credit card use in the country	22.9	33.8	23.2	20.3
Costs of implementing an e-commerce site	33.4	39.3	33.6	33.6
Making necessary organizational changes	32.6	41.1	32.9	23.9
Level of ability to use the Internet as part of business strategy	22.3	24.8	22.4	24.8
Cost of Internet access	20.7	8.9	20.4	15.1
Business laws do not support e-commerce	31.9	22.2	31.6	24.2
Taxation of Internet sales	27.1	17.6	26.8	16.5
Inadequate legal protection for Internet purchases	41.6	34.4	41.4	34.1

Source: Centre for Research on Information Technology and Organizations (CRITO) Global E-Commerce Survey, 2002.

[a] SMEs are those with 25-250 employees; large firms are those with more than 250 employees.
[b] Responses were weighted in terms of the total number of establishments and employee size within the sector for each country. Survey sample sizes for Brazil by sector are: 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size 98 establishments are classified as SME and 102 as large.
[c] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan (Province of China), China and Japan.
[d] Exact wording of question: Using a 5-point scale where 5 is "a very significant obstacle" and 1 is "not an obstacle," please rate how significant the following obstacles are to your establishment's ability to do business online. A score of 4 or 5 was classified as "a significant obstacle".

Since the problem of finding staff with e-commerce expertise is greater in Brazil (34.2%) than in the inter-country sample (26.5%), we must also look at the state of the country's education levels and local readiness to engage in the use of ITs. Given that Brazil had 3 million university-level students in 2002, a 43% increase over 1998 (INEP, 2003), the problem of skills shortage seems to be associated with insufficient on-the-job experience to develop and adapt information technologies to specific applications and business environments, rather than a lack of basic skill levels. A positive indicator of the availability of IT and managerial capabilities is that the ability to use the Internet as part of a business strategy is considered slightly less of a barrier in Brazil (22.4%) than in the inter-country sample (24.8%).

As far as Internet costs are concerned, table 6 above shows that Brazilian firms give equal importance to the cost of implementing an e-commerce site (33.6%) as do their global counterparts. The cost of Internet access is considered more of a problem in Brazil, but it seems to be restricted to SMEs. Apart from Internet access costs, other considerations may be staffing or the outside services needed to develop e-commerce.

3. E-commerce diffusion

Table 7 shows that large firms are more intensive e-commerce users in all applications. Overall, advertising and marketing, followed by online purchasing, are the most widespread applications among both SMEs and large firms. The pattern of applications is relatively similar, except for online after-sales customer service and support, which is more specific to large firms. Online sales are the least widespread application, especially among small manufacturing firms.

TABLE 7
USES OF THE INTERNET, 2002
(In Percentages)

Percentage using the Internet for …[d]	Size[a]		Total	
	SME	Large	Brazil[b]	Global[c]
Advertising and marketing purposes	58.6	59.1	58.6	57.6
Online sales	28.0	32.3	28.2	29.9
After-sales customer service and support	22.6	40.1	23.1	43.7
Online purchases	54.7	63.4	54.9	46.8
Exchanging operational data with suppliers	51.6	62.4	51.9	48.1
Exchanging operational data with business customers	49.0	56.5	49.2	50.7
Formally integrating the same business processes with suppliers or other business partners	48.8	48.1	48.8	33.9

Source: Centre for Research on Information Technology and Organizations (CRITO) Global E-Commerce Survey, 2002.

[a] SMEs are those with 25-250 employees; large firms are those with more than 250 employees.
[b] Responses were weighted in terms of the total number of establishments and employee size within the sector for each country. Survey sample sizes for Brazil by sector are: 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size 98 establishments are classified as SME and 102 as large.
[c] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan (Province of China), China and Japan.
[d] Exact wording of question: "Does your establishment use the Internet for …?".

4. Impacts of e-commerce

One of the important phenomena of the last ten years has been the rapid growth of business networks. Although this process had started before the Internet was available for commercial use, e-commerce is reputed to have important network impacts. Table 8 shows that over one-third of firms interviewed in Brazil reported an increase in network impacts such as the number of suppliers (39.8%) and distribution channels (35.2%). The evidence shows that large firms are more likely to have increased their number of distribution channels since they began using the Internet, again suggesting that they can achieve economies of scale from their e-commerce investments.

Going online also can expose firms to greater competitive pressure. Overall, Brazilian firms were affected roughly to the same extent as the full global sample in terms of the number of competitors and competitive pressure. However, small firms were much more likely to report increased competition since going online, perhaps because doing business on the Internet exposed them to competition beyond their limited existing market area.

TABLE 8
IMPACTS FROM ONLINE BUSINESS ON INDUSTRY STRUCTURE, 2002
(In Percentages)

Percentage indicating[d]	Size[a]		Total	
	SME	Large	Brazil[b]	Global[c]
Number of				
Distribution channels increased	34.8	48.5	35.2	40.2
Suppliers increased	39.7	40.5	39.8	29.9
Competitors increased	28.0	16.8	27.7	27.9
Intensity of competition increased	37.9	29.8	37.7	41.5

Source: Centre for Research on Information Technology and Organizations (CRITO) Global E-Commerce Survey, 2002.

[a] SMEs are those with 25-250 employees; large firms are those with more than 250 employees.
[b] Responses were weighted in terms of the total number of establishments and employee size within the sector for each country. Survey sample sizes for Brazil by sector are: 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size 98 establishments are classified as SME and 102 as large.
[c] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan (Province of China), China and Japan.
[d] Exact wording of question: Please indicate whether the following have increased, decreased or stayed the same in your establishment since it began using the Internet for business.

Table 9 shows the impacts on business performance of going online. Large firms seem to be reaping more benefits from e-commerce than smaller enterprises, by increasing their internal efficiency, widening sales areas, and by improving customer services, coordination with suppliers, and competitive position. On the other hand, small firms achieve more inventory and cost reduction through e-commerce. Only 12.8% of firms reported increased international sales since going online. The figure was very similar for large and small firms, and across the three sectors, showing that there is no identifiable segment of the economy with a global orientation.

In Brazil, large firms are clearly more active in implementing e-commerce technologies, and they use the Internet more extensively for most applications. This is consistent with the notion that potential economies of scale and scope would provide greater incentives for adoption. On the other hand, 41% of large firms said that making necessary organizational changes was an obstacle to doing business online, compared to 33% of small firms. This may show that organizational inflexibility is a barrier that negates some of the advantages enjoyed by larger firms, or that the cost of making organizational changes is higher among large firms.

Large firms also report greater benefits from going online, mostly in terms of increased internal efficiency, increased sales and better customer service. Smaller firms did as well or better in terms of other variables. Nonetheless, large firms were much more likely to report that their competitive position improved, so it would appear that there are advantages to leveraging e-commerce investments over a larger scale or scope of activity.

The importance of local and global factors as e-commerce drivers must also be analysed carefully in other developing countries. The small scale of local markets in most developing countries may give global factors a more prominent role as drives of e-commerce adoption than in a larger inward-oriented country as Brazil. O'Connor's (2002:57) argument about the importance of competitive pressures for IT adoption seems to ring true here. In the absence of strong domestic competition, ICT adoption in developing countries may occur earliest in sectors exposed to international competition.

TABLE 9
IMPACTS OF DOING BUSINESS ONLINE, 2002
(In Percentages)

Percentage indicating high impact[d]	Size[a]		Total	
	SME	Large	Brazil[b]	Global[c]
Internal processes more efficient	32.4	52.6	32.9	33.9
Staff productivity increased	40.3	40.7	40.3	27.2
Sales increased	26.4	31.0	26.5	20.5
Sales area widened	27.4	40.8	27.8	31.4
Customer service improved	44.8	55.9	45.1	34.8
International sales increased	12.8	11.7	12.8	19.5
Procurement costs decreased	25.0	26.2	25.1	17.7
Inventory costs decreased	28.2	20.0	27.9	14.0
Coordination with suppliers improved	34.2	42.5	34.4	29.8
Competitive position improved	23.5	39.7	24.0	29.8

Source: Centre for Research on Information Technology and Organizations (CRITO) Global E-Commerce Survey, 2002.

[a] SMEs are those with 25-250 employees; large firms are those with more than 250 employees.
[b] Responses were weighted in terms of the total number of establishments and employee size within the sector for each country. Survey sample sizes for Brazil by sector are: 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size 98 establishments are classified as SME and 102 as large.
[c] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan (Province of China), China and Japan.
[d] Exact wording of question: Using a 5-point scale where 5 is "a great deal" and 1 is "not at all", please rate the degree to which your establishment has experienced the following impacts since it began using the Internet for business. A score of 4 or 5 was classified as "high impact".

Lastly, the fact that large firms are clearly more active in implementing e-commerce technologies could have negative implications for developing countries. Since the vast majority of firms in the developing world are small, they may lack the incentives provided by scale and scope for IT adoption.

III. SME development in the IT revolution

A. Overview of the relative importance of SMEs in the economy at large[1]

Despite the renewed and increasing importance of small firms in Brazil's social and economic development, conceptual and definitional issues still plague statistics and policy arenas. Putting aside the ever-intractable issue of the size and weight of the informal sector, any attempt to measure the importance of small firms has to grapple with this complexity.

A first hurdle concerns multiple levels of aggregation. The 1988 Brazilian Constitution[2] established a legal framework for support to micro-enterprises and small businesses only, making no mention of medium-sized firms. In 1994, the Micro-enterprise Statute (Law 7.256) established a series of differential treatments for that segment in the administrative, fiscal, social security and labour domains. A second statute in 1994 (Law 8.864) established a basis for favourable treatment in the labour, social security, fiscal, credit and entrepreneurial development areas. However, as happened with the 1994 law, not all the benefits included in its bylaws were regulated. It was only in 1996 that a major implementation in the fiscal area occurred with the passing of Law 9.317, improving and enlarging the existing tax payment regime for micro-enterprises (*Sistema Integrado de Pagamento de Impostos e Contribuições das Microempresas e das Empresas de Pequeno Porte* (SIMPLES)). Since then, most federal states and a few municipalities have also adopted a simplified tax legislation for small enterprises.

A second hurdle related to classification of the small enterprise segment. Here, even the Brazilian micro and small enterprise support service (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (SEBRAE) adopts one form for policy functions (gross annual revenue) and another for research purposes (number of employees). Two key norms that establish a classification according to the size of the firm are Mercosur Resolution GMC 59/98 and the Micro-enterprise and Small Business Statute (Law 9.841, of 1999).

---

[1] A broader and more in-depth discussion of the role of MSMEs in the Brazilian economy, and an encompassing, albeit now outdated, overview of strategies and policies to promote their evolution and performance can be found in IETS 2002.

[2] Articles 146, 170, 179.

Mercosur Resolution GMC 59/98 serves as a reference for common policy formulation and was adopted by Brazil to shape its export financing programmes. It builds upon Mercosur Resolution GMC 90/93, which instituted a policy in support of MSMEs and divided the sector into: (i) industry and (ii) commerce and services. It classifies a firm through a combination of number of employees and maximum gross annual revenues, as shown in table 10.

TABLE 10
MSME CLASSIFICATION BY SECTOR – SEBRAE

	Micro enterprise		Small enterprise		Medium enterprise	
	Industry	Commerce and services	Industry	Commerce and services	Industry	Commerce and services
Number of employees	1 – 10	1 – 5	11 – 40	6 – 30	41 –200	
Annual revenues (*millions of US$*)	0.4	0.2	3.5	1.5	20.0	7.0

Source: MERCOSUL/GMC/RES 90/93 and MERCOSUL/GMC/RES 59/98.

Furthermore, MSMEs must not be controlled by another company or be part of an economic group which as a whole surpasses the established ceiling. A firm ceases to belong in this segment if it breaks out of these parameters in two consecutive years.

The Micro-enterprise and Small Business Statute is the main legal framework for policy formulation. It was regulated by Decree 3.474/00, and initially simplified registration procedures and incorporated a series of provisions not yet implemented, among other things: 20% of federal funds for research and capacity training (art. 20), and fiscal and financial incentives for entrepreneurial development. The statute classifies small enterprises by gross annual revenues.

TABLE 11
SME CLASSIFICATION BY GROSS ANNUAL REVENUE – SEBRAE

Size	Gross annual revenue	
Micro-enterprise	Up to R$ 244,000	(approximately US$ 81,000)
Small enterprise	Between R$ 244,000 and R$ 1,200,000	(approximately US$ 400,000)

Source: Federal Law 9.841, of 05/10/99 (Micro-enterprise and Small Business Statute).

These criteria are also being employed by several government SME credit programmes. The SIMPLES regime, however, has not yet been updated to the current values, and still uses the old R$ 1,200,000.00 value. Some states and municipalities use these current values while others have their own reference values, in line with local fiscal and tax regimes.

Sebrae also classifies enterprises by employed personnel in commerce and services.

The Ministry of Labour and Employment (*Ministério do Trabalho e Emprego* (MTE)), also adopts the Sebrae industry research criteria in its major employment survey, the Annual Social Information Report (*Relação Anual de Informações Sociais* (RAIS)).

Brazil's central statistical office (*Instituto Brasileiro de Geografia e Estatística* (IBGE)) has a different segment scope (micro and small) and uses yet another criterion to classify small firms in its surveys, based on staff employed, which includes both employees and owners, to allow for the collection of data on micro enterprises with no employees.

TABLE 12
SME CLASSIFICATION BY NUMBER OF EMPLOYEES – SEBRAE

Size	Employees in	
Micro-enterprise	Commerce and services: Industry:	up to 9 employees up to 19 employees
Small enterprise	Commerce and services: Industry:	from 10 to 49 employees from 20 to 99 employees
Medium-sized enterprise	Commerce and services: Industry:	from 50 to 99 employees from 100 to 499 employees
Large enterprise	Commerce and services: Industry:	over 99 employees over 499 employees

Source: Boletín Estatístico de Micro e Pequenas Empresas/Observatório Sebrae, 2003.

TABLE 13
SME DEFINITIONS BY NUMBER OF EMPLOYEES – SEBRAE

Enterprise	Employs up to
Micro	5 people
Small	19 people
These definitions are linked to a level of annual gross revenue below R$ 1.5 million (US$ 500,000)	

Source: Boletín Estatístico de Micro e Pequenas Empresas/Observatório Sebrae, 2003.

Lastly, the National Bank for Economic and Social Development (*Banco Nacional de Desenvolvimento Econômico e Social* (BNDES)), employs yet another classification in its credit operations, based on annual revenues.

In 2000, according to IBGE, there were a total of 4.1 million firms in Brazil. Micro-enterprises and small firms account for 98% of this total. In relation to the labour market of 30.5 million workers in formal companies, SMEs account for 45% of the total; 46.2% in industry, 79.7% in commerce and 29% in services. A special IBGE study of the commerce and service sectors in 2001 showed that small and medium enterprises employed 7.3 million people, accounting for 95.5% of total firms in the sector. The same study detected 2 million SMEs, of which 1.1 million employed staff while 926.8 were family firms. In the industrial sector, the IBGE Central Enterprise Registry, base year 2000, identified 550,000 micro-enterprises and small businesses, which employ 46% of formal labour.

Between 1996 and 2001, micro-enterprises and small firms grew in number from 3.1 million to 4.6 million, rising proportionately from 98.9% to 99.2% of the total. They generated 3.5 million new jobs, while medium-sized and large firms only generated 68,000. SMEs also accounted for 14.5 million formal jobs or 56.1% of the total.

According to Sebrae Nacional, MSMEs in 2001 accounted for 98.7% of the 4.1 million formal firms in the industry, commerce and services sectors.[3] They generated 96% of all employment over the last 5 years, accounting for 20% of the GNP and employing 45% of the formal workforce.[4] To this universe of legalized firms, one can add another 9.5 million informal economic establishments, according to IBGE; or 14.5 million, according to the Inter-Union Socioeconomic Studies Department (*Departamento Intersindical de Estatística e Estudos Sócio-Econômicos* (DIEESE)). This number does not include 4 million small family-based agricultural establishments. Whatever statistics are adopted, there is no denying the importance of this segment for the Brazilian economy. The majority of the 70 million Brazilians in the country's Economically Active Population (EAP) work or have links with the broad segment of MSMEs (Sebrae Nacional).

Table 14 shows the sector distribution of different categories of MSMEs based on the RAIS (2001) survey.

TABLE 14
DISTRIBUTION OF NUMBER OF FIRMS IN BRAZIL BY SIZE AND SECTOR, 2000

Enterprise	Industry		Commerce		Services		Total	
	Number of firms	%	Number of firms	%	Number of firms	%	Number of firms	%
	939 267	17.8	2 414 652	45.8	1 923 389	36 4	5 277 308	100
Small	48 314	19.7	88 941	36.2	108 203	44.1	245 458	100
Medium	9 856	33.3	5 724	19.4	13 999	47.3	29 579	100
Large	1 580	7.0	2.955	13.2	17 890	79 8	22 434	100
Total	**999 017**	**17 9**	**2 512 272**	**45.1**	**2 063 490**	**37.0**	**5 574 779**	**100**

Source: Relação Anual de Informações Sociais (RAIS), 2001, Ministério do Trabalho e Emprego (MTE).

Formal micro-enterprises and small businesses account for 41.4% of jobs, medium-sized firms for 12.3% and large enterprises for 46.3%. In the industrial sector, SMEs account for 51% of formal workers; in the commerce sector for 78% (9% in medium-sized firms) and in the services sector 26% (68% in large firms).

TABLE 15
BIRTH AND DEATH OF ENTERPRISES IN BRAZIL, 2000
(In number of)

		Micro	Small	Medium	Large	Total
1999	Firms	3 740 764	104 990	21 062	5 259	3 872 075
2000	Births	704 628	4 894	634	102	710 258
	Deaths	453 976	3 235	672	107	457 990
Change in size		**- 7 171**	**6 173**	**683**	**315**	**0**
2000	Net variation	243 481	7 832	645	310	252 258
	% of net variation	6.51	7.46	3.06	5.89	6.52
	Number of firms	3 984 245	112 822	21 707	5 569	4 124 343

Source: Boletín Estatístico de Micro e Pequenas Empresas/Observatório Sebrae, 2003.

[3] According to a different source (RAIS, 2001), there were 5.6 million firms, of which 99% were micro-enterprises or small businesses.

[4] "Micro e pequenas empresas (MPEs) no mercado internacional". If one includes medium-sized firms the broader segment accounts for one quarter of GDP, 60% of employment and 42% of wages.

Demographic studies of MSMEs between 1997 and 2000 reveal high annual birth and mortality rates, averaging 19.4% and 12.9%, respectively. In addition to concentrating the largest number of firms, micro-enterprises also exhibit the highest birth and mortality rates. Table 15 above summarizes enterprise demography in Brazil in 2000.

1. MSMEs and exports

In 2002, Brazilian exports totalled US$60.4 billion, representing less than 1% of world exports. About 85% of export sales were made by 709 firms in a universe of 17,407, revealing an export model concentrated among a few large firms. According to a study by *Fundação Centro de Estudos de Comércio Exterior* (FUNCEX), average annual exports by SMEs over the period 1997-2002 accounted for 15% of total exports (Markwald and Pessoa, 1997-2002)

A phenomenon that inhibits the expansion of the enterprise export base is early mortality (abandonment and/or discontinuity) of up to 80% of the 3,400 new firms that join the export base each year.

MSME exports have grown slowly over the last few years, only rising from US$ 9.3 billion in 1997 to US$ 9.6 billion in 2002. However, in relative terms their share of total Brazilian exports has fallen, from 17.6% in 1997 to 13.8% in 2002. Micro and small enterprise exporters account for over 70% of the country's total export base,[5] but less than 14% of exports.[6] This share is further reduced to 5% once a select group of about 200 high exporting enterprises, consisting mainly of trading companies and others, is excluded.

TABLE 16
TREND OF SME EXPORT VALUE, 1997/2002
(Millions of US$)

	All sizes	Micro-enterprises and small businesses				Share (Total/all sizes)
		Total	Micro	Small	Non-identified	
1997	52 959	9 299	3 753	5 530	36	17.6
1998	51 106	8 569	4 046	4 472	51	16.8
1999	47 996	7 388	3 247	4 088	56	15.4
2000	55 061	7 446	3 132	4 273	41	13.5
2001	58 139	9 040	3 657	4 255	148	13.8
2002	60 303	8 338	3 252	4 874	312	13.8
Annual (%)	**2.6**	**-2.2**	**-2.7**	**-2.5**	**42.6**	

Source: "Micro e pequenas empresas exportadoras no Brasil: un retrato", Markwald and Pessoa, 1997-2002.

There is nonetheless great potential for SME export growth, given that over 85% of the large enterprises in Brazil and about 41% of medium-sized industrial firms already export. As shown in table 17, the number of exporting SMEs has grown by 31.6% during the period.

In 2002, average exports by this group fell from US$658,000 to US$254,000 per year, after large-scale exporters are excluded. The value of exports of the median enterprise in this group was around US$ 40,000 per year throughout the period.

[5] 95% of the growth of the export base between 1997 and 2002, representing 3,045 new enterprises, consists of micro-enterprises and small businesses.

[6] In 2000, MSEs accounted for 83% of exporting firms, but just 30.6% of total exports.

TABLE 17
TREND OF EXPORTING SMES, 1997-2002

	All sizes	Micro-enterprises and small businesses				Share (Total/ all sizes)
		Total	Micro[a]	Small[b]	Non-identified[c]	
1997	13 850	9 631	5 286	3 992	353	69.5
1998	13 966	9 858	5 553	4 114	191	70.6
1999	15 168	10 957	6 343	4 442	172	72.2
2000	16 016	11 630	6 513	4 784	333	72.6
2001	16 821	12 316	6 639	5 025	652	73.2
2002	17 059	12 676	6 859	4 958	879	74.4

Source: "Micro e pequenas empresas exportadoras no Brasil: un retrato", Markwald and Pessoa, 1997-2002.

[a] firms with 1 to 19 employees;
[b] firms with 20 to 99 employees;
[c] firms with zero employees and/or firms that did not inform the number of employees.

Between 1994 and 2000, while the share of SMEs in the total number of exporting firms grew significantly in the case of non-industrial exports from 19.5% to 24.4%, their share in industrial exports grew only modestly from 57.5% to 58.9%. Nonetheless, the SME share of the value of non-industrial exports slumped from 14.4% to 9.4%, and their share of the value of industrial exports slumped even more sharply during the period, from 28.6% to 21.3%.

TABLE 18
EXPORT FIRMS BY TYPE AND SIZE OF ENTERPRISE, 1990-2000
(In percentages)

Enterprise	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Industrial	**63.7**	**67.2**	**68.1**	**67.0**	**67.3**	**68.6**	**68.8**	**69.0**	**69.0**	**67.1**	**66.4**
Micro	9.5	10.5	10.9	11.9	12.7	13.5	13.9	14.7	17.8	18.1	16.9
Small	16.3	18.3	21.3	21.9	23.0	23.1	23.6	24.4	24.7	24.3	24.3
Medium	22.3	23.5	23.1	21.8	21.8	20.7	20.4	19.9	19.5	18.4	17.7
Big	9.7	9.2	8.0	7.4	7.1	7.7	7.8	7.6	6.9	6.3	6.0
Non identified	5.9	5.6	4.8	3.9	2.6	3.6	3.2	2.4	0.1	0	1.6
Non industrial	**36.3**	**32.8**	**31.9**	**33.0**	**32.7**	**31.4**	**31.2**	**31.0**	**31.0**	**32.9**	**33.6**
Micro	10.2	10.4	11.2	12.2	13.2	13.5	14.3	15.1	22.0	23.7	17.3
Small	3.4	3.3	3.3	3.8	4.1	3.8	4.0	4.3	4.7	5.0	5.2
Medium	1.7	1.8	1.8	2.1	2.2	2.1	1.9	2.0	1.8	2.0	1.9
Big	0.7	0.7	0.8	1.2	1.3	1.1	1.1	1.1	1.2	1.1	1.0
Non identified	20.3	16.7	14.8	13.7	12.0	11.0	9.9	8.4	1.3	1.1	8.2

Source: SECEX/MDIC, Cadastro do IBGE e RAIS/MTE (1993, 1997, 1998, 1999).

TABLE 19
EXPORT VALUES BY TYPE AND SIZE OF FIRM, 1990-2000
(In percentages)

Enterprise	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Industrial	**74.6**	**79.8**	**83.5**	**83.7**	**81.2**	**83.3**	**83.4**	**82.8**	**83.2**	**84.3**	**85.5**
Micro	4.3	3.5	4.2	4.1	3.7	2.2	2.1	1.3	2.1	2.0	1.6
Small	4.7	5.9	6.1	6.7	6.6	5.2	4.7	4.3	4.2	4.0	3.6
Medium	14.3	15.2	16.6	18.2	18.3	15.4	16.0	14.9	15.6	15.8	16.1
Big	49.1	53.7	55.2	54.0	52.3	60.1	60.5	62.2	61.2	62.4	64.1
Non identified	2.2	1.5	1.3	0.6	0.2	0.3	0.2	0.1	0.1	0.1	0.1
Non industrial	**25.4**	**20.2**	**16.5**	**16.3**	**18.8**	**16.7**	**16.6**	**17.2**	**16.8**	**15.7**	**14.5**
Micro	5.8	5.2	4.0	4.3	5.0	5.2	4.8	4.0	4.4	4.4	3.8
Small	3.2	3.3	3.2	4.0	5.0	4.2	4.4	6.1	4.6	4.6	3.4
Medium	5.0	4.1	3.7	3.5	4.4	3.9	3.1	3.1	3.4	3.2	2.2
Big	2.5	2.6	2.4	2.4	3.4	2.9	3.8	3.6	4.4	3.5	4.6
Non identified	8.9	5.0	3.3	2.1	1.1	0.7	0.4	0.4	0	0.1	0.5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: SECEX/MDIC, Cadastro do IBGE e RAIS/MTE (1993, 1997, 1998, 1999).

2. Main SME export markets

The main markets for SME exports are the European Union (28%), followed by the United States, a position previously occupied by Mercosur before the Argentine crisis, and Canada. SMEs have also tried to break into new markets, having increased their share of exports to China and to members of the LAIA, which encompasses 12 countries. So far, neighbouring markets have been the most important for the SME internationalization process.

B. Case studies on the use of e-commerce and supply chain management (SCM) in selected industries

1. The ornamental stones cluster in the state of Espírito Santo

Ornamental stones represent a key export sector for SMEs, accounting for 6.6% of their total exports, behind timber (16.4%) and machinery and equipment (10.5%), but ahead of furniture and medical-surgical furniture, fruit and footwear.

a) Characteristics of the cluster

i) Global market

The global market for ornamental stones has been growing rapidly in recent years. Between 1997 and 2001, the 30 main producer countries expanded their production by 37%. Annual growth rates have stayed above 5%, except in 1999, with a peak of 16% in 1998.

TABLE 20
GLOBAL PRODUCTION OF ORNAMENTAL STONES, 1997-2001
(In thousands of tons)

Country	1997	1998	1999	2000	2001
China	12 960	13 000	13 000	13 000	16 800
Italy	9 713	9 428	9 757	10 130	10 464
India	8 172	8 572	8 760	10 054	10 100
Iran	5 000	6 500	7 045	7 413	7 536
Spain	5 292	5 557	5 600	5 700	5 900
Brazil[a]	**3 876**	**4 001**	**4 507**	**5 200**	**5 611**
Others (24 countries)	7 161	13 454	13 807	14 716	14 840
Total[b]	**52 174**	**60 512**	**62 476**	**66 213**	**71 251**
Annual Growth (%)b	**8.4**	**16.0**	**3.2**	**6.0**	**7.6**

Source: Adapted from Cunha *et al.* (2003, p. 78).

[a] Differs from the original: adjusted to include stones others than marble and granite.
[b] Differs from the original, because of Brazil's difference.

Growth rates display a rising trend, reflecting the expansion of the market. According to Cunha *et al.* (2003, p. 71), the ornamental stone market, including domestic and external sales, totalled US$ 40 billion in 2000.

TABLE 21
GROWTH RATE OF GLOBAL PRODUCTION OF ORNAMENTAL STONES
(In percentages)

Period	1976-1986	1976-1990	1976-1995	1986-1990	1986-1995	1990-1995
Growth rate	2.0	3.1	4.7	5.6	7.5	9.5

Source: "Arranjo Produtivo de Rochas Ornamentais (mármore e granito) no Estado do Espírito Santo", Villaschi and Sabadini, 2000, REDESIST Technical Note No. 15, Rio de Janeiro, UFRJ, (p. 4).

Brazil is the world's sixth largest producer, with output of 5.2 thousand tons in 2000 (7.9% of world's production). Its production grew by 45% from 1997 to 2001. Brazil is the world's seventh largest exporter in volume terms, with shipments totalling 1.1 thousand tons in 2001 (4.5% of worldwide exports).

TABLE 22
GLOBAL EXPORTS OF ORNAMENTAL STONES, 1996-2001
(Thousands of tons)

Countries	1996	1997	1998	1999	2000	2001
China	3 095	3 130	2 568	3 156	4 095	4 893
Italy	3 483	3 563	3 508	3 429	3 635	3 515
India	1 346	2 070	1 724	1 888	2 307	2 200
Spain	1 497	1 593	1 586	1 659	2 028	2 180
Turkey	358	434	469	1 100	1 402	1 850
Portugal	903	914	1 064	1 133	1 217	1 200
Brazil	**724**	**899**	**898**	**1 020**	**1 084**	**1 062**
Others (23 countries)	5 934	6 588	6 864	7 420	6 983	7 193
Total	17 340	19 191	18 681	20 805	22 751	24 093
Annual Growth (%)	**-**	**10.7**	**-2.7**	**11.4**	**9.4**	**5.9**

Source: Adapted from Cunha *et al.* (2003, p. 79).

The market grew continuously in volume terms between 1996 and 2001, except for 1998, reaching a level of 24,000 tons in 2001. Brazil's exports grew by 47% in that period, outpacing worldwide growth of 39%. The average annual growth rate was 6.6% for Brazil and 5.6% for the world.

ii) Cluster evolution

The ornamental stones sector (mainly marble and granite) in the state of Espírito Santo (ES) consists of two main production nodes where most of the extracting and manufacturing firms are located. The first is located around the city of Cachoeiro de Itapemirim, in the state's southern region, and the second, around the city of Nova Venécia, in the northern half.

The history of mining in the region of Cachoeiro dates back to the establishment of a cement plant in 1924, although European immigrants were already manufacturing whitewash in certain areas of the city as early as the 1870s.

The first steps in the history of mining of Cachoeiro began with exploration for calcareous stone for the production of whitewash (obtained from the mineral calcite), which was used mainly in cement manufacturing.

iii) Main characteristics

In Brazil, the exploitation of ornamental stones occurs from the southernmost state of Rio Grande do Sul up to state of Pará, at the mouth of the Amazon river, with prominence for the states of the south-eastern and north-eastern regions. In the state of Espírito Santo production progressed furthest, involving all activities of the main production chain and the support activities chain.

The ornamental stones sector in ES displays the features of a typical Marshallian industrial district, with a sizeable number of firms in the main productive chain supported by a group of suppliers that provide services and produce general machinery, equipment and inputs in the region.

ES is Brazil's largest producer and exporter. Its activities in the sector have grown continuously over the last few years, expanding by 150% (in employment and number of firms) since 1994. The sector in ES has around 24,000 direct employees (15% of the jobs generated by ES industry) and roughly 1,200 firms (with an absolute predominance of SMEs). It produces 2.5 tons per year (around 47% of Brazilian total in 2000) and exports around US$ 222 million (52% of country's total exports in 2003). According to the Brazilian Ornamental Stone Industries Association (Abirochas), in 2006 the sector expects to export over US$ 750 million and directly employ 30,000 workers.

iv) Number of firms

The number of firms in the sector has experienced sustained growth since 1970, increasing twelve -old between 1980 and 2000,[7] even though the Brazilian economy grew slowly in that period. In 1972, there were just 70 firms in ES; less than a decade later, in 1980, the number had risen to 104 (49% growth) and then accelerated to 278 firms by 1990 (167% growth), before doubling again to 530 by 1994. Over 193 firms started operations between 1994 and 1995, an increase of 36%. Similar growth rates have been repeated in 1995-1998 (24%) and 1998-2000 (33%). In 2000, there were 1,200 firms, of which 154 (12%) were exporters.

TABLE 23
GROWTH OF THE NUMBER OF FIRMS IN THE SECTOR IN ES

	1972	1980	1990	1994	1995	1998	2000
Number of firms	70	104	278	530	723	900	1 200
Growth rate (%)	-	48.6	167.3	90.6	36.4	24.5	33.3

Source: "Arranjo Produtivo de Rochas Ornamentais (mármore e granito) no Estado do Espírito Santo", Villaschi and Sabadini, 2000, REDESIST Technical Note No. 15, Rio de Janeiro, UFRJ, (p. 26), updated with data from http://www.sindirochas.com.br.

Another key feature of the sector in ES is the absolute predominance of micro-enterprises and small businesses. According to the Industrial Development Institute of Espírito Santo (IDEIES), on employment criteria 82.3% were micro-enterprises, 16.0% small firms and 1.7% medium-sized in 1998. Brazil's central statistical office (IBGE) confirms this data, revealing the following structure for the ES extractive industry in 2002:

[7] Most of the data analysis extends up to 2000, since that is the most recent data available in the sector's union website <http://www.sindirochas.com.br>.

TABLE 24
EXTRACTIVE INDUSTRIES IN ES BY SIZE - 2002

Number of Employees			Number of Local units	Percentage Of total	Percentage Cumulative
Total			**1 190**	**100**	**-**
0	-	4	749	62.94	62.94
5	-	9	194	16.30	79.24
10	-	19	154	12.94	92.18
20	-	29	42	3.53	95.71
30	-	49	29	2.44	98.15
50	-	99	12	1.01	99.16
100	-	249	6	0.50	99.66
250	-	499	2	0.17	99.83
500	or	more	2	0.17	100

Source: Central Enterprise Register (IBGE).

In 2002, 98.15% of the sector's firms (1,190) had no more than 50 employees according to IBGE. It is important to note that 62.94% (749 firms) had four employees or fewer, and 16.3% (194 enterprises) had between five and nine workers, jointly accounting for 80% of the total.

Despite the small firm size, IDEIES (1998) shows that mortality among enterprises in the sector is not particularly high. In 1998, 54.8% of firms had been in existence for three years or longer, and had therefore survived the period in which small firms tend to close. Only 34.7% of firms (251) had come into being in the previous three years. The figures do not add up to 100% because 76 firms (10.5%) did not reply to this question.

TABLE 25
ENTERPRISE IMPLEMENTATION PERIODS, 1998

Period of implementation	Number of firms	Percentage Of total	Percentage Cumulative
Up to 1979	62	8.56	8.56
1980-1989	138	19.06	27.62
1990-1994	197	27.21	54.83
1995-1998	251	34.67	89.50
No answer	76	10.50	100
Total	**724**	**100**	**-**

Source: "Arranjo Produtivo de Rochas Ornamentais (mármore e granito) no Estado do Espírito Santo", Villaschi and Sabadini, 2000, REDESIST Technical Note No. 15, Rio de Janeiro, UFRJ, (p. 30).

In ES the sector operates as a horizontal cluster with a "ring" structure of governance. No large enterprise coordinates production, and cooperative relations seem to evolve naturally owing to the proximity of small firms within each of the two production nodes (Cachoeiro and Nova Venácia).

v) Production and employees

Espírito Santo is the leading producer of ornamental stones in Brazil, which in turn is the world's sixth largest producer in volume terms. ES accounts for a large share of the sector's production, even though it has just 1.7% of Brazil's population and occupies only 0.54% of its territory.

TABLE 26
ORNAMENTAL STONE PRODUCTION: BRAZIL VERSUS ESPÍRITO SANTO, 2000

	Unit	BR	ES	ES/BR (%)
Production	***Million tons***	**5.2**	**2.4**	**46**
Granite	*% of production*	90	-	-
Marble	*% of production*	10	-	-
Firms	***Thousand***	**10.0**	**1.2**	**12**
Production/firm	*Tons/firm*	520	2 000	-
Direct employees	***Thousand***	**106**	**20**	**19**
Production/employee	*Tons/employee*	49	120	-
Employee/firm	*Unities*	11	17	-
Extracting fronts	***Unities***	**1 163**	**400**	**34**
Production/front	*Thousand of tons/front*	4	6	-
Employees/front	*Employee/front*	91	50	-
Sewing presses	***Unities***	**1 574**	**900**	**57**
Production/sewing press	*Thousand of tons/sewing press*	3.30	2.67	-
Sewing presses/firm	*Sewing press/firm*	0.16	0.75	-
Employee/sewing press	*Employee/sewing press*	67	22	-
Sewing presses/front	*Sewing press/front*	1.35	2.25	-
Sawing capacity	***Million m2/year***	**41**	**25**	**63**
Sawing capacity/firm	*Thousand m2/year/firm*	4	21	-
Sawing capacity/employee	*M2/year/employee*	383	1 250	-
Sawing capacity/front	*Thousand m2/year/front*	35	63	-
Sawing capacity/sewing press	*Thousand m2/year/sewing press*	26	28	-

Source: Union of Ornamental Marble and Granite, Whitewash and Calcareous Stone Extracting and Improvement Industries of Espírito Santo (SINDIROCHAS), (http://www.sindirochas.com.br/exportacao_index.htm).

ES accounts for 46% of Brazilian output of ornamental stones, although its production is concentrated in granite (90% of the state's total production). It has 34% of the country's extractive fronts and 57% of the sewing presses.

Espírito Santo is the state where production is technologically most advanced in Brazil. Its firms produce an average of 2,000 tons compared to 520 tons in the country as a whole. Each employee produces 120 tons in ES and 49 tons in Brazil overall, on average, which is reflected in the number of employees per extracting front, i.e. 50 in ES against 91 in Brazil as a whole. In ES, each front produces 6,000 tons on average, compared to a national total of 4,000. Nonetheless, the performance of ES is not outstanding in two indicators: in sawing capacity per sewing press, which is close to the country average, 28,000 m2 per year per sewing press, while the national total is 26,000; and it is below average in output per sewing press, 2,670 tons per sewing press compared to the Brazilian average of 3,300.

Production in ES is also more automated than in the rest of the country. It uses 2.25 sewing presses per extracting front, while the country overall uses 1.35. Sawing capacities in ES amount to 21,000 m2/year per firm, 1,250 m2/year per employee and 63,000 m2/year per front, compared to averages of 4,000, 383 and 35,000 m2/year respectively for BR. ES uses one sewing press for every 22 employees, while the national total is 67. Consequentially, in every four firms

in ES, three of them have a sewing press, while in Brazil as a whole only three out of every 19 firms have sewing presses.

The state's 1,200 enterprises represent 12% of firms in this sector throughout Brazil. On average, each firm employs 17 workers, compared to an average of 11 for the country at large. Overall, the ES stone sector employed 20,000 people in 2000 (19% of the sector's direct employees), counting formal jobs only. One of the sector's unions, Labour Union of the Marble, Granite and Calcareous Stone Industries of Espírito Santo (Sindimármore), estimates the number of informal workers at 3,000.

The following table shows that firms had 24,000 employees in 2003 (15% of jobs generated in ES industry). In 1980, there were just 3,200. This number had doubled by 1990 and grew by over 40% until 1994. From 1998 to 2003, the number of formal employees jumped by 118%, and since 1994 it has increased by 164%. According to Abirochas, the prediction is for 30,000 direct jobs by 2006.

TABLE 27
EVOLUTION OF SECTORAL EMPLOYMENT IN ES

		1980	1990	1994	1995	1998	2000	2003
Total	(*thousands*)	3.2	6.5	9.1	10.0	11.0	20.0	24.0
Growth rate	(%)	-	102.4	40.4	10.2	10.0	81.9	20.0

Source: "Arranjo Produtivo de Rochas Ornamentais (mármore e granito) no Estado do Espírito Santo", Villaschi and Sabadini, 2000, REDESIST Technical Note No. 15, Rio de Janeiro, UFRJ, (p. 50), updated by Abirochas.

vi) Exports

The value of ornamental stone exports in Brazil and Espírito Santo has been growing continuously since 1999. In 2003, the ES exports amounted to US$ 222 million, up by 31% from 2002 (Brazilian exports grew by 26%), and by 269% since 1999. In the last few years, except for 2001 (up by 10%), the annual growth of ES exports exceeded 30% and without exception outpaced the figure for Brazil as a whole. Consequently, ES exports of ornamental stones jumped from 36% of Brazilian exports of these products in 1999 to 52% in 2003.

TABLE 28
ORNAMENTAL STONE EXPORTS, 1999-2004

		2004 (Jan-Jun)	2003	2002	2001	2000	1999
ES total	(*US$ million*)	116.34	222.00	168.91	127.79	115.84	84.16
BR total	(*US$ million*)	223.73	426.92	339.00	280.17	271.77	232.46
ES/BR	(%)	52.0	52.0	50.0	46.0	43.0	36.0
ES's growth rate	(%)	-	31.4	32.2	10.3	37.6	-
BR's growth rate	(%)	-	25.9	21.0	3.1	16.9	-

Source: Union of Ornamental Marble and Granite, Whitewash and Calcareous Stone Extracting and Improvement Industries of Espírito Santo (SINDIROCHAS), (http://www.sindirochas.com.br/exportacao_index.htm).

In the first six months of 2004, exports amounted to US$ 116 million (up by 20% compared to the same period in 2003), accounting for 52.11% of total Brazilian exports. As mentioned earlier, according to Abirochas, exports are expected to reach US$ 750 million per year by 2006.

Processed materials now represent 81% of total exports compared to just 36% in 1996. Higher value-added is a distinguishing feature of the ES cluster, since Brazilian exports are generally concentrated in raw material extraction. According to Abirochas, a cubic metre of polished plate generates up to four times the revenue of raw stone blocks in foreign markets. In the case of exhausted items, this value may increase by up to tenfold.

In 2000, the state's exports accounted for 45% of the national total, both in value and by weight. By weight, Brazil is the world's seventh largest exporter, and ES exports accounted for 52% of total volume nationwide in 2003 (Abirochas). Shipments of ornamental stones accounted for 61% of the Brazilian total, with 73% of total shipments destined for sales abroad and 27% to other regions of Brazil. Both BR and ES export around 20% of their production in weight. In US$/ton, ES and BR also display very similar indices of US$ 48.35 and US$ 52.22 per ton exported respectively.

TABLE 29
ORNAMENTAL STONE EXPORTS: BRAZIL VERSUS ESPÍRITO SANTO, 2000

	Unit	BR	ES	ES/BR (%)
Production in weight	*Million tons*	5.2	2.4	46
Exports in weight	*Million tons*	1.1	0.49	44
Production/exports (in weight)	*%*	21.15	20.42	-
Ports shipments (ornamental rocks)	*Million tons*	1.1	0.67	61
Exports in value	*US$ million*	271.54	116.05	43
Exports value/weight	*US$/ton*	52.22	48.35	-

Source: Union of Ornamental Marble and Granite, Whitewash and Calcareous Stone Extracting and Improvement Industries of Espírito Santo (SINDIROCHAS), (http://www.sindirochas.com.br/exportacao_index.htm).

Between 1997 and 2000, the number of ornamental stone exporters has grown by 79% in ES, from 86 firms to 154, while in Brazil as a whole the number has grown from 332 to 508 (53%). Thus, ES has increased its share of exporting firms from 25.9% in 1997 to 30.3% in 2000.

TABLE 30
EVOLUTION OF EXPORTING UNITS: BR VERSUS ES, 2000
(In units)

	1997	1998	1999	2000	% 1997-2000
Brazil	332	371	433	508	53.01
Espírito Santo	86	104	123	154	79.07

Source: Union of Ornamental Marble and Granite, Whitewash and Calcareous Stone Extracting and Improvement Industries of Espírito Santo (SINDIROCHAS), (http://www.sindirochas.com.br/exportacao_index.htm).

In 2000, each ES firm exported US$ 752,000 and 3,180 tons on average, compared to Brazilian averages of US$ 535,000 and 2,170 tons.

The main destination for ES exports is the United States, which absorbed 64% in value terms and 32% by weight in 2003. The value percentage is much higher than the figure for weight because the United States buys more manufactured items than Italy, China and Spain, which usually buy raw stone blocks for manufacture and resale. Italy, for example, accounts for 20% of

exports by weight, but just 9% in value terms. The growth of exports to the United States, in value and weight terms, also involves higher value-added. According to Cunha *et al.* (2003, p. 83), Brazil is the third largest stone supplier to the United States, accounting for 18.4% of that country's import value.

TABLE 31
DESTINATION OF EXPORTS: 2002-2003

	2002				2003				% change (of US$)
	US$ thousand	%	Tons	%	US$ thousand	%	Tons	%	
United States	96 519	57	149 691	25	142 479	64	227 440	32	47.62
Italy	24 573	15	170 120	29	19 646	9	139 513	20	-20.05
China	12 497	7	97 598	17	15 690	7	138 325	19	25.55
Spain	10 486	6	67 460	11	9 199	4	54 367	8	-12.27
Taiwan	3 695	2	27 295	5	6 415	3	49 723	7	73.61
Total	**168 797**	**100**	**590 311**	**100**	**221 778**	**100**	**715 353**	**100**	**31.39**

Source: "Interação econômica BR/UE para além de fluxos comerciais e de investimentos - reflexões neoschumpeterianas e fatos estilizados capixabas", Position Paper of Conference Brazil Amplified European Union, Rio de Janeiro, UFRJ, Villaschi, 2004, (p. 10).

In 1998, IDEIES questioned 724 of the sector's firms on their export intentions. The results were as follows:

TABLE 32
SURVEY OF EXPORT INTENTIONS, 1998

	Number of firms	%
Already exported	27	3.73
Exports	82	11.33
Never exported, but wishes to do so	350	48.34
Never exported, and does not wish to do so	224	30.94
No answer	41	5.66

Source: "Arranjo Produtivo de Rochas Ornamentais (mármore e granito) no Estado do Espírito Santo", Villaschi and Sabadini, 2000, REDESIST Technical Note No. 15, Rio de Janeiro, UFRJ, (p. 51), updated by Abirochas.

Although only 11.3% of firms export, nearly half of SMEs (48.3%) had never exported but were interested in doing so, which suggests good potential for expanding export activities.

vii) Exports by firm

The average export value per firm in ES was US$ 752,000 in 2000. Exports are not very highly concentrated, since the 10 largest marble and granite companies, according to IDEIES, had estimated exports of around US$ 14 million in 2003, accounting for 6% of the total (US$ 222 million).

TABLE 33
TURNOVER AND EXPORTS OF THE 10 LARGEST MARBLE AND GRANITE COMPANIES OF ES, 2003
(In thousands of US$)

Firm	Turnover	Estimated Exports[a]
MARBRASA[b]	10 224	5 112
ANDRADE MARM. GRAN	8 941	1 826
VIXTILES	8 463	1 728
CAJUGRAM	6 329	1 292
AGG	4 677	955
POLIMENTO ITALIANO	4 658	951
NEMER	3 560	727
MA EXPORT (Aquidabã)	3 280	670
MARCEL	2 516	514
BRAMAGRAN	2 208	451
Total	**54 856**	**14 226**

Source: Diagnóstico e atualização do cadastro do setor de mármores e granitos do Estado do Espírito Santo, Vitória, IDEIES, 1998, (www.iel-ideies.com.br).

[a] Using the ES exports/production average of 20.42%, except for Marbrasa.
[b] Using the 50% exports/production average shown on its website (www.marbrasa.com.br).

viii) Export promotion and export policies

Today the sector in ES organizes two annual international fairs. The older of the two, held in Cachoeiro, began in 1989 with just 32 mainly local firms, serving a public of 5,500. In 1990, the number of exhibitors doubled and the public grew by 30%. By 1992, the number of firms and the size of the public had increased by 130% and 30%, respectively. In 1995, the public grew by 60% and the number of firms increased by 50%, and by 1999 the public had doubled again. In 2003[8] there were 40% more exhibitors than in 1995, with 320 firms and 32,000 people.

TABLE 34
INTERNATIONAL FAIR OF CACHOEIRO
(In numbers)

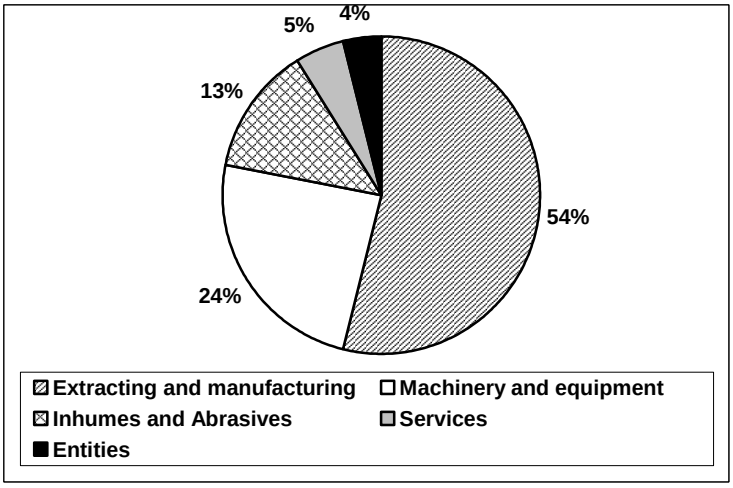
Selected Years	Exhibitors	Public
1989	32	5 500
1990	64	7 000
1992	150	9 200
1995	230	15 000
1999	243	30 000
2003	320	32 000

Source: "Arranjo Produtivo de Rochas Ornamentais (mármore e granito) no Estado do Espírito Santo", Villaschi and Sabadini, 2000, REDESIST Technical Note No. 15, Rio de Janeiro, UFRJ, (p. 61), updated with www.feiradomarmore.com.br.

[8] The 2004 edition of the fair will be held in August.

The fair is held in an area of 25,000 m2. As figure 2 shows, of total exhibitors in 2003, 54% were extracting and manufacturing firms, 24% machinery and equipment producers, 13.2% inhumes and abrasives suppliers, 4.8% were service firms and 4% were the entities of the sector.

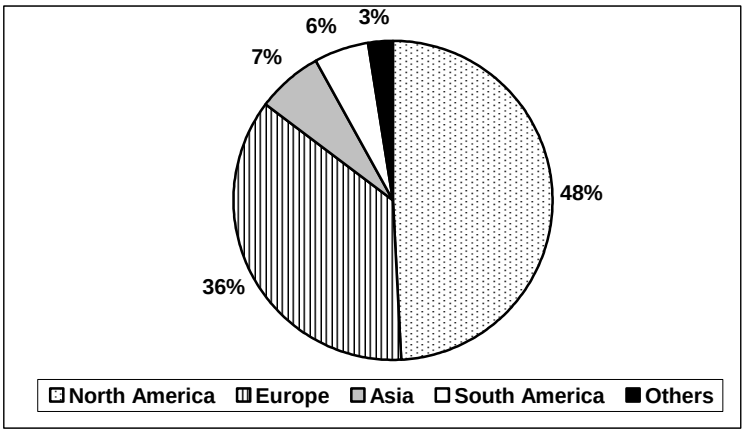
FIGURE 2
EXHIBITORS AT THE INTERNATIONAL FAIR OF CACHOEIRO
(In percentages)



Source: www.feiradomarmore.com.br.

The second fair, targeting an international public, is held in Vitória, the capital of ES and its largest city. It had a daily average of 4,500 visitors in 2003 and 5,750 in 2004. The distribution of exhibitors is similar to that at the Cachoeiro fair. The distribution of foreign visitors is shown in the following figure.

FIGURE 3
INTERNATIONAL VISITORS TO THE VITÓRIA FAIR
(In percentages)



Source: www.feiradomarmore.com.br.

Of all foreign visitors, 49% came from North America, 36% from Europe, 6.7% from Asia and 5.5% from South America. Africa, Central America and Oceania jointly account for 2.5%.

Since 1998, the Federal Programme of New Export Arrangements (PNPE), discussed in chapter IV, is developing actions to increase the value added of the cluster's exports. The programme has achieved relatively good results, since the share of manufactured exports has grown in this period. Another significant development is that the number of raw block buyers, such as Italy, has decreased, while buyers of manufactured products, such as the United States, have grown.

Another federal programme that will benefit the sector in ES is the anchor enterprises support programme, discussed in chapter V. In the framework of that programme, Total Trading, a trading enterprise specializing in selling to North America, received a US$ 1.7 million credit to support exports by SMEs in the cluster. Firms sell part of their production to the trading company, which in turn carries out the export operation (90% of exports of the trading company came from ES firms). Under the credit arrangement, the SMEs will receive payment at the time of sale, even though export payments are made within a 90 to 120-day period. Over 78 ES SMEs currently sell a share of their production to Total Trading and will benefit from the credit.

ix) Main difficulties

The IDEIES survey mentioned above found that the following are the key difficulties facing firms in the export process:

- foreign language;
- lack of experience in foreign business;
- lack of knowledge of the external market, including information and export procedures;
- lack of a marketing strategy and promotion of materials and companies in others countries;
- absence of organizational and technical capacity in the companies to maintain a presence in a competitive market; and
- lack of internal competitiveness in the firms to comply with requirements and international standards.

Other bottlenecks identified include: technological imbalance, low productivity compared to international standards, and environmental degradation. In relation to the first two, Abirochas foresees the need for investments in excess of US$ 1 billion to bring the sector up to date by 2015. BNDES is currently negotiating a credit facility of R$ 300 million (about US$ 100 million). A small share will be destined for the producers and the largest portion to manufactures and equipment makers, in an effort to increase the value added of the sector's exports. According to the Euvaldo Lodi Institute (*Instituto Euvaldo Lodi* (IEL)), affiliated to the National Industry Confederation (*Confederação Nacional da Indústria* (CNI)), the sector displays a significant technological lag in terms of automation parts and computer science, mainly because there is just one manufacturer of automatic machines in the region. For semi-automatic and manual machines, there is a wider range of supply, and firms can choose from a variety of models covering a wide range of needs.

Environmental degradation is a corollary of technological imbalance and low productivity. It gradually reduces productivity and the lifetime of extracting fronts, thereby threatening the sector's long-term sustainability.

x) Promotion institutions

In 2004, the federal government established a working group on "local production arrangements", which brought together 23 public and private entities, coordinated by the Ministry of Development, Industry and Foreign Trade (*Ministério do Desenvolvimento, Indústria e Comércio Exterior* (MDIC)). The group selected 11 local arrangements for analysis and to receive up to R$ 20 million (about US$ 7 million). The ES ornamental stone cluster was one of those selected, along with the caps industry in Apucarana (PR), auto-parts in the Serra Gaúcha region (RS), garments in Goiás-Anápolis (GO), footwear in Franca (SP), wood and furniture in Paragominas (PA) and in Ubá (MG), lingerie in Nova Friburgo (RJ), fruit growing in Juazeiro (BA) and Petrolina (PE), and plaster in Araripina (PE).

The ES cluster was also selected by the federal "New Export Arrangements Programme" (PNPE), as one of the 18 main local arrangements by the Sebrae, and it is one of the eight clusters studied by BNDES, which is developing a specific credit line for local arrangements and a special line for the ornamental stone sector.

There are also some important institutions at the local level. The sector's main trade association, the Union of Ornamental Marble and Granite, Whitewash and Calcareous Stone Extracting and Improvement Industries of Espírito Santo (SINDIROCHAS), was founded in 1973. It undertakes a range of support activities for the entrepreneurs of the sector, such as job intermediation and legal assistance. The trade group is also responsible for organizing the international fair and a series of training courses in cooperation with other public and quasi-public institutions such as the Marble and Granite Technology Centre (CETEMAG), National Industrial Apprenticeship Service (SENAI) and Sebrae. SINDIROCHAS also contracted technical studies from IDEIES; and, in partnership with the Federal University of Espírito Santo (UFES), it has organized a specialist course on ornamental stones annually since 1995. It also founded a technology centre (CETEMAG) in 1988, and a credit cooperative (CREDIROCHAS) in 2000, which offers cheap credit to affiliates; and it is planning to set up an export consortium. The trade group maintains a website (www.sindirochas.com.br) providing a vast amount of information about the sector.

There is also a trade association relating to the cluster's machine producers, the Association of Machinery, Equipment and Component Manufacturers of Espírito Santo (MAQROCHAS). This was created in March 2004 and has 20 members.

The Sindimármore, founded in 1990, is not well structured to serve workers' needs, but participates in fairs and important sectoral meetings.

The CETEMAG, created in 1988 by SINDIROCHAS, coordinates and executes the sector's technological development policy. It gives technical assistance to firms and directs them towards technical training in Sebrae, SENAI or even courses of its own. It serves as organizer of the sector's technical demands and builds continuous partnerships with the Technological Institute of the Federal University of Espírito Santo (ITUFES). The IEL and IDEIES, in partnership with UFES, also carry out technological extension projects and prepare diagnostic studies, partly funded by Sebrae.

The SENAI mainly provides courses, while Sebrae prepares courses and provides technological assistance, and also finances technology consultancy and innovations.

At the national level, the sector has two top-level organizations: the Brazilian Association of Ornamental Stone Industries (Abirochas) and the Brazilian Association of Marble and Granite Export Industries (ABIEMG).

b) Technologies introduced, purpose of IT use and its impacts

This section describes IT use in the ES cluster, firstly giving a general overview of applications and then analysing three IT uses: websites, information portals and e-commerce.

The technologies employed in the sector are related to information provision, such as the need for customers to view stone colours and patterns before purchase. For this reason, several ES firms have developed their own websites. In the website registry of local productive arrangements (also known as a vertical industry portal, or vortal), to be discussed below, 139 firms (11.6% of the sector total) had a website registered. Many of these sites are available in more than one language, have a product catalogue, offer price quotes by e-mail and allow customer registration.

The cluster was chosen to take part in the "Regional Action" programme, developed in partnership with Ministry of Science and Technology (*Ministério da Ciência e Tecnologia* (MCT)), the National Research Council (*Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq)), Brazil's Innovation Agency (*Financiadora de Estudos e Projetos* FINEP)) and the state's science and technology secretariats.

The programme makes use of a technology platform framework that seeks to generate technology demands in the private sector, from knowledge-generating groups (e.g. universities and research institutes), potential customers and other relevant actors for the implementation of cooperative projects (e.g. a university or consulting firm outside the cluster environment). Communication processes and negotiation among participating actors are focused on technology. In order to achieve minimal conditions for success, the "technological platform" has to go through the following stages (Rocha, 2001): context creation (problem identification) or construction of scenarios for the sector; identification and knowledge generation for selected technological problems; motivation of actors to solve the problems identified or to take advantage of the opportunity envisaged; negotiation among the relevant actors to resolve problems and prepare cooperative projects.

An initial effort in this framework in the ES cluster involves surveying the main characteristics of the selected arrangements, taking into consideration the definition of intra- and inter-sector relations. The result was the report on the analysis of the value chain of the marble and granite and construction industry of Espírito Santo (*Análise da Cadeia de Valor da Indústria de Mármore e Granito e Construção Civil do Espírito Santo*), prepared by the Euvaldo Lodi Institute (IEL, 1999), regional chapter. The study identified the main technological and training bottlenecks and labour training and specialization needs for the productive sector, in partnership with the Marble and Granite Technology Centre (CETEMAQ), IEILDES, UFES, Sebrae, SENAI and others.

One of the programme's final activities was the establishment of a "vortal" for the local arrangement. Vortals are web-portals that bring together online information about certain Brazilian clusters. They are available for 14 local arrangements in 11 states and 9 different sectors. The general features of the vortal and additional information about others clusters are presented in chapter V. Here we discuss the introduction of the vortal in ES.

The aim of the vortal is to contribute to the development of SME competitive capacity, which it does by providing a set of information, communication channels and devices, and wide ranging support for marketing services through the web. It uses the Internet to widely disseminate information on the sector that is already available in the Internet in one location, duly described and classified. The instrument was created in 2001 and relates mainly to the spread of sectoral information.

Similar to the vortal, the sector has two private information websites: one launched in 1999 (Marble Website) and another in 2000 ('The Way to the Stones Website'). They are important to the sector since the vortal, due to its local characteristic, is available only in Portuguese. The languages used in the Marble and The Way to the Stones websites are both Portuguese and English. The private portals are also significant given the nature of services available, such as the stones catalogue.

E-commerce is not yet a reality in the sector. There are only a few isolated and limited experiences, such as price quotes sent by e-mail. CETEMAQ and SINDIROCHAS launched an online business portal (PETRACUS), but this was discontinued because of its high operational costs. The web-based organization MARMOREGRANITO is a trading company specializing in marketing and sales, through e-commerce, business-to-consumer (B2C) and business-to-business (B2B). It has a website (www.marmoregranito.com.br) were it is possible to obtain price quotes.

i) Websites

There is a wide range of stone colours and patterns. The Marble website catalogue, for example, contains over 1,100 kinds of stones from 46 countries. Given this bewildering diversity, customers need to see the product before making a purchase. This was the great incentive for firms to create websites. In the sector's vortal, 139 firms (11.6% of the sector total) have a registered website.

Most websites are relatively well developed, offering a product catalogue, e-mail price quotes and customer registration. Many are in more than one language. This is not the case with those developed by Prossiga, however.

- **Prossiga websites**

Prossiga is a federal programme created in 1995 to promote the creation and use of Internet information and communication services, focusing primarily on science and technology and on country's relevant socioeconomic activity sectors. It is the host organization of the vortals and offers a free website creation service for firms in selected local arrangements. The service consists of a static webpage, with texts describing the firm and its products.

From the standpoint of the ornamental stone industries, the service is not very satisfactory, since it is very important for the websites to be in more than one language and display photographs of the stones to potential customers. These features are not present in Prossiga-developed websites.

Only 14 of the 139 websites listed in the vortal (10%) were made by Prossiga, and many of the sector's firms that do not yet have websites refuse to use the federal programme.

- **Comparison with other vortals**

The ES stone cluster is one of the vortals with the highest cumulative number of registered organizations (firms, professionals, associations and others). This section compares website registry of ornamental stone vortals (ES, Rio de Janeiro-RJ and Bahia-BA) and other vortals with over 300 cumulative registers (Pharmaceutical Industry, in Góias-GO, and Fruit Agriculture, in Ceará-CE).

The ES cluster is the clearly the one with the largest number of enterprise websites registered (139). It is almost the double the size of the RJ stone cluster and over eight times as large as that of BA. In contrast, the fruit and agriculture vortal (CE) has 131 website registrations, over half of them developed by Prossiga with the shortcomings indicated above. In fact, in terms of firm-developed websites, ES has more than twice as many as the second ranked (125 compared to 60) and six times those of the RJ and BA websites combined.

TABLE 35
CUMULATIVE REGISTRATIONS IN SELECTED VORTALS, BY TYPE
(In number of)

Cluster		Producers/Industries/ Commerce/Suppliers			Researchers[a]	Others	Total registers
		Own-develop-ment	Prossiga-developed	Total			
Pharmaceutical industry	(GO)	13	9	22	324	314	660
Ornamental stones	(ES)	125	14	139	126	100	365
Fruit growing	(CE)	60	71	131	51	182	364
Ornamental stones	(RJ)	13	58	71	126	136	333
Ornamental stones	(BA)	7	9	16	126	98	240

Source: Prepared by the authors from www.prossiga.br/arranjos.

[a] Personal homepage of academic analysts of the sector.

Although the pharmaceutical industry in GO has many registrations, they are mostly cantered in researchers (324) and legislation. There are actually few enterprise websites (22).

The service has relatively low use. In May 2003,[9] the cumulative number of viewers over the previous 12 months amounted to a mere 812, up by 4.9% from the previous cumulative figure and by 4.3% compared to March. The initial vortal page received 1.14 visits per day. In June 2004, the total number of cumulative visits was around 1,500.

TABLE 36
CUMULATIVE VISITS TO THE VORTAL IN 12 MONTHS

	March 2003	April 2003	May 2003	Daily average
Ornamental stones	742	774	812	1.14

Source: http://www5.prossiga.br/estatistica/tabelas.html.

The number of registered organizations (firms, professionals, associations and others) rose from 358 to 365 between March and May 2003, an increase of 1.96%. Of this total, there were 139 firm registrations (38%) and 125 (32%) researcher registrations.

TABLE 37
CUMULATIVE ONLINE REGISTRATIONS

	March 2003	April 2003	May 2003	Growth rate
Ornamental stones	358	358	365	1.96

Source: http://www5.prossiga.br/estatistica/tabelas.html.

- **Marble website**

This website (http://www.marble.com.br/), launched in 1999, has the mission to provide the ornamental stones sector with an interactive channel to provide up-to-date information on the

[9] This is the most recent data available in the Prossiga analytic tables.

sector and its products. It offers online price quotes, a catalogue of over 1,100 types of stone from 46 countries, and a registry of Brazilian sector's companies by region, together with information on events and news items.

It provides information in 15 categories: management; architecture and design; stone catalogue; legal assistance; construction; online quote; exports; fairs and events; geology and mining; government and sector entities; marble guide (firm catalogues); marketing; mining history; publications and technology.

The Marble website contains links to the online exporters guide of the MDIC. This is an important initiative since firms generally point to lack of experience in foreign business and lack of information on export procedures as the main difficulties in exporting.

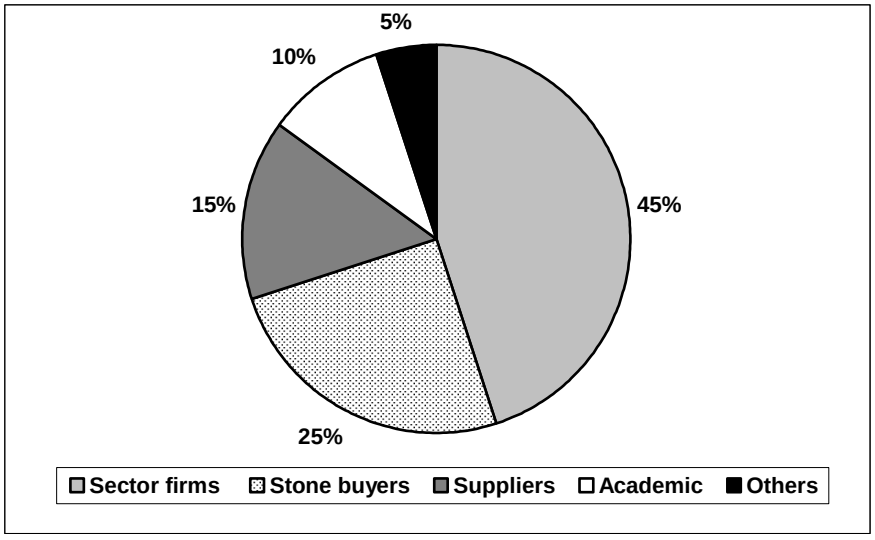
The website also contains the Marble & Inc magazine available for full download, and one can also subscribe for an e-mail newsletter.

The online quote is not exactly the service available in the website. As is standard practice in the sector, to obtain quote a customer needs to send e-mail and a reply will be sent by e-mail or fax.

Between October 2003 and February 2004, the site received over 100,000 visits per month (an average audited by Integraweb®). During the 17th Vitória Marble and Granite International Fair, it peaked at 125,000 hits per month.

Its target public includes sectoral entrepreneurs and professionals, government organizations, associations, engineers, interior designers, decorators, architects and designers. As shown in the figure below, 45% of its total public are firms, 25% stone buyers, 15% suppliers, 10% academics, and 5% others.

FIGURE 4
USERS OF THE MARBLE WEBSITE
(In percentages)



Source: <www.marble.com.br>.

Although the information in the site is poorly translated[10] and is only available in Portuguese and English, 38% of its hits come from abroad (58% of them North American).

- **The Way of the Stones website**

The Way of the Stones website (http://www.pcpedras.com.br/), has been present in the stone sector since July 2000. It publishes news and marketing advertisements in English and Portuguese.

The website contains a registry of stone producing firms, classified in four categories: 1- Marble and Granite, 2- Machinery and Equipment, 3- Suppliers and 4- General Services. It also publishes a newsletter covering fairs and events in the stone sector. Its catalogue provides information on stone type and the producer firm's website, and one can generally ask for a quote. The site receives a stable average of 25,000 hits per month.

ii) E-commerce websites

As mentioned above, in this sector it is misleading to state that a quote by e-mail is an online one. The only firm that considers itself specialized in e-commerce, MARMOREGRANITO, does in fact provide online quotes but with the difference that it sells products made by its commercial partners. Its website location is www.marmoregranito.com.br.

c) Problems for SMEs in introducing and using IT

The main problems in access to the new technologies indicated by the sector's entrepreneurs are (Villaschi and Sabadini, 2000, p. 63):

- Small production scale
- Lack of familiarity with the new technologies
- Access to financial resources
- Shortage of specialized workers

In order to develop large IT projects, such as e-commerce, small ES firms need to cooperate and share. This is where they hit the second problem: lack of knowledge of information technologies. It would be very useful if sector fairs could place more emphasis on IT use. The APEX could also play a major role in this area.

The Brazilian Development Bank (BNDES) is launching a series of initiatives to deal with the credit problem, such as a working-capital credit line for clusters and a special line for investment in the ornamental stones sector. BNDES also has a number of credit lines to help firms introduce IT, such as Prosoft. Banco do Brasil, a state-owned bank, has a credit line for IT deployment in firms, and although it is focused on hardware (computers and peripherals), it could also be of help. The sector also has a credit cooperative (CREDIROCHAS) that could be used to fund IT programmes among its affiliates.

The lack of specialized workers could be solved with courses in CETEMAG or in organizations outside the sector.

In the cases analysed, the one that experienced most problems was the vortal. Following the change in federal government in 2003, the project was halted and no new information is being added. This, together with the absence of a product catalogue in the vortal, explains why the site is showing fewer page-views than the private information websites.

[10] The translation is apparently done by automatic software. It contains many errors and does not translate accents properly.

Enterprise websites are generally well developed, which shows that they do not have many problems in developing their own websites. Another sign of this is that Prossiga produced relatively few of the sector's websites (10%, or just 14 out of the 139).

E-commerce is not a reality in the sector, partly because of costs and partly because of small scales.

d) Lessons learned from the case

The ES cluster shows that an SME cluster with no large enterprises can succeed in Brazil. As pointed out above, Brazil is one of world's largest producers, and ES accounts for almost half of the country's production and exports.

Exports are not highly concentrated in the sector. In 2000, 154 or 12% of firms were exporters. Of total exports (US$ 116 million, in 2000), each firm exported US$ 752,000 on average. Of total exports in 2003 (US$ 222 million), the 10 largest firms accounted for just 6% (US$ 14 million).

Mainly because of cluster performance, despite their small size, mortality among the sector's firms is not very high. In 1998, 54.83% of existing firms were three years old or more, and thus had passed through the period in which small firms tend to close down; 28% of firms had been in existence for over nine years.

Federal export promotion policies are doing well in the sector. The "Programme of New Export Arrangements" (PNPE) has been very important in increasing the value added of the cluster's exports. Raw block buyer destinations, such as Italy, have declined, while buyers of manufactured products, such as the United States, have expanded.

IT could help solve some of the cluster's identified bottlenecks, such as low productivity in comparison with international standards and environmental degradation. IT could also be useful in overcoming difficulties in exporting, such as the foreign language and lack of experience in foreign business, information and export procedures.

The arrangement shows many cooperative relations that result in courses, fairs, credit cooperatives, export consortia and so forth. Although very promising, such relations have done little to advance IT use. Of the three information portals, one is governmental and two are owned by enterprises outside the sector.

The main federal government intervention related to IT in the sector has been discontinued and is far from achieving its expected results.

Government cluster assistance programmes which develop websites for cluster participants (e.g. Prossiga) do not develop adequate websites; they are usually static and lack key features and capabilities for certain product line clusters. For example, to be effective, ornamental stone sites require a catalogue with pictures and online (indicative) quotes, capabilities that are generally not provided effectively in sites developed by Prossiga. As can be seen in table 35 above, in the state of Espírito Santo a very small percentage of company websites were developed under the Prossiga framework. This stands in sharp contrast to other high-use websites (fruits in Ceará and ornamental stones in Rio de Janeiro), in which the percentage of Prossiga-developed sites is higher.

2. Aeronautics industry suppliers in São José dos Campos

Brazilian aeronautics exports have grown considerably over the past decade, led by a large national firm, Embraer. Driven by Embraer and its foreign first-tier suppliers, exports by SMEs in

the São José dos Campos aeronautics vertical cluster have taken off in the past few years, albeit from a small base. A group of exporting SMEs within the cluster has set up a consortium known as the High Technology Association (HTA), to jointly promote their export capacity. The consortium is supported by APEX/MDIC and by Sebrae/Nacional. Estimated export potential is on the order of R$ 20 million a year, which could occupy between 35% and 40% of the companies' idle capacity (Bernardes, 2002: 24).

a) Characteristics of the selected cluster

This vertical cluster is led by Embraer, one of Brazil's largest industrial firms and the world's fourth largest aircraft manufacturer. Embraer revenues amounted to US$ 3 billion in 2003. The cluster is located in the county of São José dos Campos, in the state of São Paulo, which saw its share in the state economy rise from 6.5% in 1996 to 11% in 2001.

Embraer purchases supplies worth over US$ 60 million from SMEs, 50% in Brazil and 50% from abroad. Over 30 small-specialized suppliers are located near its assembly plants. The composition of the cluster is presented in table 38 below.

TABLE 38
VERTICAL CLUSTER OF THE AERONAUTICS INDUSTRY IN SÃO JOSÉ DOS CAMPOS

Product	Firms
Manufacturing, parts and composite materials	Aeroserv (HTA) Autômata Industrial (HTA) Mirage (HTA) Alltec (HTA) Graúna-Carpini & Marques Indústria (HTA) Elane Ferreira Pereira, Metinjo Metalizacao Industrial Joseense, Mirage (HTA), SPU Indústria e Comércio de Peças (HTA) Status Usinagem Mecânica (HTA) Tecplas Indústria e Comércio de Fibras (HTA)
Engineering projects and software systems	Akros, Dynamic Sollutions, Akae, Cenic, Compoende Equipamentos para Ensaios e Serviços Especializados (HTA) Fibraforte Engenharia de Softwares, LEG-Engenharia e Comércio (HTA) New Plotter Engenharia, Poly Card Engenharia e Comércio de Informática,
Decoration / Interiors	C&D Aerospace (USA),
Landing gear	ELEB/LIBERHERR (Brazil/Germany)
Sub-systems	Sobraer (Spain)
Radar	Mectron (Brazil)
Structures	Kawasaki Heavy Industries (Japan) Gamesa (Spain) ENAER (Chile) (not yet in installed in Brazil) Latecoere (France) (not yet in installed in Brazil)
Windows	Pilkington Aerospace (United Kingdom)
Hydraulic Systems	Parker-Hamnifin

Source: "Redes de Inovação e Cadeias Produtivas Globais: Impactos da Estratégia de Competição da Embraer no Arranjo Aeronáutico da Região de São José dos Campos", Bernardes, 2001, REDESIST Technical Note No. 23, Rio de Janeiro, UFRJ, updated and adapted by authors.

- The High Technology Association (HTA) Export Association

In 2002, 11 SMEs in the cluster formed the HTA, an exporter association. Member firms have an average of 15 years in the aeronautical sector. Most were founded by former EMBRAER employees, bringing 20 years' experience to bear in several areas. Member firms have complementary capabilities in design and development, machining (CNC/Conv.), composites, surface treatment, and non-destructive tests and assembly.

HTA is a trading company created with the support of support of the government export-support agency APEX (the process began in 1999). Since then, thanks to APEX financial and organizational resources, HTA has participated in several international fairs and missions.

HTA is also responsible for ISO 9000 certification of all of its 11 associated companies (although Embraer re-certifies them when they become suppliers).

The association's main potential clients are aircraft manufacturers and firms that supply aeronautical systems located in the Americas, Europe and Asia. As shown in table 39 below, their revenues have fluctuated wildly over the past few years. In 2003, the smaller firms had a minimum revenue of about R$ 100,000 and the largest of about R$ 1.3 million. The average revenue for the group of 11 SMEs was about US$ 65,000.

TABLE 39
REVENUES OF MEMBER FIRMS OF THE HTA EXPORT ASSOCIATION
(In R$)

Companies	2001	2002	2003	Average
Aeroserv	4 482 000	1 792 000	500 000	2 258 000
Alltec	995 000	853 000	710 180	852 727
Autômata	621 404	497 123	923 229	680 585
Bronzeana	301 825	282 300	327 450	303 858
Compoende	360 000	290 000	330 000	326 667
Graúna	1 634 000	1 050 000	1 342 250	1 342 083
Leg	310 000	220 000	280 000	270 000
Mirage	1 460 500	974 320	1 207 300	1 214 040
Spu	339 500	397 700	461 615	399 605
Status	390 597	308 926	532 632	410 718
Tecplás	426 106	390 597	461 614	426 106
Total	**11 320 932**	**7 055 966**	**7 076 270**	**771 308**

Source: Prepared by the authors on the basis of High Technology Association (HTA) data.

Of the 11 firms, only three had more than 100 employees in June 2004 (Aeroserv, Altec and Graúna); most had between 30 and 100 employees, and just two had less than 30 (Compoende and LEG). As shown in table 40 below, one of these smaller firms, LEG, has the highest revenue/per employee ratio reflecting the highly specialized nature of its activities, followed by another small firm (Compoende), which is also active in a high-tech activity, and a large to medium-sized-size one (Autômata).

Enterprises with unique and often high-tech capabilities display the highest revenue per employee, as also shown in table 41 below. The table also shows the wide scope and generally complementary nature of the capabilities of the different firms.

TABLE 40
HIGH TECHNOLOGY ASSOCIATION (HTA) EXPORT ASSOCIATION MEMBER FIRMS: EMPLOYEES AND REVENUES/EMPLOYEE
(In R$)

	Revenues (2003)	Employees (06/2004)	Revenue/ employee
Aeroserv	500 000	150	3 333
Alltec	710 180	110	6 456
Autômata	923 229	70	13 189
Bronzeana	327 450	30	10 915
Compoende	330 000	17	19 412
Graúna	1 342 250	150	8 948
LEG	280 000	8	35 000
Mirage	1 207 300	145	8 326
Status	461 615	55	8 393
SPU	532 632	70	7 609
Tecplas	461 614	50	9 232
Total	**7 076 270**	**855**	**8 276**

Source: Prepared by the authors on the basis of High Technology Association (HTA) data.

TABLE 41
CAPABILITIES OF HTA EXPORT ASSOCIATION MEMBER FIRMS

Participating companies by sector	Aeroserv	Alltec	Autômata	Bronzeana	Compoende	Graúna	Leg	Mirage	Spu	Status	Tecplás
Machining (CNC/Conv.)			■	■		■		■	■	■	
Control and electronic system							■				
Sheet metal work	■		■			■		■	■		
Tooling	■		■	■		■		■	■	■	
Repair and overhaul	■		■		■						
Composites	■	■									■
Assembly	■		■			■		■			
Engeneering							■				
Airframe component manufacture	■		■	■		■		■	■	■	
Thermal and surface treatments					■						
Nosdestructive test					■						
Testing and certification					■						
Design and development							■				
Special cutting and drilling			■			■			■		
Systems and components integration	■										

Source: High Technology Association (HTA).

b) IT use[11]

HTA member firms have a relatively high level of IT use, compared to the averages for SMEs in the state of São Paulo, as reported above. On average there are 11 PCs per company and one PC for every seven employees. Nonetheless, there is a low level of Internet use and no use of EDI or any form of e-commerce. Companies may receive orders and claims from the Embraer website, but there is no type of Supply Relationship Management (SRM). In terms of software applications firms are quite advanced, making use of the most advanced professional software in their fields: Catia, Master CAM and Autocad, among others. The level of industrial automation is also high with the use of 43 CNC machines involving numerical control and five 3-D Measuring Machines.

Only four (36%) of the firms have their own website. These sites allow customer registration, but some do not even provide information on products and services. Those with websites all post information in 3 languages: Portuguese, English and Spanish.

The HTA website is still at an early stage of development. It only provides static information about the consortium, its products and services, and does not have a reserved area either for its associates or for potential customers; nor does it offer the possibility of registering potential customers, and it has no links to the websites of associate firms.

c) Exports

Thus far only one of the firms in the group, Aeroserv, has exported over US$ 3 million in services over the period 2001-2003. In general, the events of September 11 put a brake on the group's initial export plans. In 2004, HTA and its members firms are negotiating exports of about US$ 50,000, aiming to raise the level to an average of US$ 3 million within three years.

The initial export effort included an offset clause in respect of imported aircraft, such as the CLX programme (cargo plane) purchased from Spain, which involved a 100% counterpart. The contract provides that Spain will purchase US$ 30 million in Brazilian aeronautics parts over 10 years. Additional offset-clause exports are under negotiation with Israel for a value of US$ 500,000 and a number of American customers.

Aeroserv exports had to specialize in design and assembly, which involved sending 50 of its 130 employees to perform related services in Spain. As seen in table 40, Aeroserv suffered the sharpest drop in revenues among HTA companies, falling from US$ 4.5 million in 2001 to US$ 500,000 in 2003. As shown in table 42, exports accounted for 50% of the firm's revenues in 2001 and an average of 25% in 2002 and 2003. The remaining cut in revenues is explained by the termination of an Embraer contract for development of the LX prototype. There were also some minor exports to France in 2003.

TABLE 42
AEROSERV EXPORTS
(In US dollars)

	2001	2002	2003	Total
Exports	2 315 263.50	465 732.74	125 440.92	2 906 437.16
Revenue	4 482 000.00	1 792 000.00	500 000.00	6 774 000.00

Source: High Technology Association (HTA).

[11] This section was based on a survey prepared by the authors and administered by HTA to its members.

i) Export motivations

According to HTA, member firms see exports as a way to expand markets and the customer base and thus reduce dependence on Embraer, which on average accounts for 70% of their production. Some firms depend on Embraer for up to 95% of their business. They also seek capacity-building and competitiveness.

The premise lies in the reality of the global aeronautics market, in which aeronautic parts represent US$ 33 billion per year. The goal of HTA is to capture 0.5% of this market. Some enticing analogies are the fact that USA exports US$ 14 billion, Canada US$ 1.3 billion and Spain US$ 1 billion.

ii) Export policy catalyst

HTA sees the Brazilian Export Promotion Agency (APEX) as a major catalyst for its export drive. Negotiations with APEX began in 1999, and the project was finally launched in 2001 for three years, after which it was extended for another year. A new project is currently under development. The existing project provides support for participation in international fairs and missions, averaging two fairs and two missions per year. It also contributes to member companies' ISO 9000 certification programme. Project costs are shared between the firms (50%) and APEX (50%). The project does not provide technical support to exports, however.

In fact, as volumes are still low, the firms prefer to use private agents for their export sales; but they do not use either government trade facilitation websites or credit lines, considering those available to be satisfactory.

Increasing the number and volume of offset contracts, a major source of business, is perceived by firms as one of the Government's most important contributions.

iii) Barriers to export

The firms recognize that they lag about 30% behind the technological state of the art. Other barriers cited include: distance from major markets, freight costs, high input costs (often imported), lack of working capital, lack of investment capital and lack of guarantees. It was also mentioned that Embraer does not award long-term contracts, but just one of a kind of sub-contracting order. This does not generate the necessary incentives for firms to invest in technology and productivity. Competition from imported equipment above a technological level was also cited.

Finally, it was mentioned that the terms, grace periods, and interest rates on financing are generally unfavourable, particularly when compared to competitors from East Europe and Asia, which often benefit from government support.

iv) Export strategy

Active pursuit of offset processes is seen as the key strategy to be followed. There is also a need to supply integrated solutions that are as complete as possible. In this regard, there is a need to improve capability in surface treatment technology. Finally, risk sharing is sought with customers.

v) IT & exports

Generally speaking there is very little use of IT to facilitate exports. There is a widespread perception that because of the highly specialized nature of the sector, personal contacts are the most important factor when establishing export relationships.

Participation in fairs and missions are seen as the main channel for establishing business relations, while Internet is rarely used for this purpose. There is no specialized website to search for and screen international trade partners. Export operations are assisted by private agents. In short, IT is not used for trade facilitation

d) Lessons learned from the case study

SMEs in high-tech vertical clusters face particular problems in exporting, because the nature of the business exposes them to intense international competition very early on. The existence of a lead or anchor firm in a vertical cluster is a mixed blessing, particularly in sectors such as aeronautics where subcontracting patterns have developed to the point of relying on a small number of first-tier suppliers. Breaking into this closed group, often consisting of foreign firms is a hard task. A lead national firm could in principle assist SMEs in this endeavour, but it often chooses not to, to avoid disaffecting key first-tier suppliers, which in turn are tied in their home country government aeronautics subsidy programmes.

The use of IT for exports and to strengthen the cluster's overall business capacity is hindered by the short-term nature of supplier contracts allowed by the lead firm, which prevents firms from pursuing a more long-term cooperative strategy. Government programmes with a one-size-fits-all format have severe limitations in addressing the specific IT needs of such enterprise groupings.

C. Problems for SMEs to participate in the trade-oriented value chain

The problems faced by SMEs in participating in IT networks can be subdivided in two groups: those related to their IT capacity, and those related to institutional factors.

The first group includes the high cost of purchasing equipment and operating it, the shortage of affordable quality human resources, and difficulties in identifying the company's IT needs and designing and implementing a strategy to meet them.

The second group includes the limited scope and administrative burden of finance programmes, availability of expertise on the IT functions and needs of SMEs, and a lack of knowledge of sector-specific network and export-oriented IT processes.

The main barriers that prevent SMEs from participating effectively in supply chains and trade networks include the industrial structure (in the case of high-tech sectors), industry fragmentation (in the case or ornamental stones) and, in general the one-size-fits-all format of existing support programmes. The quality of the activities on offer may also be a hindrance to their full integration into trade networks, as exemplified by the resource-poor nature of the websites developed by government programmes for ornamental stone and other similar clusters.

- Obstacles to the creation and growth of new enterprises

A survey conducted by the International Finance Corporation (IFC), entitled Doing Business in Brazil (Djankov and Mcliesh, 2004) shows that in São Paulo, Brazil's leading business city, it takes 152 days to start up a business, while in Mexico City it takes 51. The time taken can be reduced to 74 days by using specialized services, but this is more than 10 times the equivalent period in Chile. Bureaucracy is present even after opening the firm: for example, Brazil has one of the most rigid labour regulations in the world after India.

In relation to exports, Markwald and Puga (2002) claim that SMEs face problems relating to insufficient tax rebates, lack of relevant commercial information, logistical problems and poor credit access. They suggest that policies should focus on strengthening firms that are starting to export, in order to avoid discontinuities in export activity.

IV. Government policies designed for SMES, IT, and international trade

A. IT policies in the country's overall development strategy

Since the early 1990s, industrial policy has been shifting towards a more liberal regime. Local industry progressively lost its greenhouse protection and became exposed to international competition. The strategic response by firms facing competition from imports in the local market led to a downgrading of Brazilian specialization in the international division of labour (Cassiolato and Baptista, 1996). This trend had a major impact on the more advanced electronic equipment sector. From 1980 to 1994 its weight in the overall industrial sector decreased from 10% to 8%.

Current Brazilian policy for the IT industry epitomizes this shift from protectionism to liberalism. The IT policies prevailing in the 1980s were oriented towards local production and general development of technological capabilities. The outcome of a decade of protectionism was a locally owned industry manufacturing a wide range of hardware and also designing software, both for the local market. At this time minicomputers were widely used and the manufacturing scale did not yet provide a significant competitive edge as it does today for PCs. By the end of the 1980s local production of IT equipment (including telecommunications) had reached a level of US$ 7 billion, with a high degree of local content in both technology and components. The liberalization of the IT market for imports and foreign investments in the 1990s altered the industry structure. International IT leaders gradually took over most existing firms and turned away from local design and manufacturing to imports. The locally owned firms that survived were those targeting niche markets, client-specific software, and telecommunications equipment, where the client-supplier relationship was strong enough to withstand foreign competition (La Rovere, Tigre and Fagundes, 1996, pp. 123-143).

The 1991 policy (Law 8248/91) aimed to establish alternative mechanisms to preserve some local equipment manufacturing and R&D activities in the IT sector. The policy consisted of four types of incentives. First, fiscal benefits available until 1999 consisted of a waiver on the industrial goods tax (IPI) resulting in a 15% reduction in the final cost of production. Second, a 50% income tax discount for R&D expenditures was made available to firms in all industrial sectors. Recent measures, however, limited this incentive to a maximum of 4% of total income tax. Thirdly, in order to provide support for new capital investment, a discount of 1% on the

income tax payable by companies investing in IT firms was available until 1997. Fourthly, government procurement policy favours the acquisition of IT goods developed and produced in Brazil, as long as they have similar prices to imported equipment. By 1997, 248 firms had benefited from these measures. Part of the firms' R&D expenses were channelled to government-sponsored R&D programmes.

In 1999, the IPI rebate was further extended until 2013 by a law passed by Congress, with a scheduled reduction of fiscal incentives. The waiver on the IPI will be progressively reduced by 1% a year, from 100% in 1999 to 57% in 2013. In order for firms to take advantage of the fiscal benefits, the legislation required the following complementary actions by firms:

- Firms must invest at least 5% of their revenues from IT products (excluding software and professional services) in R&D activities, of which 2% must be through joint projects with universities or research institutes, or in government-sanctioned IT programmes.
- Manufacturing firms have to fulfil the "Basic Productive Process," which is a production step defined for each class of product. This production phase is considered to be the borderline between imports and local manufacturing. In PCs, for example, most firms assemble the computer's motherboard in Brazil as a minimum standard of value-added to qualify for fiscal benefits.
- Firms are required to comply with quality standards by obtaining ISO 9000 certification.

The extension of existing fiscal incentives was partly justified by the persistence of a large grey market for IT products. Tax exemptions in IT-related programmes amounted to R$ 600 million in 1997, but smuggled products pay no taxes at all. In fact there is a trade-off between fiscal incentives and balance of payments: higher taxes may act as a stimulus to the smuggling of computers, but also prevent the prices of locally produced computer from falling.

Other programmes based on "positive" policy mechanisms include the National Research Network (RNP) and Associação para Promoção da Excelência do Software Brasileiro (SOFTEX 2000). RNP aims to develop Internet links at science and technology institutions, and has also boosted commercial use of the Internet by providing infrastructure and technical capabilities. In 1997, RNP invested $ 20 million in local IT service providers, schools, and infrastructure such as high-speed backbones, and in linking universities and business centres. The project is now shifting towards academic and social use through Internet II, since private backbones are now available to support e-commerce.

The software exports programme (Softex 2000) was introduced in 1993 with ambitious aims: to capture 1% of the world software market, corresponding to US$ 2 billion in exports by 2000, and for local firms to capture a 50% share of the national market. The programme includes the formation of regional centres to stimulate cooperation among small software firms, the installation of marketing offices overseas (USA, Germany, Argentina, China) in order to support the export efforts of Brazilian firms, and incentives for training IT professionals within firms. The programme is now managed by a non-governmental organization.

Softex 2000 results and prospects are controversial. Nonetheless, if its over-ambitious aims are discounted, the programme is certainly helping local firms to gain greater exposure to the demands of international markets, thereby providing a kind of "quality test" for products developed in Brazil.

Other government-sponsored R&D programmes in IT are aimed at building infrastructure and promoting joint projects between universities and private firms. The main results, according

to the oversight agency CNPq, were the creation of a new cooperative research culture, the standardization of hardware and software platforms, and the provision of incentives for graduate programmes in computer science, which expanded from 13 in 1990 to 20 in 1995.

In the framework of the Mercosur free trade agreement, Brazil has been negotiating a common policy for international trade and industrial development for the IT sector with Argentina, Paraguay and Uruguay. So far an agreement has been reached under which the countries' tariffs on imports from outside the Mercosur zone will converge to 16% by 2006. As Brazil is now the only country in the region with substantial IT production, its users do not benefit from the zero tariff now applied to trade with its Mercosur partners. Brazil is unlikely to join the International Technology Agreement (ITA) proposed by the USA to eliminate all barriers on trade in IT products.

B. Policies to support SMEs

There are several national and regional government institutions involved in export promotion policy with an SME focus; and there are 15 organizations, both public and semi-public, involved in foreign trade support and promotion. These include agencies under the Ministry of Development, Industry and Foreign Trade – MDIC, (Apex and Camex); Sebrae; the Post Office; the National Industry Federation (CNI) which operates several International Business Centres; the Ministry of Foreign Relations (MRE or Itamaraty) through its network of embassies and consulates abroad; Banco do Brasil, the country's second largest commercial bank; BNDES; and Finep, Brazil's Innovation Agency under the Ministry of Science and Technology.

1. Export promotion

a) General policies

The main policy to support SMEs in Brazil is the Brazilian Entrepreneurship Programme (PBE), which focuses on promoting small and medium-sized enterprises, bringing together many actions and programmes of diversified agents that affect new businesses. It also seeks to contribute to the formalization of enterprises, revenue generation, and reduction of the mortality rate among new businesses.

The main thrusts of the programme are: management training; micro-financing; and post-credit monitoring or enterprise assistance. The programme also has complementary activities aimed at increasing the SME share in exports; their digital inclusion; support for productive arrangements; and strengthening of the handicraft segment.

Small businesses are given a smaller spread in credit programmes. At BNDES, a major source of long term credit, the median spread for SMEs is 1% per year, whereas large business has a median spread of 2.5%. There are also special credit lines in most public banks for small firms willing to export. In order to facilitate SME access to credit, particularly micro-enterprises, BNDES launched a magnetic credit card that allows firms to carry out and monitor their own credit operations.

The following institutions make up the programme: the Ministry of Industrial and Trade Development (MDIC), which coordinates it; the Ministry of Labour, including the labour secretariats in the states; the General Secretary of the Presidency of the Republic; the Ministry of Communications; the Ministry of National Integration; the Brazilian Development Bank (BNDES); the Amazon Bank (BASA); Banco do Brasil; the Brazilian Northeast Bank (BNB); the federal government savings bank, the country's largest (Caixa Economica Federal); Sebrae and

the Brazilian Post and Telegraph Company (*Correios*). Some of these entities are presented in the following section.

Between October 1999 and December 2002, the programme trained 6,070,127 entrepreneurs, provided management consultancy to 239,206 firms and carried out 5,198,996 micro finance operations, involving R$ 35 billion (roughly US$ 12 billion) for an average value of US$ 2,000.

TABLE 43
FEDERAL ENTREPRENEURSHIP PROGRAMME, OCT-1999/DEC-2002

	Benefited
Action	
Training (entrepreneur)	6 070 127
Consultancy (firms)	239 206
Micro Finance	
Operations	5 198 996
Value (*US$ million*)	11 550

Source: Ministério do Desenvolvimento, Indústria e Comércio Exterior (MDIC) (www.mdic.gov.br).

b) Policy institutions

This section presents some of key institutions involved in the promotion of international trade and new business creation. The list is not exhaustive.

c) Ministry of Industrial and Trade Development (MDIC)

The Ministry was established in 2000 with a mandate that includes:

(i) Industrial, commerce and services development policy;

(ii) Intellectual property and technology transfer;

(iii) Metrology, standardization and industrial quality;

(iv) Foreign commerce policy;

(v) Regulation and execution of foreign trade programmes and activities;

(vi) Application of trade defence mechanisms and participation in international negotiations on foreign trade;

(vii) Formulation of the business support policy; and

(viii) Serving as executive secretariat of the Board of Trade

Some of these activities are shared with its agencies and related financial institutions such as BNDES, the National Institute of Industrial Property (INPI) and the National Institute of Metrology, Standardization and Industrial Quality (INMETRO).

One of its main programmes in the area of new business development is the Small Scale Entrepreneur Programme (EPP), the objective of which is to train the SME entrepreneur in the procedures needed to operate in foreign trade. So far, over 9,000 entrepreneurs from all over Brazil have been through the programme.

d) Brazilian micro-enterprise and small business support service (Sebrae)

Sebrae has been working for the sustainable development of small businesses since 1972. The organization promotes training courses, facilitates access to credit, stimulates cooperation among firms, organizes business-oriented fairs and roundtables, and stimulates the development of activities contributing to employment and income generation. Hundreds of projects are managed by the Sebrae business and management units.[12]

Sebrae has great policy implementation capacity as it operates throughout Brazil, with regional units in all 26 states and the Federal District, forming a system offering strong potential for upward mobility, and over 600 service points.

e) Export promotion agency (APEX)

APEX is part of the Sebrae structure with a mission to support the implementation of export promotion policies. Its goals include export growth, in terms of values and items, an increase in the number of exporting companies, and new job creation. Projects supported by APEX are executed by private non-profit institutions, public institutions and Sebrae regional units. The costs are shared between APEX and the executing organizations, with a gradual phase-out of APEX support. Small enterprises are the agency's focus. It supports projects in firms with up to 99 employees or US$ 3.5 million in annual revenues.

APEX is developing 185 projects in support of Brazilian product exports such as foods, beverages, handicrafts, furniture, machinery and equipment, shoes, cosmetics, jewellery, textiles, clothes, organic products, ornamental rock and flowers, along with new products in Brazil's export portfolio. It is also striving to increase the number of micro-enterprises and SMEs capable of selling their products in the international market through strategic sectors that can be targeted by coordinated government action. It provides capacity-building and helps firms understand the needs of the international market.

Its website (http://www.apexbrasil.com.br/) provides a step-by-step guide to exporting, explains different types of export sales, briefly shows how to determine an export price, and instructs potential exporters on administrative procedures and documents.

APEX provides financial support for a series of activities that help increase export supply, together with straightforward commercial promotion, including: seminars and workshops for awareness raising and mobilization, product and market prospecting, training and capacity-building, product and process adaptation, (design, packaging, ISO certification), marketing and advertisement, participation in fairs abroad, business rounds with exporting firms and importers, and e-commerce (B2B, B2C, virtual catalogue).

For example, APEX supported the Export Development Programme of the Glass Trade Association, which in its initial phase is assisting 10 small and medium-sized firms operating in the interior design, lighting and coffee table utensils markets. The aim is to raise exports from 0.4% to 1% of revenues within three years (R$ 3.5 billion in 2003). The 2004 export target is US$ 22.3 million.

Up to September 2003, APEX had helped 8,196 SMEs participate in 410 international events. Business generated in these events amounted to US$ 399 million, and future agreements top US$ 1.8 billion. Assisted by 185 projects executed by APEX in partnership with the private sector, micro-enterprises and SMES exported to 42 countries.

[12] A fuller discussion of Sebrae entrepreneurship programmes can be found in Botelho, Jonathan and Gallagher (2004).

f) The National Economic and Social Development Bank (BNDES)

BNDES is an autonomous federal public entity attached to the MDIC. It provides long-term financing for enterprises that have the potential to contribute to the country's development. It also seeks to strengthen the capital structure of private companies and the development of capital markets, machinery and equipment trade and export finance.

Since its establishment in June 20, 1952, BNDES has financed large industrial and infrastructure projects, and plays a major role in support of investments in agriculture, commerce and service and, more recently, in micro, small and medium-sized enterprises. Another quite recent development in its portfolio involves support for social investments aimed at education and health, family agriculture, basic sanitation and public transport.

Its financial credit lines and financial programmes serve the investment needs of firms established in the country of any size and sector. It extends credit in partnership with financial institutions and regional government agencies, affording greater access to the BNDES resources.

- **BNDES export promotion programmes**

Financing for the export of goods and services through accredited financial institutions, in the following categories:

- Pre-shipment:
  finances the production of goods and services to be exported in specific shipments;
- Short-term pre-shipment:
  finances the production of goods and services to be exported, with payment terms of up to 180 days;
- Special pre-shipment:
  finances national production of exported goods, without links to specific shipments, but with a predetermined period for execution;
- Pre-shipment anchor company:
  finances the commercialization of goods produced by micro, small and medium-sized enterprises through exporting companies (anchor company);
- Post-shipment:
  finances trade in goods and services abroad, by refinancing the exporter, or through the buyer's credit category.

The guarantee instruments used are the same as those offered by credit agencies for exports. To further facilitate access to export credit, the following are available: Guarantee Fund for the Promotion of Competitiveness (FGPC), aimed at facilitating access to credit for micro, small and medium-sized enterprises.

Insurance for Export Credit covers the commercial and political risk of exported goods and services. In Brazil, this instrument is operated by the Brazilian Export Credit Insurer (SBCE).

It is necessary to apply to the accredited financial institution of your preference to negotiate the operation and decide whether it will be the guaranteeing party or the solicitor of the operation. Operations are performed in accordance with Operational Standards by presenting forms defined according to operation type.

g) Export promotion policies

The key policies used to promote SME exports are the Export Technology Support Programme (PROGEX), the Programme of New Export Arrangements (PNPE) and the National Network of Trade Agents (REDEAGENTES).

h) Export Technology Support Programme (PROGEX)

The purpose of PROGEX is to provide technological assistance to micro-enterprises and small businesses that want to become exporters, or to those already exporting that wish to improve their performance in external markets. PROGEX supports product adaptation to external markets involving improvement of quality and the productive process; cost reduction; meeting technical specifications; overcoming technical barriers; design and packaging.

The programme makes use of consultancy from universities and research centres in a two-stage process. In the first stage, professionals from a technological organization carry out a feasibility study through a visit to the company and prepare an initial diagnostic study. They analyse the product and productive processes, identifying the main technical problems to be solved and estimating the costs and investments needed to implement solutions. In the second stage, the professionals spend time in the firm to adapt the product, improve quality and implement solutions to the problems identified.

i) Programme of New Export Arrangements (PNPE)

PNPE carries out actions to provide stimulation and technological and commercial support to enterprises in sectors with export potential, especially small firms. Its objective is to expand the number and scope of Brazilian exports in terms of products, companies, and markets. Its initiatives include the dissemination of marketing information, stimulation of quality and productivity, help in increasing technological capacity and the incorporation of new technologies in the productive process.

j) Rede Nacional de Agentes de Comércio Exterior (REDEAGENTES)

The key aim of the National Network of Trade Agents (REDEAGENTES) is to disseminate an export culture and to guide small businesses on export procedures. It provides free training for foreign trade agents and small-scale entrepreneurs. From the beginning of the programme in 2000 until December 2003, it trained more than 2,000 foreign trade agents and about 6,000 entrepreneurs and employees from various institutions such as cooperatives, trade associations, city halls and other similar institutions. After training, foreign trade agents are integrated into the REDEAGENTES network based on the Internet, where they start to contribute to the process of disseminating the export culture and provide guidance to other small businesses on how to export.

There are also various regional export facilitation initiatives such as the Micro-enterprise Support Service in Santa Catarina state (Sebrae/SC), which initiated a series of debates in April 2004 as part of the pioneering Santa Catarina Export Potential project. The initial goal of the programme is to build capacity in 400 of the state's 3,226 SMEs with export potential, to improve their capacity to sell in the foreign market.

The State of Rio Grande do Sul, Brazil's southernmost state offers a foreign business platform targeted on small firms, in which exporters and importers can register. It receives 50 hits daily (www.redenegocios.rs.gov.br).

2. Trade facilitation

a) Banco do Brasil

In late 2002 Banco do Brasil created the Foreign Trade Platform (FTP) as a system especially designed to facilitate and stimulate SME exports. This allows for an online export operation and meets demand from small firms that wish to start exporting.

Through the website www.bb.com.br the entrepreneur has access to a virtual international business room, without restrictions to a bank client (exporter). The service streamlines the export process for amounts of up to US$10,000. FTP has an electronic catalogue with samples registered by importers; it issues export documents and offers registration in the Integrated Foreign Commerce System (SISCOMEX) among other facilities. The site also offers opportunities for doing business in both directions, covering the whole process from photo exhibition of the product to transport. In order to avoid risks for beginner export firms, FTP also offers an additional service of advance payment custody. The exporter only ships the merchandise when notified that the payment has been made in Brazil. Similarly, payment is converted only when the importer receives the merchandise.

From its inception in January 2003 until December that year, the service registered 2,846 exporters and 680 importers, and completed 173 operations valued at US$ 483,000. Today, there are 4,790 export product offers and 701 importing firms registered.

b) Websites

There are three main websites for SMEs that wish to export. The first two managed by the MDIC and the third managed by the Ministry of Foreign Relations (MRE):

(i) The Exporter's Portal (http://www.portaldoexportador.gov.br/);
(ii) Exporter's Window (https://www.exportadoresbrasileiros.gov.br/);
(iii) The Brazilian Trade Net (http://www.braziltradenet.gov.br.

The Exporter's Portal is a major source of information on foreign trade. The subjects are displayed by topic for easy consultation. The site also offers a communication channel for suggestions, doubts and consultations relating to foreign trade. The site has Portuguese as its sole language. Since its creation in November 2001, it has received 6,220,000 hits and 6,000 e-mails from 84 countries, of which 36% addressed the Exporter´s Window (Mancini 2004).

The Exporter's Window, launched in late 2003, contains a complete catalogue of information on Brazilian exporters. The site has over 25,000 companies registered in cadastre, which also include potential exporters. The site is available in Portuguese and English.

The Ministry of Foreign Relations (MRE or Itamaraty) website BrazilTradeNet (www.braziltradenet.gov.br) offers a virtual space where small exporters can market their products and processes. Its objectives are: 1- facilitate and increase Brazilian exports through the use of high technology and the MRE Trade Promotion Sectors network; 2- offer strategic information for business between Brazilian and foreign firms; 3- increase foreign direct investment; and 4- disseminate Brazil's image and the quality of its products.

BrazilTradeNet offers to Brazilian and foreign companies, a large set of free services and information of interest for export activity and foreign investment. It also publicizes promotional information: business results from participation in fairs, missions or seminars in Brazil and abroad, and is a major source of information for foreign companies wishing to invest in Brazil. The site is available in Portuguese, English and Spanish.

By late 2003, the site had 13,000 potential exporting firms registered and 9,600 product offers. About 58,000 importers were also registered on the site. In addition the site makes available market research reports, market trend information, investment guidelines and resources, and other related information. Although the site specifies MSMEs as one of its five target audiences, there is no area dedicated specifically to MSMEs. The number of daily hits ranges between 3,000 and 5,000.

c) Export finance

Banco do Brasil finances exporting SMEs through its Export Financing Programme (Proex) which currently serves 400 firms: 11% large, 39% medium-sized, 37% small and 13% micro-enterprises.

In 2003, there was a 50% increase in the number of MSMEs seeking financial support to start exporting. In the same period, they increased their exports by 25%, with goods ranging from lingerie to balloons. Proex target markets are also quite diverse: Thailand, Croatia, China, Japan and Tchek Republic, along with traditional ones such as the European Union and the United States. Despite these positive developments, the number of exporting MSMEs that continue to export after the initial effort is small, because of the segment's inherent nature.

d) Postal service

The State postal company Correios has established the Easy Export programme to take Brazilian products to the four corners of the world. In 2003, SME products accounted for 62% of total sales, and SMEs represented 67% of the exporting firms in the programme.

São Paulo state accounted for half of total SME sales, followed by Minas Gerais (18%) and Rio de Janeiro (14%). The main markets were: United States (38%), Japan (10%) and Portugal (7%). The products most exported by SMEs were jewellery, precious metals, and fashion accessories, amounting to 23% of the total, followed by garments and accessories, electric machinery, equipment and materials.

The export operation can be carried out online, at the website <www.correios.com.br/exportafacil>, which provides information about the programme, markets and legislation, together with a step-by-step guide to exporting.

Correios forecasts that in 2004 it will ship over 24,000 export packages abroad, a 75% increase over the previous year. Products can be sent to over 200 countries and the process requires just one export form to be completed. The exported parcel can be up to 30kg in weight with a maximum value of US$ 10,000.

Created in November 2000, the main results of the Easy Export programme are: in 2001, 6,745 shipments were made for a total value of R$ 8,670,349.89; in 2002 there were 11,440 shipments totalling R$ 19,011,898.37, with a significant increase in the value of exported merchandise; and in 2003 shipments reached 19,631 valued at R$ 35,543,007.40, growth of 87% in relation to the previous year.

3. FDI promotion

The MRE website discussed above has an investment attraction area, with an Investors' Map and a page on "Why Invest in Brazil?". In addition, MRE manages its own Investment Promotion and Corporate Technology Transfer System (SIPRI), a network of national and foreign agents. The goal of SIPRI is to enhance foreign investment attraction and to establish partnerships between Brazilian and foreign firms allowing for the transfer of high technology.

The federal government's main effort was until recently focused on the hybrid agency Brazil Invest, which was shut down last July. The Brazilian Investment Promotion Network (Invest Brazil) was created in November 2000, following a long debate with several actors involved in the investment attraction process, as a Civil Society Organization of Public Interest (OSCIP) — a non-profit legal entity. Its founding members include representatives of all major industry and services trade associations along with bilateral chambers of commerce in Brazil.

It main objective was to attract foreign direct investment and stimulate national investment for development. In order to fulfil this objective, Brazil Invest had as a permanent activity the dissemination of information on the Brazilian economy, on Mercosur, on the country's business environment and on investment opportunities available to national and foreign investors and opinion leaders.

The network aimed to operate as a flexible and low-overhead organization, offering activities on demand, giving priority to investments that filled gaps in the country's social and economic infrastructure, helped balance trade deficits, generated jobs and had a technological content favourable to the generation of local intellectual capital.

Its strategy was to focus initially on building up the country's image as a competitive destination for FDI; on establishing partnerships, in coordination with the relevant MRE units, with state development offices, investment promotion organizations, service and information providers, among others; and in selectively promoting investment opportunities, emphasizing projects of high impact and ease of implementation.

4. Business promotion (new business, incubation, entrepreneurship)

Brazil has an array of programmes for the emergence and early-development of new businesses (such as incubation), together with entrepreneurship-awareness and capacity-building programmes. Given the sheer number and the broad scope of these programmes and the report's focus and related space limitations, it is impossible even to provide a summary. Full treatment of this issue can be found in Botelho, Jonathan and Gallagher (2003). This section will thus present just a few key programmes.

The main policy in support of SMEs is the PBE, which focuses on promoting small and medium-sized enterprises, bringing together many actions from programmes of diverse agents that affect new businesses. It also seeks to contribute to the formalization of enterprises, income generation, and reducing new business mortality.

The programme's key areas are: management training; micro-financing; after-credit follow-up, or enterprise assistance. It also has complementary actions aimed at increasing the participation of SMEs in exports; digital inclusion; support for cluster-like arrangements; and strengthening of the handicraft segment.

Small businesses have access to smaller interest rate spreads in credit operations. At BNDES, a major source of long-term credit, the average spread for SMEs is 1% per year, while the large business are subject to an average spread of 2.5%. There are also special credit lines for small firms wishing to export in most public banks (Banco do Brasil and Caixa Econômica Federal), and in regional development banks (such as Banco do Nordeste Brasileiro).

The following institutions participate in the Brazil Entrepreneurship Programme: Ministry of Industrial and Trade Development (MDIC), which co-ordinates it; the Ministry of Labour, including the labour secretariats of the states; the General Secretariat of the Presidency of the Republic; Ministry of Communications; Ministry of National Integration; BNDES; the Amazons Bank (BASA); Banco do Brasil; the Brazilian Northeast Bank (BNB); the Federal

government saving bank (Caixa Econômica Federal (CEF)); Sebrae and the Brazilian postal company (Correios).

Between October 1999 and December 2002, the programme trained 6,070,127 entrepreneurs, assisted 239,206 firms and carried out 5,198,996 microfinance operations, involving R$ 35 billion (roughly US$ 12 billion) with an average value of US$ 2,000.

- National Bank for Economic and Social Development (BNDES)

The financial support lines and BNDES programmes serve the investment needs of companies of any size and sector, established in Brazil. The partnership with financial institutions, and with agencies established around the country, makes it possible to spread credit more widely, affording greater access to BNDES resources.

By June 2003 the BNDES Programme in Support of Micro, Small and Medium-sized Enterprises had undertaken 24,616 loan operations for an average value of US$ 50,700. Almost half of the loans were made to micro-enterprises, and these accounted for 29.7% of disbursements. Medium-sized enterprises accounted for 35.4% of the total volume of resources.

IDB is negotiating with the Brazilian Government for a loan of US$1 billion to the SME sector to be invested in the creation, expansion and diversification of firms and in the support of foreign trade activities. The loan will be supported by a US$1 billion counterpart from BNDES, which will transfer the funds to the firms. The loans will be made available to the firms through a network of over 100 financial institutions accredited by BNDES, including private and public commercial banks, funding agencies and others. These are medium to long-term loan operations, lasting an average of five years.

Over the last eight years, BNDES and IDB signed four projects targeted on MSMEs totalling US$ 5.8 billion, of which US$ 3.5 billion was financed by IDB and the rest by BNDES.

C. Special measures to correct the 'digital divide' among companies

1. Human resources

By all measures, education levels in Brazil increased substantially in the last decade, including literacy and enrolment indicators at all educational levels. Primary education is now almost universal (95.7%), and 78.5% of the population of secondary school age are already enrolled, compared to less than 60% in 1992. Secondary education is usually considered a necessary condition for IT use. Table 44 below displays major education indicators.

TABLE 44
EDUCATION INDICATORS

Indicator	Percentage of	1992	1999
Adult literacy	Individuals over 15 years of age who can read and write	82.8	86,7
Functional illiteracy	Individuals with less than 4 years' schooling	36.9	29.4
Primary education	Enrolment of children from 7 to 14 years of age	86.6	95.7
Secondary education	Enrolment from 15 to 17 years of age	59.7	78.5
Adult education	Enrolment of individuals between 20 and 24 years of age	16.9	25.5
Tertiary education	Tertiary enrolment in age group	-	-

Source: Human Development Report for 1998 and 1993, United Nations Development Programme (UNDP), 2000. "Pesquisa Nacional por Amostra de Domicílios 2001", Instituto Brasileiro de Geografia e Estatística (IBGE), 2001. World Development Indicators (WDI) for 1998, World Bank (WB), 2000.

As far as IT technical workforce is concerned, in absolute terms Brazil has a large number of software professionals compared to other developing countries, as the following table shows.

TABLE 45
HUMAN RESOURCE INDICATORS

Country	Mexico	Brazil	Korea	Taiwan	Malaysia
Population (*millions*)	96.5	159	44.9	21	20.1
Adult literacy (%)	90	83	98	n.a	84
Mean years of education	4.7	3.9	8.8	n.a	N/A
Secondary enrolment ratio (%)	58	45	101	n.a	57
R&D scientists and technicians (*per 1,000 people*)	0.3	0.2	2.9	n.a	0.2
Number of software professionals	321 482	549 840	340 168	140 070	53 389

Source: United Nations Development Programme (UNDP), 1998 and 1993. For Mexico, CONACyT, 1995, Indicators of Scientific and Technological Activities, Dedrick and Kraemer, 1998. Software Productivity and Quality Today – The Worldwide Perspective, Jones, 1993, data updated in 1995 in correspondence with authors.

In Brazil, there are 680 undergraduate courses on IT-related subjects. Each year, about 22,000 students obtain a degree in those subjects, while enrolment totals roughly 190,000. In addition, students from others areas such as applied sciences and mathematics eventually became IT professionals.

TABLE 46
GRADUATES AND ENROLMENT ON UNIVERSITY-LEVEL IT COURSES
(In number of)

Area	Courses	Graduates	Enrolment
Data processing	180	7 388	43 701
Computer sciences	159	8 367	74 567
Social communications	152	2 701	37 738
Information systems	53	836	13 078
Industrial design	40	1 242	9 811
System analysis	35	582	9 829
Other*	61	1 167	9 168
Total	**680**	**22 283**	**197 892**

Source: Ministry of Education, Sinopse Estatística do Ensino Superior, 1998.

[a] Areas related to IT.

In 2000 about 3,000 students were undertaking post-graduate courses in computer sciences, of which 20% were doctoral degrees.

TABLE 47
POST-GRADUATES IN COMPUTER SCIENCES, 2000
(In number of)

Item	MSc	Ph.D.	Total
Number of programmes	28	13	41
Incoming students	877	124	1 001
Enrolment	2 405	593	2 998
Conclusion (1999)	461	65	526
Supervisors	611	297	908

Source: Programa Sociedade da Informação no Brasil (SocInfo), based on data provided by the Brazilian Computer Society (2000).

2. Technical aspects

Independent committees working in cooperation with Government, universities and business oversee development of the technical aspects of Internet diffusion. The National Research Network (*Rede Nacional de Pesquisas* (RNP)) is an example of such an institution. It was established in 1989 by the Ministry of Science and Technology and was responsible for introducing the Internet in Brazil. It provides high-speed backbones to universities, hospitals and other social institutions by wholesale purchasing and reselling spare capacity available at private infrastructure providers. Since private institutions are now well established in Internet services, RNP is targeting social and scientific goals through the implementation of the Internet II project. The aim here is to provide an alternative high performance network for technical information and research activities. Although the project will not directly affect e-commerce, it may indirectly help improve private networks, since it will divert most university and research centre Internet traffic from existing networks. It may also contribute to the development of new applications and help these institutions use e-commerce in their management and procurement activities.

Other policies include the development of affordable computers, since equipment and software costs are major barriers to Internet diffusion in most segments of Brazilian society. Universities and computer manufacturing firms have designed several versions of a "popular computer" with a target price of US$ 300. The design specifications were based on the network computer concept, using upgradeable minimum hardware, operating in connection to local or remote servers. For software there are versions using either free operational systems (LINUX 6.0) or open codes based on GNU, oriented towards the Internet environment. The advantages of free software are twofold. First it costs under $ 5 compared to $ 50 for Windows. Second, users will not be exposed to frequent changes in versions and thus not forced to buy new software and hardware as happens to proprietary software users. Nonetheless, free software has the disadvantages of poor technical support and low availability of applications.

A network computer must be linked to a server, either through local area networks (in the case of schools and other multi-user institutions) or through a remote ISP. Since there are many towns in Brazil without an Internet provider, the Government is launching the "0i00 service", which enables Internet users to pay local call charges when dialling long distance to any ISP within the country.

3. Financial aspects

Software firms usually face difficulties in obtaining financial resources from private banks, since they are unable to provide physical collateral. Although no major government action has been taken so far in this respect, the Softex-BNDES programme provides financial support for software development and marketing activities as well as acquisition of equipment and training. The programme has a credit line from BNDES and holds equity in the software firms as collateral.

Another initiative is to develop financial packages to support the sale of computers to small business and domestic users. Banco do Brasil has a financing programme including hardware, software and an Internet service provider. The programme also aims at creating economies of scale in hardware manufacturing in order to make the system competitive in the export market.

4. Infocenters

In developing countries, IT dissemination is a more selective process than in advanced countries where business practices across industry branches, regions and firm sizes are more homogeneous. In a country where labour is a relatively less expensive input than capital, firms are more

reluctant to invest in automation. The investment required to introduce IT is a major inhibitor of diffusion since equipment is relatively unaffordable and employees are less educated than in developed countries. As expected, this barrier affects small firms more than large ones, and those operating in less competitive branches of the local economy.

The universalization of Internet access in Brazil cannot rely on individual PCs alone. While potential demand for computers exists even in micro and informal businesses, investment costs are a barrier to wide diffusion. There are already government programmes[13] aimed at filling this demand by introducing Internet in small business, such as newsstands, post offices, lottery and convenience stores. These would play the role of intermediary between consumers and the net. According to Sebrae, more than 100,000 micro and small retailing shops are already connected.

The federal government has one major programme of digital inclusion for SMEs: Information and Business Infocentres. Its main goals are to train entrepreneurs and workers in the use of information technologies, promoting the emergence of new enterprises, boosting exports, larger joint ventures between entities and new partnerships, improvement of the quality of products and services, and strengthening of projects for productive arrangements.

There is only one specialized federal credit line —the Enterprise Computerization Programme, operated by Banco do Brasil—, but this situation may change since the Government is currently developing the Brazilian Digital Inclusion Programme (PBID) to be launched in 2005. Each of these initiatives is described below.

a) Infocentres of information and business

The specialized contents of SME interests that establish relations among all infocentres Net, are available at the portal http://www.telecentros.desenvolvimento.gov.br, and are depicted in a new methodology entitled Hyperbolic Navigation. This is presented graphically in the form of tree of knowledge, whose centre represents the information desired, from which radial axes emerge in the direction of nodes, where in turn, new axes emerge, and so on. The site also hosts virtual communities and contains an informative area with news and events related to SMEs. infocentres also offer attendance-based and distance training and business opportunities.

By July 2004, 400 infocentres were operating and 10 cooperation agreements had been signed to implement further 163 units. The project's goal is to implement 1,000 infocentres by July 2005 and at least one in each of Brazil's 5,567 municipalities by 2007. For this purpose, the Government is establishing partnerships with public banks and private enterprises. TIM, for example, is responsible for a net of 41 infocentres.

b) Enterprise computerization programme

There is one major credit line for SMEs wishing to buy computers: the Enterprise Computerization Programme, operated by Banco do Brasil. The programme aims to finance the acquisition of computers and peripherals by micro-enterprises and small businesses, in order to modernize management and facilitate electronic communication between the customer and Banco do Brasil.

The supplier will provide pre-sales services including advice to customers about the choice of equipment best suited to its needs. Five different kits (basic or advanced) are available, for delivery within 20 working days, anywhere in the country:

[13] For example, the Information Society Programme.

(i) Microcomputer;
(ii) Microcomputer and laser printer;
(iii) Microcomputer and ink jet printer;
(iv) Microcomputer, laser printer and Emission of Fiscal Coupons (ECF);
(v) Microcomputer, ink jet printer and Emission of Fiscal Coupons (ECF).

The credit can rise to R$ 50,000 (US$ 18,000), financing 100% of the kits. The stated period is up to 24 months and the applicable interest rate is the long-term rate plus 5.33% per year.

c) Brazilian digital inclusion programme

A government-working group is currently drafting the Brazilian Digital Inclusion Programme (PBID) to be launched in 2005. This will have three main axes: "Casa Brasil", long-distance education and connected PC.

"Casa Brasil" will be the new name for the infocentres and will include not only those related to Information and Business, but also infocentres located in schools and in rural zones, and in frontier and remote regions. All of them will use open software, in order to guarantee the economic sustainability of the project. Open source software is also being used in Ministries.

Distance education will be mainly related to formal education, although the Information and Business Infocentres offer some business-related training. The focus is to offer primary education where there are shortages of teaching staff and teacher capacity.

The connected PC is probably the goal that will have greatest impact among SMEs, since its target is to offer a cheaper personal computer with Internet access to micro-enterprises and low-income population groups. The aim is to produce up to 40 million of these computers and sell them for between US$ 340 and US$ 400. The public banks (Banco do Brazil and Caixa Econômica Federal), would finance the sale in up to 24 instalments, with a monthly cost of US$ 15. In consortium, the number of instalments can rise to 50 with monthly payments of just US$ 7. Telephone companies and cable TV operators would provide the Internet infrastructure. The federal government will give tax benefits, also being negotiated with local governments. In 2001, the Federal University of Minas Gerais (UFMG) started a programme to develop a computer to be sold for US$ 250, but the project was halted. Now the idea is returning, mainly because of the success of the Korean digital inclusion programme.

5. Other

a) Sebrae programmes

- Programme of technological support for small enterprises (PATME)

The first stage is to convince entrepreneurs that investment in modernization systems can yield returns. For this, Sebrae has reached agreements to provide advisory services through technological centres, university, research institutions, technical schools and technological development foundations. The incentives include improvements to products, equipment, methods and production lines. PATME also offers financial support for computerization and can finance up to 70% of project costs. Another computerization initiative is SebraeTec, launched in 2002. The intention here is to invest in programmes that develop technological capacity among small businesses. Apart from projects to provide advice on computerization, SebraeTec supports the establishment of new software developers, in order to increase the supply of programmes and

facilitate access for small firms. Parallel to SebraeTec, Sebrae/RJ develops other activities to extend computerization in the state. One of the projects, Software Rio, offers support for the establishment of a new firm that can sell cheaper programs to small enterprises. Ever since its launch, one of the objectives of Software Rio has been to request state government to grant tax incentives to developers wishing to start operations in the region. The expectation is to reduce the state's dependence on imported software and, consequently, to reduce costs.

b) Institutional issues

Legal and statutory factors such as regulation of transactions, privacy protection, security, intellectual capital protection, taxes on e-commerce transactions, and government policies such as promotion of IT production and use can enable or inhibit IT diffusion.

Brazil has not developed specific legislation but there are several projects in the pipeline in the National Congress. The rules governing online sales are the same as applied to the "Code of Customers Defence". However, there is a project in the legislature (Draft Law 1589/99) to regulate electronic commerce and authentication of digital signatures. The project has been approved in the Commission for Science and Technology and is awaiting plenary decision. The proposed law includes:[14]

- Certification of electronic signatures by a public notary and their annexation to electronic documents.
- Use of a cryptographic system based on a public or asymmetric key. The codified message will be received using a private key decoded by the corresponding public key.
- Foreign certified documents would only be accepted if Brazilian contracts receive the same treatment overseas.

Cross-country legislation is a necessary condition for e-commerce, especially in free-trade areas like Mercosur. In Argentina, Decree 427/98 is already in force, regulating digital signatures and a cryptographic system based on an asymmetric key. Its application is restricted to public administration, however.

Within Brazilian federal government agencies, official document exchange is already done electronically using a public key Infrastructure. Presidential Decrees 3585 and 3587 establish that official documents for regulatory acts must be transmitted electronically.

In the case of intellectual propriety rights, Brazil joined the WTO Trade Related Intellectual Propriety Agreement (TRIPS) in 1996. It recognizes software copyright but also grants patents in specific cases, usually when software is embodied in hardware. Piracy has been decreasing but it still accounts for a large share of the home software market.

Standardization, such as EDI codes, used to be established by business associations such as ANFAVEA (automobile manufactures), FEBRABAN (banking association), and drugs distributors. These sector standards usually follow the EDIFACT international model. Since the Internet is becoming more secure and available, however, EDI operations are mostly tending to be phased out as e-business tool.

[14] CFF, Veirano & Advogados Asociados; Gazeta Mercantil L. A. (2000, p. 18).

D. E-government aimed at SMEs and trade promotion

1. Overall strategy/structure of e-government

The e-government policy in Brazil is under the responsibility of the Executive Committee of Electronic Government, whose aims include: formulate policies, establish guidelines, coordinate and articulate e-government actions, aimed at providing services and information to citizens.

The Committee was established in the framework of the Government Counsel by Decree 18 of October of 2000. The Ministry of Planning, Budget and Management is its Executive-Secretary and guarantees the necessary support to the working of the Committee.

The committee's brief is to:

(i) coordinate and articulate the implementation of programmes and projects for rationalization in the acquisition and use of infrastructure and services, and in information and communication technology applications within the Federal Public Administration;

(ii) establish guidelines for the formulation of an annual information and communication technologies plan in each Ministry;

(iii) establish guidelines and strategies for planning the supply of online services in Federal Public Administration agencies and entities;

(iv) define quality standards for electronic forms of interaction;

(v) coordinate the implementation of mechanisms to rationalize expenditures and cost appropriation in the application of resources in information and communication technologies, within the Federal Public Administration;

(vi) establish service levels for the supply of services and information for electronic media;

(vii) establish guidelines and orientations, and publish, for the purpose of bid proposal and revision of the draft law of the Plurianual Plan, Budgetary Lines of direction and the Annual Budget, on the appropriation bills of the agencies and the entities of the Federal Public Administration, relating to the allocation of investment resources and expenditure in the ICT area.

In 2003 following the election of a new Government, the Committee was divided into eight technical committees. It pursues the action guidelines and expected results in each case:

a) Digital inclusion committee guidelines

- Digital Inclusion as a right of citizenship
- Plurality of models under the same lines of direction
- Public segmentation
- Infrastructure
- Commitment with local development
- Integration
- Evaluation
- Use of open source software

Expected results - 2003/2006

- National Digital Inclusion Policy defined
- Create 6,000 community infocentres (one in each Brazilian municipality)
- Double the number of citizens with Internet access, to have 30% of the population carrying out transactions online with the federal government
- National System for the evaluation of digital inclusion implemented

b) Online services and website management committee guidelines

- Lines of Direction to guarantee a citizen focus
- Lines of direction for integration
- Lines of direction for quality assurance and reliability of content
- Line of direction for security
- Line of direction for management of websites and online services

Expected results – 2003/2006

- Integration of websites and online services with standards set for federal government websites and the government portal in operation
- Security and privacy policy implemented
- Sharing of resources of the federal and state governments
- Government-wide knowledge of the preferences, demands, satisfaction and criticisms of the online services

c) Open software implementation committee guidelines

- Prioritize solutions, programmes and services based on open source software
- Counter growth of the legacy based on proprietary technology
- Achieve gradual migration from proprietary systems
- Prioritize the acquisition of hardware compatible with free platforms
- Guarantee the free distribution of systems in free software in a collaborative and voluntary form
- Strengthen and share existing free software actions in and outside the government
- Generate incentives for the national market to adopt ICT business models based on open source software
- Generate conditions for cultural organizational change towards the adoption of open source software
- Promote capacity-building/training of public employees in the use of FLOSS
- Design a FLOSS national policy
- Prioritize web platforms in the development of user systems and interfaces
- Adopt open standards in the development of ICT and multi-platform services and applications
- Disseminate the use of FLOSS
- Enlarge the network of services supplied to citizens with FLOSS
- Ensure citizen access to public services without forcing them to use a specific platform
- Use FLOSS as a basis for digital inclusion programmes
- Ensure the full auditing and security of systems, respecting existing legislation on the topics
- Establish interoperability standards with legacy systems based on open standards

Expected results - 2003/2006

- Development of civil servant capabilities to use free software
- Development of interoperability standards and free software in the federal government
- Dissemination of free software in schools and universities
- Development of a national free software policy, including support for the local supply software industry.

d) Committee for systems integration

- Establishing policies, standards, rules and methods for integration systems in the federal government.
- Foster a collaborative environment for system integration.
- Prioritize the client/server architecture in web government corporate systems

e) Network infrastructure committee

- Define a networking policy for government agencies.
- Promote optimization of network resources.
- Develop updated information systems based on the existing situation and network infrastructure needs.
- Ensure the effectiveness of the committees' activities.

f) Committee on knowledge management and strategic information

- Promote knowledge management practices in public administration
- Monitor best practices in knowledge management in public administration and disseminate them through e-government.
- Search, and disseminate knowledge management application tools to the Executive Committee on Electronic Government.

g) Government to government committee

- Prioritize actions involving social information systems, law and order and Ministry of Justice services.
- Facilitate access to public data and transparency among different levels of government.
- Avoid duplication of effort
- Promote the sharing of technological, human and financial resources
- Develop strategies to help states and municipalities provide services online.

h) Legacy systems and license committee

- Legacy systems must operate on different platforms, use open sources and enable interoperability.
- Federal government must develop better negotiating skills for obtaining software licenses, through information and unified negotiations.

2. Some e-government applications

Some of the applications of e-government policy are very important to SMEs, although none is actually targeted on that sector. These include the e-procurement portal (Comprasnet), the SISCOMEX, and the Brazilian Payment System (SPB).

a) E-procurement

The federal government launched its procurement portal in 1997. The Comprasnet (http://www.comprasnet.gov.br) portal is where the Government publicizes its business opportunities. The site enables firms to obtain online all the certificates needed to do business with Government. It also sends an e-mail to firms alerting them of business opportunities in their area.

Since 2001, the Government has used the portal to make online transactions. These are important initiatives to improve SME participation in government procurement, because it greatly reduces the transaction costs of doing business with the public sector. As a result, the number of SMEs registered in the portal has increased threefold from 33 million in 1997 to 102 million in 2003.

b) Integrated foreign commerce system (SISCOMEX)

The federal government has a system that integrates the activities of registering, accompanying and controlling foreign trade procedures, by means of a single computerized flow of information known as SISCOMEX. This system provides information to many other systems, of which the most important is the Foreign Trade Information Analysis (ALICE), and plays an important role in keeping trade facilitation websites up to date, such as the Exporter's Portal and BrazilTradeNet.

ALICE, is an Internet-based system for foreign trade analysis, under the Foreign Trade Division of MDIC. ALICE was developed with the aim of modernizing modes of access and the systematic diffusion of statistical data on Brazilian trade flows. It is update monthly, at the time of the release of the balance of trade, and is based on data in the SISCOMEX, which manages Brazil's foreign trade. Access to ALICE-Web is free (http://aliceweb.desenvolvimento.gov.br/).

c) E-payment

The Brazilian Payment System (SPB) is one of the most outstanding public-private partnerships in banking automation in Brazil. Since April 2002, all transactions involving more than R$ 5,000 have been settled on the same day (previously the operation took at least one day) and much more securely. The entire banking system is connected to the Central Bank and five other clearinghouses that began operations in 2002, online with the SPB deployment schedule. This means that the Central Bank (BACEN) can access detailed online monitoring of banking transactions, manage the liquidity of the financial system more precisely, and therefore minimize systemic risk (Botelho, 2004).

> "The Brazilian Payment System was implemented on April 2002, respecting the recommendations of international multilateral financial institutions.[15] The system allows interbank transfers to be accomplished in real time, unconditionally and irrevocably. In the new system, the completion of transactions has been made conditional on the presence of a sufficient bank balance to cover the operation. Thus, the new Electronic Payment System permits real-time transfer of funds from one account to another, in the same or another financial institution, and settlement of operations with federal bonds,

[15] Brazil thus fulfilled the requirements of Model 1, described by the Bank for International Settlements.

carried out through the SELIC system. These efforts contributed also to the modernization of the economy, with important efficiency gains." (Mora, 2003).

E. Institutional issues

1. Standardization and public key infrastructures

The National Institute of Information Technology (ITI), an autonomous federal body attached to the Civil House of the Presidency of the Republic, is the Authority Certifier Root (AC Root) of the Brazilian Public Keys Infrastructure (ICP-Brazil). As such it is the first authority in the certification chain, executor of the certification policies and norms of operational techniques and approved by the Managing Committee of ICP-Brazil. It has the power to emit, to forward, to distribute, to revoke and to manage the certificates of the Certifier Authorities (AC) immediately below it; to manage the list of certificates emitted, revoked and expired; to execute activities of AC monitoring and auditing, Register Authorities (AIR) and the qualified rendering of services in ICP-Brazil.

It is also within the purview of the National Institute of Information Technology (ITI) to stimulate and coordinate scientific research and technological development projects aimed at expanding digital citizenship. In this area, the main line of ITI action concerns the popularization of digital certification and digital inclusion; acting on issues such as cryptograph systems, open software, hardware compatible with open and universal standards, digital convergence of medias, among others.

Digital certification in Brazil was introduced by a law in 2001 (regulated by Provisional Measure 2200) that structured the Brazilian Public Keys Infrastructure (ICP Brazil), a digital certification model.

> "ICP Brazil consists of a group of techniques, practices and procedures to be implemented by the Government and private organizations to guarantee the authenticity, integrity and legal validity of electronic documents. The managing authority is the ICP-Brazil Management Committee.
>
> The digital certification model adopted in Brazil was conceived by the federal government, based on the logic of public keys. One of the keys, known to the public, is deposited with the Certifying Authority. The other key, the private one known only to the user, is stored in the Digital Certificate. Only a specific private key is capable of "opening" the respective counterpart represented by a public key. When doing so, the final user guarantees digital certification of the operation and, consequently, its legal validity.
>
> The institutional arrangement of the structure is based on the ICP-Brazil Management Committee and a chain of certifying authorities consisting of the Root Certifying Authority - AC Root (exercised by ITI), the Certifying Authorities (ACs) and the Registration Authorities (ARs). ITI generates and manages the pair of cryptographic keys of the AC Root. The AC Root is assigned to execute certification policies and to approve technical norms for the ICP-Brazil Management Committee. The AC Root administers the list of issued, revoked and expired certificates, although it cannot send certificates to the final user. It verifies the Certifying Authorities' power to issue digital certificates and also oversees the Certifying Authorities (ACs) and Registration Authorities (AR). ACs issue and revoke digital certificates (i.e. the equivalent of cryptographic keys that match the public key to a certain title-holder) while ARs are responsible for requesting certificates and for maintaining registration of their operations." (Mora, 2003).

2. Intellectual property rights

The National Industrial Property Institute (INPI) is an autonomous federal body, created in 1970, linked to the Ministry of Development, Industry, and Foreign Trade. Its main purpose is to implement standards regulating industrial property within the national sphere, considering its social, economic, legal, and technical functions. Another of its functions is to issue opinions on the convenience of execution, ratification and denouncement of conventions, treaties, pacts, and agreements on industrial property.

Created to replace the former National Industrial Property Department, the Institute was made responsible for the legalization of technology transfer contracts and subsequently for the registration of computer programs, corporate franchise contracts, registration of industrial design and geographic indications, in addition to the traditional tasks of granting trademarks and patents.

INPI provides information from among its over 20 million patent documents to companies, government agencies, through specific programmes. It executes special programmes to support domestic enterprises, such as the Patents Promotion Programme (PROMOPAT) which allows one technical group of INPI to act directly in firms, to identify innovations that could have legal protection; the Automatic Information Supply Programme (PROFIN), in which INPI sends regular information contained in patents across the entire world related to the areas of performance of the contracted companies, over the Internet or on paper; the Programme of Incentives for Commerce of Patented National Technology (PROCOMTEC), aimed at small companies and isolated investors wishing to sell or license innovations; and the Programme to Monitor the Technical Evolution of Industry (PROATEC), which aims to subsidize government policy in priority sectors, through technological analyses.

V. Regional networks

A. Existing regional networks or websites

There are two major types of network using IT to promote SME business. One is national with no focus on specific sectors, and the other is locally or regionally cantered on a sector. The networks hosted by Information and Business Infocentres, described in chapter IV item C, are a major example of the first, while the vortals for local clusters are an example of the second

Network of Information and Business Infocentres: <www.telecentros.desenvolvimento.gov.br>

Complementing all the information on the website, such as the Hyperbolic Tree, and news and events related to SMEs, the site also offers a restricted area for the information trade.[16] This area displays all online members and offers the possibility of sending instantaneous e-mails, and holding virtual meetings and forums. It also has a large number of virtual communities, some based in a locational aspect, such as the administrative regions, one for each of the five Brazilian region, others grouped by themes, such as the Thematic Committee in Training and Entrepreneur Capacity, with work groups on Strategic Planning and Management Capacity, and Thematic Committees on Foreign Trade and Integration, Investment and Financing, Legal and Bureaucratic Rationalization and Technology and Innovation.

In July 2004, the network had over 800 records (which can be also firms, associations or people). There is no information available on site visits.

Vortals for local clusters: <http://www.prossiga.br/arranjos/>

Vortals are web portals containing online information on some of the Brazilian clusters. They are available for 14 local arrangements in 11 states and 9 sectors (see table 48) and were constructed in partnership with Ministry of Science and Technology (MCT), the National Research Council (CNPq), Studies and Projects Finance (FINEP) and the state's science and technology secretariats, in a programme called "Regional Action".

They are built on the technology platform methodology and are developed and hosted by Prossiga, a federal programme established in 1995 to promote the creation and use of Internet

[16] In fact, the area is not very restricted. Anyone who fills a cadastre can enter.

information and communication services, focusing primarily on science and technology, and the country's important socioeconomic activity sectors.

TABLE 48
VORTALS OF BRAZILIAN CLUSTERS

Sector	State	Website
Carnaúba	Piauí	http://www.prossiga.br/arranjos/pi-carnauba.html
Floricultura	Ceará	http://www.prossiga.br/arranjos/ce-floricultura.html
Gesso	Pernambuco	http://www.prossiga.br/arranjos/pe-gesso.html
Indústria farmacêutica	Goiás	http://www.prossiga.br/arranjos/go-farmaco.html
Malacocultura	- Santa Catarina - Amapá - Espírito Santo	http://www.prossiga.br/arranjos/go-malaco.html http://www.prossiga.br/arranjos/vortais/moveis_ap.html http://www.prossiga.br/arranjos/vortais/moveis_es.html
Móveis e artefatos de madeira	- Pará - Santa Catarina	http://www.prossiga.br/arranjos/vortais/moveis_pa.html http://www.prossiga.br/arranjos/vortais/moveis_sc.html
Piscicultura	- Rondônia - Bahia	http://www.prossiga.br/arranjos/ro-piscicultura.html http://www.prossiga.br/arranjos/vortais/rochas_ba.html
Rochas ornamentais	- Espírito Santo - Rio de Janeiro	http://www.prossiga.br/arranjos/vortais/rochas_es.html http://www.prossiga.br/arranjos/vortais/rochas_rj.html
Sisal	Bahia	http://www.prossiga.br/arranjos/ba-sisal.html

Source: http://www.prossiga.br/arranjos/.

In general, the work follows the following stages:

1. Survey and analysis of local productive arrangements with current and/or potential importance for socioeconomic development and the reduction of regional inequalities;

2. Selection of arrangements to be benefited, with support from regional and/or state management committees;

3. Analysis of the main characteristics of the selected arrangements, considering the intra- and inter-sectoral relations that define them;

4. Identification of the main technology and training bottlenecks, skill development and specialization of labour for the productive sector;

5. Definition of actions to be executed in firms, research and education institutions and firms providing technical and technological services;

6. Definition of cooperative projects to carry out actions;

7. Presentation of projects to promotion agencies through the executive secretariat installed in the Assessorship of Regionalized R&D Actions of the Ministry of Science and Technology (MCT).

The project approval decision is directly related to the priorities established in the platform negotiation process. Analysis of the merit of a project considers not only excellence but also its relevance, especially its impact on local sustainable development.

The vortal service put the first sites online in 2001 and aims to improve SME competitive capacity by offering a set of information, communication devices and varied support to market services through the web. It uses the Internet to widely disseminate the information on the sector already existing on the web, fully described and classified.

Information on the service is contained in the following structure (model of vortal presentation <http://www.prossiga.br/arranjos/>):

a) Organizations and professionals:

Information of a strictly local type, including organizations directly linked to the exploration and commercialization of the cluster product. They are compiled under the categories:

- Industry and Commerce.

The other categories are locally broader, exceeding the borders of the states:

- Importers and exporters;
- Suppliers;
- Transporters;
- Artisans and designers;
- Counsellorships;
- Unions;
- Associations;
- Cooperatives;
- Financial institutions (national/regional and local);
- Entrepreneurial management, that brings software of interest to the activities of the sector.

b) Governmental information:

- Legislation (of federal, state or municipal scope);
- Patents and Trademarks (including number of the order, date of the deposit, summary, name of the petitioners and inventors, among other information).

The information encompasses national and local scopes in the categories:

- Public Institutions (promotion, regulation, national/local), and
- Governmental Policies and Plans.

c) Events:

- Congress, Seminars, Fairs (publicize names of expositors, date and place held, photos of products and other information);
- Courses (provides information on courses offered by universities or companies, attendance-based or distance, in addition to timetables and lists of courses);
- Missions and road-shows.

d) Publications:

Scientific or technical information, in full or summary form, under the following categories:

- Newspaper and magazine articles and other texts;
- Statistics, studies and diagnosis;
- Technical Reports and Research;
- Thesis, dissertations and other scientific texts;
- Magazines, periodicals and bulletins;
- Books, manuals and handbooks;
- Audiovisual resources (includes photographs, videos etc, and can support education activities and others linked to the cluster sector).

e) Research:

- Current projects to support research and the formation of human resources in federal and state R&D agencies;

- Public and private organizations that carry out research or offer courses relating to the activity of the sector are also included;
- Researchers (lists of specialists).

f) Market:

Quotations (price quotes for the cluster's commodity products, when applicable).

g) E-commerce:

Pages of organizations that engage in business through the Internet.

h) Information services on the web:

Portals and vortals (homepage of Internet information services on the cluster sector).

For the organizations and professionals of the sector that do not have their own website, Prossiga offers the service of institutional and personal homepage creation. As result, a large set of homepages was created, helping to give greater visibility to the organizations of the sector and the professionals who operate in it.

Largely through the support of MCT and state secretariats, many firms have their own website, even though it general only contains static information and is available only in Portuguese. The cluster chain usually has at least one e-commerce site, which shows that IT is being used to promote business.

The service is relatively highly used. In May 2003,[17] accumulated visits over the last 12 months amounted to 23,000, representing an increase of 10% from the last cumulative figure and 20% compared to those for March. The initial vortal page received 10 visits per day (4,500 visits in 12 months); and, on average, each vortal receives 3.5 visits per day.

TABLE 49
ACCUMULATED VISITS TO VORTALS IN 12 MONTHS

		March 2003	April 2003	May 2003	Daily average
Initial page		3 684	4 044	4 459	9.52
Carnaúba	(PI)	2 029	2 125	2 305	4.61
Flower growing	(CE)	2 664	3 110	3 450	12.88
Plaster	(PE)	2 543	2 654	2 789	4.26
Pharmaceutical industry	(GO)	1 361	1 484	1 647	3.81
Malacoculture	(SC)	722	786	844	1.21
Furniture and wood artefacts	(AP)	403	509	697	2.78
Furniture and wood artefacts	(ES)	677	712	748	1.08
Furniture and wood artefacts	(PA)	346	401	482	1.74
Furniture and wood artefacts	(SC)	759	828	894	1.46
Fish Farming	(RO)	805	856	950	1.66
Ornamental stones	(BA)	474	515	592	1.1
Ornamental stones	(ES)	742	774	812	1.14
Ornamental stones	(RJ)	1 110	1 199	1 283	2.39
Sisal	(BA)	884	979	1 070	2.29
Total		**19 203**	**20 976**	**23 022**	**3.46**

Source: http://www5.prossiga.br/estatistica/tabelas.html.

[17] Latest data available.

The number of entities (firms, professionals, associations and others) registered grew by 10% from 3,231 to 3,540 between March and May. On average, each vortal has 250 entities registered.

TABLE 50
ONLINE REGISTERED ACCUMULATED

		March 2003	April 2003	May 2003	Growth Rate
Carnaúba	(PI)	52	52	52	0.00
Flower growing	(CE)	349	364	364	4.30
Plaster	(PE)	281	297	296	5.34
Pharmaceutical industry	(GO)	499	580	660	32.26
Malacoculture	(SC)	85	101	102	20.00
Furniture and wood artefacts	(AP)	230	233	244	6.09
Furniture and wood artefacts	(ES)	163	182	186	14.11
Furniture and wood artefacts	(PA)	239	240	269	12.55
Furniture and wood artefacts	(SC)	178	180	178	0.00
Fish farming	RO)	163	165	164	0.61
Ornamental stones	(BA)	225	239	240	6.67
Ornamental stones	(ES)	358	358	365	1.96
Ornamental stones	(RJ)	325	327	333	2.46
Sisal	(BA)	84	85	87	3.57
Total		**3 231**	**3 403**	**3 540**	**9.56**

Source: http://www5.prossiga.br/estatistica.

B. New networks or websites in the planning stage

In June 2004, the federal government launched a new programme to promote SME exports, which consists of financing the export of goods produced by SMEs, in the pre-shipment phase, through credit institutions. The credit can be as much as 100% of the FOB value and will be related to the long-term rate, plus 1% a year of BNDES remuneration (the programme agent) and remuneration of the credit institution (no more than 4%).

These exporters will operate as anchor enterprises, facilitating indirect export; they can be trading companies, commercial exporters or firms in the supply chain that acquire the production of a significant set of SMEs looking for exportation.

If the programme is successful, the federal government expects to have a good number of anchor enterprises organizing SME exports, through trade nets spread throughout the country.

The fact that the federal government is going to launch a major digital inclusion programme made it possible for networks such as the Information and Business Infocentres to grow fast in a few years.

The vortals have been dealing with problems since 2003, when the new government took office.[18] Many expansions plans were interrupted and no new vortal was launched. They are unlikely to expand in the near future.

[18] The tables with visits to the website, for example, ended in May 2003. The monthly electronic informative with analysis of the site views only extends to October 2002; and the quarterly bulletin of statistics ended in December 2001.

The São Paulo State Federation of Commercial Associations (Facesp) launched the National Network of Business Portals (RNPN) in 2003, which now has 6,000 members. The rapid growth of RNPN is based on its philosophy of simplicity in connection to the portal, together with low cost and a safe environment. The portal offers small firms an electronic catalogue, electronic exchange of product and service information, and either targeted or generic quoting.

C. Possibility of inter-regional links

Mercosur[19] is a federal government priority, but online cooperation to promote SMEs is still far from a reality. The official site of the agreement displays only static information, mainly on documents and agreements. Apart from the documents, there is no database on the site, and entrepreneurs will only find interesting subjects in the documents that are launched.

Mercosur has a civil society group on cooperativism, but this is not yet providing any form of online service that can help SMEs. The electronic commerce group also has not implemented any suggestion.

LAIA[20] has a much more developed website than Mercosur, but its information is also mainly static. There is also the Entrepreneurial Portal where firms can display information on their services and products and a complete database on commercial trade, tariff measures and preferences among country members (SICOEX) is available.

The Entrepreneurial Portal is organized in four main areas: Regulations, Directories, Preferences and Entrepreneurial Meetings. It aims to inform trade operators in member countries of the access conditions to the regional market, and provide useful information for the accomplishment of commercial transactions. The Regulation area contains import and duty free zone regulation in each member country, together with basic manuals on import operations. The directories list business associations that are cadastred in the gateway, divided into enterprises and SMEs, and a list of importers and exporters for each country. The cadastre only contains institutional information. The Preferences area shows the tariffs preferences by the country granting it and the country receiving it. Entrepreneurial Meetings contains a list of fairs and missions per country.

The Foreign Trade Information System (SICOEX) is composed of interconnected online databases and consists of data, kept up-to-date since 1995, on member countries' trade, tariff measures and preferences for any product traded within the framework of the Montevideo Treaty of 1980,[21] together with information on laws regulating foreign trade.

Since the portal contains all these facilities, in the near future it could host developments such as online settlement gateways that could contribute to the use of IT in SME business promotion.

[19] Mercosur members are Brazil, Argentina, Uruguay and Paraguay.

[20] LAIA members are Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela.

[21] The Montevideo Treaty of 1980 created LAIA.

VI. Conclusion and recommendation

A. Lessons learned

The two contrasting experiences analyzed above first of all show us the importance of paying attention to the nature of the industry and its structure. In the case of aeronautics parts, the small number of firms, their highly specialized production capabilities and the critical role played by the leading firm, Embraer, in the vertical cluster require closer cooperation between firms in order to negotiate better and longer-term contracts with the leading firm, and to develop foreign niche markets which are often part of national industry supply chains. Here, a marketing strategy aimed at building trust with potential customers is needed, given the nature and internationalized structure of the aeronautics end market. This is a long-term process. Furthermore, firms have to be able to integrate their complementary capabilities and make up for those that are lacking, in order to offer foreign customers a more comprehensive solution platform. Finally, in this proto-cluster, non arms-length forward linkages to first-tier suppliers might be more important than backward linkages to even smaller firms, thereby complementing the current direct strictly business linkages to the leading firm. These first-tier suppliers, pressured by end buyers, will be always pursuing cost reductions in services provision and new parts development.

In contrast, in the ornamental stones sector, the cluster is more horizontal and without concentration. The relatively large number of firms and the length of the supply chain with several levels of input and equipment suppliers make the formation of stronger and denser networks harder to achieve. The cluster is very active in exports, particularly when compared to other industry-like clusters and other regions. Its success is due in part to previous export promotion policies. The challenge ahead is to sustain momentum and to increase the value-added of exports. The Prossiga website creation programme for local productive arrangements and clusters has been discontinued and it appears no replacement is in sight. The new administration is emphasizing a wholesale policy of telecentre expansion, which, while necessary, may represent a setback in relation to the previous orientation of IT diffusion in terms of targeted local empowerment.

B. Assessment of experiences in export promotion and IT policies for SMEs

It seems that whereas SME export promotion policies in Brazil are entering a second-generation, those for IT are still in their infancy. We are still only beginning to gain an understanding of individual SME IT needs and uses. Nonetheless, we have not yet fathomed the possibilities for IT use in SME networks. Beyond the basic goal of achieving widespread dissemination, there has been little policy development in this area. In regard to broad dissemination, the new government initiative to develop cheap computers could be part of the answer, but that remains to be seen. Moreover, SMEs will still be faced with the problem of obtaining adequate software and, most importantly, qualified IT staff aware of the organizational and strategic challenges facing SMEs.

On the other hand, export promotion policies are becoming more sophisticated and tailor made. The recent emergence of local/regional networks of exporting firms such as the HTA consortium, and the support given to them by APEX, as well as easier use of export portals such as that of Banco do Brasil and export facilities such as those provided by Correios, are a few signs of gradual and important changes in policy. The scope of APEX support for these networks needs to be expanded to include development of IT tools to promote meaningful collaboration and to allow for interactive export activities. This would increase the supply of complete platforms in the case of high-tech sectors, thus capturing greater value-added and providing increased sustainability. Export sustainability is a critical problem that continues to plague SME exports. This has been correctly identified but still remains to be diagnosed, above and beyond the lure of the domestic market once the local economy recovers. Guidance and sustainability by anchor firms appears to be a promising avenue for both SME export capacity-building and sustainability. Care is needed, however, to prevent a strong dependency relationship from developing. In this regard, experimentation could be pursued to involve first-tier suppliers in this support and learning network for export-oriented SMEs.

The full potential of Internet-based instruments has not yet been fully grasped by promotion agencies. Full interactivity and high-quality graphical interfaces are critical for breaking into an overcrowded export market. Marketing is often weak or export capability lacking in exporting SMEs, either because of the type of specialized training needed, in the case of high-tech firms, or because of a lack of specialized training in the case of traditional industry clusters. Internet tools can be employed effectively in building the capacities that are lacking.

C. Assessment of the present situation of regional networks

Regional networks of SMEs in Latin America are still in an embryonic stage. The conflictive state of affairs existing between the two leading Mercosur partners, Brazil and Argentina, coupled with Chile's autonomous strategy, does not bode well for the next few years in the absence of a strong policy. Nonetheless, the design of such a policy will require a better understanding of existing relationships (if any), and a mapping of potential relationships, based on complementary products and services, contrasting best practices in export activities and willingness to collaborate across borders in the search for a higher value-added business proposal.

References

ALADI (Latin American Integration Association) (2003), Estudio sobre Gobierno Digital, ALADI/SEC/Estudio 153 Rev. 1, Uruguay, <www.aladi.org/NSFALADI/ecomerc. NSF/012ed27bee063f3203256da30066b9b0/3bd8bdddc46c846803256e93004e7555>

Bernardes, R. (2001), "Redes de Inovação e Cadeias Produtivas Globais: Impactos da Estratégia de Competição da Embraer no Arranjo Aeronáutico da Região de São José dos Campos", REDESIST Technical Note No. 23, Rio de Janeiro, UFRJ.

Bernardes, R. and M. Pinho (2002), Aglomeração e Aprendizado na rede de fornecedores locais da Embraer, Rio de Janeiro, REDESIST-UFRJ.

Botelho, Antonio José (2004), IT and the Financial System in Brazil, a report to the project "Diffusion and Effective Use of Information Technology: A Latin-Asian Dialogue on Initial Conditions and Policy Challenges", August.

Botelho, A. J., E. Jonathan and T. Gallagher (2004), Tendencias del empreendedorismo juvenil en Brasil: de la cultura a la acción, El nuevo rostro empresarial: indagación sobre el empresariado juvenil en América Latina y el Caribe, Washington, D.C.

Botelho, A. and P. Tigre (2001), "Brazil Meets The Global Challenge: IT Policy In A Post-Liberalization Environment", The Information Society: An International Journal, vol. 17, No. 2, Bloomington, IN.

Brazilian Computer Society (2000), Programa Sociedade da Informação no Brasil (SocInfo).

Cassiolato, J. and M. Baptista (1996), The Effects of the Brazilian Liberalisation of the IT Industry on Technological Capabilities of Local Firms, Information Technology for Development 7:53–73.

Chahin, A. *et al.* (2004), E-gov.br: a próxima revolução brasileira, São Paulo, Prentice Hall.

Chiodi Filho, C. (2002), "Situação e Perspectivas Brasileiras no Setor de Rochas Ornamentais e de Revestimento", First Brazilian Symposium in Ornamental Stones, Rio de Janeiro, CETEM/MCT.

CONACyT (Consejo Nacional de Ciencia y Tecnología) (1995), Indicators of Scientific and Technological Activities.

CRITO (Centre for Research on Information Technology and Organizations) (2002), Global E-Commerce Survey.

Cunha, L. M. *et alli* (2003), "Rochas ornamentais: exportações promissoras", BNDES Setorial, No. 17, Rio de Janeiro.

Dedrick and Kraemer (1998), For Mexico, CONACyT, 1995, Indicators of Scientific and Technological Activities.

E-Consulting Corp. (2003), Internet Indicators <www.econsultingcorp.com.br/insider_info/indicadores.htm>

Ferraz, G. and J. Ribeiro (2002), "Um Levantamento de Atividades Relacionadas às Exportações das Empresas Brasileiras" in "O Desafio das Exportações", Rio de Janeiro, BNDES.

Gazeta Mercantil Latino-Americana (2001), February 12-18.

_____ (2000), September 25 to October 1.

IBGE (Instituto Brasileiro de Geografia e Estatística) (2001), "Pesquisa Nacional por Amostra de Domicílios 2001".

IDEIES (Espírito Santo Industrial Development Institute) (1998), Diagnóstico e atualização do cadastro do setor de mármores e granitos do Estado do Espírito Santo, Vitória.

IEL (*Instituto Euvaldo Lodi*) (1999), Análise da Cadeia de Valor da Indústria de Mármore e Granito e Construção Civil do Espírito Santo, Vitória.

IETS (Labour and Society Research Institute) (2002), "Criação de um ambiente favorável aos micro e pequenos negócios e desenvolvimento", IETS Policy Paper No. 2. <www.iets.inf.br/acervo/Policy-Papers.htm>

ITU (International Telecommunication Union) (2003), World Telecommunication Indicators,Geneva.

Jones (1993), Software Productivity and Quality Today – The Worldwide Perspective.

La Rovere, R., P. Tigre and J. Fagundes (1996), Information Networks Diffusion in Brazil: Global and Local factors, in P. Palvia, S. Palvia, and E. Roche, editors, Global Information Technology and Systems Management: Key Issues and Trends, Nashua, NH: Ivy League Publishing.

Markwald, Ricardo and Elisa Pessoa (1997-2002), Micro e pequenas empresas exportadoras no Brasil: un retrato.

Markwald, R. y F. Puga (2002), "Focando a Política de Promoção de Exportações" in "O Desafio das Exportações", Rio de Janeiro, BNDES.

MDIC (Ministry of Industrial and Trade Development) (2004), Summary version of the Brazilian trade balance, August 23, <http://www.desenvolvimento.gov.br/arquivo/secex/balanca/balComBrasileira/semanal/NovaBalanca.ppt>

_____ (2001), Instrumentos de Apoio ao Setor Produtivo, Brasília, <www.desenvolvimento.gov.br/sitio/publicacoes/desProducao/Ins_ApoSetProdutivo.php>

Ministry of Education (1998), Sinopse Estatística do Ensino Superior.

Pinheiro, A. C. *et alli* (2002), "O Desafio das Exportações", Rio de Janeiro, BNDES.

RAIS (Relação Anual de Informações Sociais) (2001), Ministério do Trabalho e Emprego (MTE).

Rocha, I. (2001), Plataformas Tecnológicas: conceito e aplicações, Brasília, MCT.

SEBRAE (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas) (2003), Boletín Estatístico de Micro e Pequenas Empresas/Observatório Sebrae.

SECEX/MDIC (Secretaria de Comércio Exterior/Ministério do Desenvolvimento, Indústria e Comercio Exterior) (1993, 1997, 1998, 1999), Cadastro do IBGE e RAIS/MTE.

Shapiro, C. and H. Varian (1999), Information Rules, Massachusetts, Harvard Business School Press.

Tigre, P. B. (2003), E-Commerce Readiness and Diffusion: The Case of Brazil, Globalization and Electronic Project, <www.crito.uci.edu>

_____ (2002), "O Papel da Política Tecnológica na Promoção das Exportações" in "O Desafio das Exportações", Rio de Janeiro, BNDES.

Tornatzky, L. and M. Fleischer (1990), The Process of Technological Innovation, Lexington, MA: Lexington Books.

UNDP (United Nations Development Programme) (2000), Human Development Report for 1998 and 1993.

Villaschi, A. (2004), "Interação econômica BR/UE para além de fluxos comerciais e de investimentos - reflexões neoschumpeterianas e fatos estilizados capixabas", Position Paper of Conference Brazil Amplified European Union, Rio de Janeiro, UFRJ.

Villaschi, A. and M. Sabadini (2000), "Arranjo Produtivo de Rochas Ornamentais (mármore e granito) no Estado do Espírito Santo", REDESIST Technical Note No. 15, Rio de Janeiro, UFRJ.

WB (World Bank) (2000), World Development Indicators (WDI) for 1998.

WITSA (World Information Technology and Services Alliance) (2002), Digital Planet, The Global Information Economy.

Websites

Latin American Integration Association (ALADI)	:	www.aladi.org.br
Brazilian Export Promotion Agency (APEX)	:	www.apexbrasil.com.br
Banco do Brasil	:	www.bb.com.br
National Bank for Economic and Social Development (BNDES)	:	www.bndes.gov.br
Portal de comércio exterior (BrazilTradeNet) do MRE	:	www.braziltradenet.gov.br/
Portal de compras do Governo Federal (COMPRASNET) do MPOG	:	www.comprasnet.gov.br
Correios (CorreiosNet) do Ministério das Comunicaçoes	:	www.correios.com.br
Centre for Research on Information Technology and Organizations (CRITO)	:	www.crito.uci.edu
Empresa Brasileira de Aeronáutica S.A. (EMBRAER)	:	www.embraer.com.br
Brazilian Exporters, Ministério do Desenvolvimento, Indústria e Comércio Exterior	:	www.exportadoresbrasileiros.gov.br/
Feira Internacional Mármore e Granito, Espírito Santo	:	www.feiradomarmore.com.br
Brazilian Government site	:	www.governoeletronico.e.gov.br/ governoeletronico/index.html
Brazilian Institute of Geography and Statistics (IBGE)	:	www.ibge.gov.br
Euvaldo Lodi Institute (IEL)	:	www.iel-ideies.com.br
National Institute of Metrology, Standardization and Industrial Quality (INMETRO)	:	www.inmetro.gov.br
National Institute of Industrial Property (INPI)	:	www.inpi.gov.br
Marble Connection World	:	www.marble.com.br/
Ministry of Development, Industry and Foreign Trade (MDIC)	:	www.mdic.gov.br
Mercosur Brazil	:	www.mercosul.gov.br
Ministry of Labour and Employment (MTE)	:	www.mte.gov.br
Portal Caminho das Pedras - o Rumo Certo dos Seus Negócios	:	www.pcpedras.com.br/
Portal do Exportador do Ministério do Desenvolvimento, Indústria e Comércio Exterior	:	www.portaldoexportador.gov.br/
Prossiga	:	www.prossiga.br/arranjos
Brazilian Microenterprise and Small Enterprise Support Service (Sebrae)	:	www.sebrae.com.br
Union of the Ornamental Marble and Granite, Whitewash and Calcareous Stone Extracting and Improvement Industries of Espírito Santo (Sindirochas)	:	www.sindirochas.com.br
Integrated Foreign Trade System (SISCOMEX)	:	www.receita.fazenda.gov.br/aduana/siscomex/siscomex.htm
Telecentro de Informação e Negocios do Ministério do Desenvolvimento, Indústria e Comércio Exterior	:	www.telecentros.desenvolvimento.gov.br