



Globalization and E-Commerce: Growth and Impacts in Brazil

June 2001

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This research is part of the Globalization of E-Commerce project of the *Center for Research on Information Technology and Organizations* (CRITO) at the University of California, Irvine. The research is supported by a grant from the U.S. National Science Foundation (CISE/IIS/CSS). The project in Brazil is also supported by a grant from the National Council for Science and Technology Development (CNPq).

Summary

- In Brazil, high inflation rates and public policies for local information technology development encouraged the early adoption of electronic data interchange (EDI), especially in the banking industry.
- The process of Internet development in Brazil was somewhat similar to the NSFNet program in the United States. The National Research Network (RNP) began operating a national backbone in 1991, and in 1996 it became available for commercial purposes.
- As elsewhere in the Americas, the diffusion of electronic commerce has been growing fast in Brazil. Internet active users range, according to different sources, from four to six million. Brazil is the largest Internet user in Latin America, with an estimated share varying from one-third to one-half of total users.
- Brazilian business has high expectations about the potential of e-commerce. Thousands of new start-up dot.coms and existing businesses are now creating web-based services.
- Population attitude towards the Internet is also very positive. Computers are considered the second most desired consumption item after cars. However, poverty and poor income distribution restrict diffusion rates.
- Macroeconomic policies and regulatory changes in the 1990s have played a positive role for e-commerce development. Mainly, they increase both supply and demand for telecommunications services, especially with business-to-business (B-to-B).
- Brazil is the fifth most populated country in the world; more than 80 percent of its population is living in cities, and 49 percent of Brazilians are aged 24 years or younger. These factors may play a positive role in Internet diffusion.
- The Brazilian economy has been growing at a relatively slow pace as compared to its historical growth rates, since inflation control became its highest priority in economic policy. Brazil ranks third in the Americas in GDP value. However, in per capita terms, it falls behind the top five wealthiest countries in Latin America.
- As elsewhere in the Americas, Brazilian sector distribution of employment shows an increasing role of the service sector. About 55 percent of the labor force is now working in services, while employment in manufacturing represents only 12 percent.
- Micro and small firms provide 35 percent of total employment while large firms employ 45 percent of the total registered workforce. Taking into account that informal workers, who represent more than one-half of total Brazilian workers, are mostly in small firms, the role of large firms is probably overestimated.
- Education levels increased substantially in the last decade. Primary education was almost universalized (95.7 percent) and 78.5 percent of the college-aged population was already enrolled, compared to less than 60 percent in 1992.
- In 1999, investments in telecommunications as a percentage of the GDP (1.25 percent) were the highest in the Americas. In the last four years, fixed-line teledensity doubled while cellular subscribers quintupled. In per capita terms, Brazil is now on track with the Latin American average, both in fixed-line and cellular phones. In late 2000, fixed-line teledensity was available for about 23 percent of the population, 15.5 percent of which were connected to the Internet.
- Since the early 1970s, Brazil has developed capabilities both in production and use of information technologies. Mexico and Brazil are the only Latin American countries with a

substantial IT hardware production. However, Brazil produces mostly for the internal market and is also a heavy importer.

- In Brazil, Internet infrastructure is heterogeneous. While there are islands of high-speed links in major cities, most parts lack adequate ISPs and reliable connections.
- The use of credit cards has been growing at a fast pace since the early 1990s. 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 one billion transactions per year. In 2000, overall purchases by credit cards reached US\$ 26.5 billion, equivalent to seven percent of total private domestic consumption in Brazil¹.
- Despite the slowdown in investment estimated for 2001, Brazil continues to be the primary focus for Internet and other new economic investment in Latin America, because of its lead in e-commerce. Private equity investment in the Brazilian “new economy” more than tripled to US\$ 3.5 billion in 2000.
- The government has been very active in promoting e-commerce diffusion. Two policies may be distinguished in Brazil as relevant to Internet diffusion: the Program for the Information Society and the E-Government initiative.
- The vast majority of Brazilian firms are already linked to the Internet, but they are still at an early stage of user development. More than 50 percent of firms use the Internet for e-mail and to access information only—a user pattern more typical of individuals, rather than corporations (Tigre, 2000).
- Another survey (FIESP, 2000) shows that only five percent of firms undertook e-commerce transactions. However, the majority of businesses believe they will be introducing e-commerce in the near future, as the Internet becomes an important channel for trade between firms.
- The use of the Internet as a business tool is more noticeable in information-related sectors like finance, communications, information services, and other services that can be easily digitized.
- The evidence suggests that the size of businesses adopting e-commerce does not affect the outcome very much. However, it is apparent that some applications are particular to very large firms.
- The main difficulty in using the Internet in business transactions is the need to first implement organizational changes. Security also is considered a major obstacle for realizing transactions that involve the online transmission of confidential information.
- As far as technology sources are concerned, only very large firms develop e-commerce solutions in-house. Ready-to-use software packages and outsourcing are the main technology sources for smaller firms.
- The business-to-commerce (B-to-C) Latin American market will be characterized by a small number of dominant players using a variety of channels to reach middle- and upper-class consumers.
- Consumers are increasingly demanding products from web sites located in their own countries. In order to succeed in the e-commerce market, multinational Internet service providers should invest in local content and distribution networks.
- The diffusion of the Internet presents many opportunities for social development, notably in the fields of education, health and general information. However, the future growth of e-

¹ Gazeta Mercantil Latino-Americana, 12-18 Feb. 2001 pp.26.

commerce in Brazil may be limited by social and economic factors like income level, income distribution and education.

Introduction

The Brazilian Bank Association (FEBRABAN), which established an electronic data interchange standard (CNAB) as early as 1979, pioneered the use of EDI. High inflation rates encouraged the early adoption of information technologies and data communications. The first network involved 80 financial institutions and their major clients, and was operated by specialized interconnection providers². It took a decade for other industrial sectors to catch up and diffuse EDI among their business networks. In 1991, the National Transport Association established a sector standard followed by 130 road transportation companies. One year later, the automobile industry launched the RND standard linking 600 firms along the supply chain. From 1993, further sector initiatives were based on the United Nation's standard EDIFACT. This enabled the diffusion of EDI networks on a cross-sector basis. In 1996, the long distance phone operator Embratel initiated the first practical experiences of online transactions using the Internet. Since then, e-commerce began moving from EDI to the Internet as web-based systems became more secure.

The process of Internet development in Brazil was somewhat similar to the NSFNet program in the United States. In the late 1980s, the Ministry of Science and Technology established a consortium—National Research Network (RNP)—to coordinate the deployment of a national backbone. It began to operate on an experimental basis in 1991, and was restricted to academic users. RNP helped to establish points-of-presence (POP) in major Brazilian universities by providing the required expertise and equipment. In 1995, RNP launched a new, fully operational backbone with two Mbps linking Brazil and the United States. One year later, the Internet became available to non-academic users and the access services market was opened to private investors. In 1997, seven new backbones were available, including those launched by Universe On-Line, Embratel, Banco Rural, Unisys, Global One and SBT. More than 100 firms now operate in the data communication market, boosting investment and creating competitive alternatives to link large users and Internet service providers (ISP) through private access lines.

As elsewhere in the Americas, the diffusion of electronic commerce has been growing fast in Brazil. The virtuous circle, generated by strong network externalities associated with the Internet, created a surge in the estimated number of users. Internet active users range, according to different sources, from four to six million. Brazil is the largest Internet user in Latin America, with an estimated share varying from one-third to one-half of total users. It can be noted that statistics on e-commerce are not completely precise, since the methodologies adopted differ widely.

In Brazilian businesses, expectations of e-commerce are high. Thousands of new start-up dot.com firms are striking to get financial resources to enter the market, despite the failures of NASDAQ. In almost all sectors, large businesses are now creating web-based services. The population's attitude towards the Internet is also quite positive. Computers are the second most

² Interchange and Proceda.

desired item after cars, according to a survey by the Instituto Brasileiro de Opiniao Publica e Estatistica. The Internet is everywhere in the media, as it becomes a major communication tool. Another Internet promoter firm—I-best—estimates that one-third of Internet users in Brazil have already bought products and services online. Online consumers are typically from the middle and upper classes. According to IBGE³, families in the upper ten percent income group own 60 percent of all domestic computers.

There are some promising public initiatives being established to diffuse the Internet in the low-income population, including the Information Society program. Most of the resources will come from FUST, a “universalization fund” based on a one percent tax on telecommunication services. The fund will contribute to the reduction of the digital divide by implementing a range of diffusion policies. This includes equipping public schools, hospitals and social institutions with computers and Internet facilities. A “popular computer,” a network computer operating in connection with local or remote servers, eventually using free software, was designed locally under the program’s specifications with a target price of US\$ 300, in an attempt to make the Internet affordable to the lower income population. A special low-tax financial scheme is being put together to sell millions of these Internet computers to micro and small firms and domestic users.

National Environment

Macroeconomic policy changes

Since the beginning of the 1990s, Brazilian markets for goods and services have become increasingly liberalized. Tariff and non-tariff barriers have been lowered. Inflation rates declined from three digits in 1993 to one in 2000, as a result of the Plan Real, a macroeconomic stabilization plan. Restrictions on foreign direct investment that existed in sectors like banking, public services and mining have been relaxed. In most policy issues, Brazil followed regional trends and principles established by the so-called “Washington Consensus.” The results of a decade of economic liberalization may be summarized as:

- A sharp increase in foreign investment alongside a process of industrial restructuring and concentration;
- Import liberalization and reduction of both tariff and non-tariff barriers;
- Regulatory changes aimed at introducing competition in services and creating a more liberal environment for investment, funds transfer and price setting;
- Adherence to major international agreements on trade (World Trade Organization) and intellectual property (TRIPS); and
- Strengthening of the Mercosur trade zone, thus creating a sub-regional free market linking Argentina, Brazil, Paraguay and Uruguay.

The impact of these structural changes on the development of e-commerce has been mainly positive. The globalization of most economic sectors increased the demand for telecommunications services, especially B-to-B e-commerce. The Brazilian manufacturing

³ Instituto Brasileiro de Geografia e Estatísticas. Pesquisa Nacional de Amostra por Domicílio (PNAD).

industry became more integrated into the international value chain. Within Mercosur, Brazil reinforced its role as a regional production base for global manufacturing and service firms, which are usually information intensive.

Population and Demographics

With 171 million inhabitants in 2001, Brazil is the fifth most populated country in the world. More than 80 percent of its population is living in cities, ten of which have more than one million inhabitants. The population is predominantly young, with 30 percent of the population under 15 years of age, and 49 percent aged 24 or younger. These factors may play a positive role in Internet diffusion.

TABLE 1
Demographic Indicators for Brazil

Indicator	1998	1999	2001
Population (1,000)	165,873	168,066	171,636 ^a
Annual population growth (%)	1.33		
Urban population (%)	80.14		
Number of households (1,000)	42,600	46,306 ^b	
Population per square km	19.61	19.35	19.76
Population under 15 years of age (%)	30.14		
Population over 65 years of age (%)	4.85		
Average persons per household	3.89	3.4 ^c	

Source: WDI 2000, IBGE 2001, ITU Yearbook.

^aIBGE estimate for April 2001.

^bPNAD 1999 (www.ibge.gov.br/ibge/estatistica/populacao/trabalho).

^cIBGE Sintese de indicadores sociais.

In comparative terms, Brazil is second to the US in population in the Americas. Demographic indicators, such as urban population and age group populations, are commensurate with the Americas average, as shown in Table 2, below.

TABLE 2
Demographic Indicators in the Americas

Demographics	Population 1999 ^a	Urban population (% of total) 1999 ^b	% over age 65 1998 ^c	% under age 15 1998 ^c
Argentina	34,770,000	89.60	9.54	28.16
Brazil	155,820,000	80.72	4.85	30.14
Canada	29,353,900	77.02	12.34	19.49
Chile	14,275,000	85.44	6.90	28.79
Mexico	93,769,088	74.20	4.42	34.12
United States	263,039,008	76.98	12.27	21.87
Venezuela	21,640,000	86.62	4.25	34.90
Latin America ^d	340,655,061	80.43	5.28	31.33
OECD ^e	1,107,844,550	77.28	12.62	20.74

^aSource: International Telecommunication Union, *World Telecommunication Indicators*. Geneva: International Telecommunication Union, March 2001. The data for population are mid-year estimates.

^bSource: World Bank Group, WDI Data Query located at <http://www.devdata.worldbank.org/data-query/>. WDI definition: urban population is the midyear population of areas defined as urban in each country and reported to the United Nations. It is measured as a percentage of the total population.

^cSource: World Bank, *World Development Indicators CD-ROM 2000*.

^dOnly countries included in the 44-country sample are used in the classification. Latin America consists of the following countries: Argentina, Brazil, Chile, Mexico and Venezuela.

^eOnly countries included in the 44-country sample are used in the classification. OECD consists of the following countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Economy and Wealth

Economic growth

The Brazilian economy has been growing at a relatively slow pace as compared to its historical growth rates. Inflation control became the highest priority in economic policy. At least four classes of anti-inflationary policies were adopted under a program called Plan Real. One class was intended to keep a flexible, but relatively stable and controlled exchange rate. This policy, however, had to be changed in 1999 due to “speculative attacks” on the overvalued Real. The second class was a tight monetary control based on very high interest rates and cuts in government expenses. The third was the widespread reduction of import tariffs. This policy was intended to increase the supply of goods and boost competition in the domestic market. And finally, the fourth policy was privatization, aiming at attracting foreign investment and reducing public deficits.

These policies bore fruit as far as inflation control is concerned, but were detrimental to economic growth. From 1995 to 1999, average GDP growth was 2.07 percent a year, a level insufficient to promote employment growth. Apparently, the Brazilian economy is caught in a trade-off between economic growth and inflation control. Foreign debt increased in the initial years of the Plan Real, due to high interest rates and account deficits, but has stabilized in the last three years. Total public debt (internal and foreign) represents 50 percent of the GDP. The Balance of Services explains most of the current account deficit. Some of these resources are obtained by direct foreign investment. However, the peak of FDI has already passed on, since

privatization programs are mostly over. The balance must be obtained as loans in the international money market.

According to a BNDES (National Development Bank) report⁴, between 1988 to 1997, Brazilian exports rose from US\$ 33.8 billion to US\$ 53 billion, an increase of 57 percent, corresponding to average annual growth of 4.6 percent⁵. During the same period, imports quadrupled, growing by an average of 15.4 percent to reach US\$ 61.3 billion. This asymmetry in the growth rate led to an inversion in the sign of the trade balance—a surplus of US\$ 19.2 billion in 1988 became a deficit of US\$ 6.7 billion in 1997.

TABLE 3
Brazilian Foreign Account

	1996	1997	1998	1999	2000
Balance of Trade - FOB	-5,599	-6,748	-6,604	-1,260	- 698
Balance of Services (net)	-20,443	-26,278	-28,800	-25,829	-25,706
Registered Foreign Debt		167,760	220,350	219,196	215,415

Source: Boletim do Banco Central do Brasil, April 2001.

Government officials, on the other hand, believe that inflation control and deregulation were necessary conditions to promote economic growth. They believe that Brazil now has the fundamental institutional and market conditions to enter into a prosperity phase.

Income distribution and unemployment

In terms of wealth and income distribution, Brazil ranks third in the Americas in GDP value. However, in per capita terms, Brazil falls behind the top five wealthiest countries in Latin America. Also, it presents one of the worst income distributions in the Americas. As Table 4 shows, while the share of income of the richest 20 percent of the population was 63.8 percent, the poorest 20 percent earned only 2.5 percent.

⁴ Brazilian Trade Liberalization and Integration in the 1990s, by André Averbug (available at www.bndes.gov.br).

⁵ We comment separately on the period to 1997 and the year 1998, due to the Asian crisis that began in October of the former year, and that caused a wave of devaluations of currencies in that region, affecting Brazil's trade balance in two ways: by reducing the purchasing power (imports) of Asian economies, and by making their products more competitive in the international market.

TABLE 4
Wealth Indicators in the Americas

Wealth	GDP, 1999(US\$ billions) ^a	GDP, per capita, 1999 ^a (US\$)	Share of income or consumption, richest 20% 1987-1998 ^b (%)	Share of income or consumption, poorest 20% 1987-1998 ^b (%)
Argentina	282.77	7,730.78	n.a.	n.a.
Brazil	530.86	3,160.11	63.80	2.50
Canada	642.89	21,083.01	39.30	7.50
Chile	67.47	4,492.30	61.00	3.50
Mexico	483.56	4,966.42	58.20	3.60
United States	9,299.20	34,101.60	46.40	5.20
Venezuela	102.22	4,312.01	53.10	3.70
Latin America ^c	1,466.88	4,306.04	59.03	3.33
OECD ^d	24,893.86	22,470.91	40.19	7.71

^aSource: International Telecommunication Union, World Telecommunication Indicators. Geneva: International Telecommunication Union, March 2001. ITU definition: the data are current price data in national currency converted to United States dollars by applying the average annual exchange rate (from the International Monetary Fund, IMF) to the figure reported in national currency. GDP per capita is calculated by dividing GDP in US dollars by the mid-year estimate of population obtained from the United Nations.

^bSource: United Nations Development Programme, Human Development Report 2000. New York & Oxford: Oxford University Press, pp. 169-172. Dates for the data vary by country from 1987 to 1998.

^cSee Table 2.

^dSee Table 2.

Unfortunately, data on GDP varies according to the source. While the International Telecommunication Union's (ITU) 1999 GDP estimate is US\$ 530,860 million, the World Bank's estimate is higher at US\$ 760,345 million. The ITU figure is closest to the Brazilian Central Bank estimate.

TABLE 5
Brazilian Economy and Wealth Indicators

Indicator	1992	1998	1999
GDP (US\$ billion) ^a		778.21	760.34
GDP per capita (US\$) ^a		4691.58	
Average income (in minimum salaries) of bottom 40% of population ^b	0.7	n.a	0.98
Average income (in minimum salaries) ^c of top 10% of population ^b	13.33	n.a	18.44
Wealth distribution (Gini coefficient)	0.571 ^d	n.a	0.567
Population below poverty line ^e (%)	25.9 ^d	n.a	20.1

^aSource: World Bank, World Development Indicators CD-ROM 2000.

^bSource: IBGE.

^cMinimum salary (from May 2001): R\$ 180 roughly equivalent to \$US 90.

^dData for 1992.

^eDefined as per capita income of less than half minimum salary (\$US 45).

As far as income distribution is concerned, the data provided by IBGE (PNAD) shows that while it is true that the poor became less poor in the last decade by increasing their absolute income, it is also true that the income distribution did not change much. From the comparison between 1992 and 1999 we conclude that:

- The bottom 40 percent of workers increased their income by 40 percent, while the top one percent increased their income by 38 percent;
- More than five percent of the population jumped up the poverty line;
- The Gini coefficient remained stable, declining slightly from 0.571 to 0.567 (the closer to one, the more unequal the income distribution); and
- The top one percent of workers kept 13.1 percent of their total salaries while the bottom 40 percent of workers also kept 14 percent of their total share.

The process of development in the 1990s created some opportunities for real salary increases, but changing income distribution is a much harder task. The job market is increasingly demanding a highly qualified workforce to operate in the most dynamic fields of the economy. Since qualified people are in short supply in fast growing industries, the salary gap between the richest and the poorest workers remains wide open.

Despite unbalanced income distribution and regional economic and social differences, Brazil's relatively large middle- and upper-class market segments encourage private investment in e-commerce. Per capita income of the top 20 percent of the population (about 34 million people) is about US\$ 15,000 a year, equivalent to many European countries. At the same time, the bottom 40 percent of the population survives with an average per capita income of US\$ 1,000. For its unbalanced income distribution, Brazil was nicknamed "Belindia" by some economists for combining an upper class with a consumption level similar to Belgium, and a lower class similar to India.

Education is usually distinguished as a tool for improving income distribution. The higher the qualification of the worker, the higher the salary. By all indicators, Brazil is increasing school enrollment and literacy. However, the impact of educational levels on income distribution is not yet visible.

The unemployment rate (9 percent) is in level terms with the Latin American average. However, as in other parts of the continent, there is a higher percentage of the population working informally without social security coverage.

TABLE 6
Unemployment, Inflation and Economic Growth in the Americas

Economy	Unemployment Rate, 1999 ^a	Inflation, Consumer Prices, (annual %)1998 ^b	Average GDP Growth, 1995-1999 ^c
Argentina	12.8 ^d	0.92	2.24
Brazil	9.0 ^d	3.20	2.07
Canada	7.6	0.99	2.76
Chile	7.2 ^d	5.11	5.60
Mexico	1.7	15.93	2.79
United States	4.2	1.55	4.17
Venezuela	14.9	35.78	0.61
Latin America ^e	9.1	12.19	2.66
OECD ^f	7.1	6.60	3.22

^aSource: International Labor Organization, LABORSTA (<http://www.laborsta.ilo.org>), Table 3A.

^bSource: World Bank, World Development Indicators CD-Rom 2000. WDI definition: *Inflation* as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specific intervals, such as yearly (the Laspeyres formula is generally used).

^cSource: World Bank Group, WDI Data Query located at <http://www.devdata.worldbank.org/data-query/>. WDI definition: *Annual percentage growth rate of GDP* at market prices based on constant local currency. Aggregates are based on constant 1995 U.S. dollars.

^dData is for 1998.

^eSee Table 2.

^fSee Table 2.

Sectoral distribution of employment and GNP

As elsewhere in the Americas, the Brazilian sector of distribution of employment shows an increasing role of the services sector. About 55 percent of the labor force is now working in services. Employment in manufacturing represents about 12 percent, having declined in the last decade due to productivity growth (estimated at 5 percent a year in the 1990s) and to the process of re-specialization, which followed the openness for foreign trade and investment. Agriculture is one of the most competitive economic sectors, accounting for more than 30 percent of Brazilian exports. As in manufacturing, employment in agriculture is declining due to mechanization and productivity growth, but it still provides about one-quarter of total employment.

TABLE 7
Sectoral Distribution of Employment, 1995-1997

Sector	1995 (%)	1996 (%)	1997 (%)
Agriculture	26.07	24.35	24.19
Industrial	19.59	19.9	20.0
Manufacturing	12.28	12.38	12.27
Service	54.34	55.75	55.81
Trade, restaurants and hotels	13.09	13.36	13.3
Transport, storage, communication	3.65	3.76	3.98
Financing, insurance real estate, business services	1.92	1.93	1.84
Community, social and personal services	35.68	36.71	36.69

Source: ILO, Table 2B, LABORSTA (www.ilo.org) 2000.

TABLE 8
Sector Distribution of GDP, 1995

Sector	1995 (%)
Agriculture, hunting, forestry & fishing	13.63
Mining and quarrying	1.17
Manufacturing	24.72
Electricity, gas and water	2.83
Construction	9.01
Wholesale and retail trade and restaurants and hotels	7.59
Transport, storage and communication	6.13
Financing, insurance, real estate and business services	20.09
Community, social and personal services	20.82

Source: UN National Accounts, 1999.

Human Resources

By all indicators, education levels increased substantially in the last decade. These include literacy and enrollment in all educational levels. By the turn of the century, primary education was almost universalized (95.7 percent) and 78.5 percent of the secondary education aged population was already enrolled, compared to less than 60 percent in 1992. Secondary education is usually considered a necessary requirement for information technology uses. A higher level of education facilitates Internet diffusion.

TABLE 9
Education Indicators

Indicator	1992	1998	1999
Adult literacy (% over age 15 who can read and write)	82.8	84.50	86.7
Functional illiteracy (% of people with less than 4 years of study)	36.9	-	29.4
Primary education (% of enrollment of children from 7 to 14 years of age)	86.6	-	95.7
Secondary education (% of enrollment from 15 to 17 years)	59.7	61.5	78.5
Adult education % of enrollment from 20 to 24 years of age	16.9	-	25.5
Tertiary education % of tertiary enrollment of age group	-	15	-

Source: UNDP Human Development Report (2000) for 1998 and IBGE (2001) for 1992 and 1999.

In comparative terms, Brazil presents an absolute high availability of software professionals, as compared to other developing countries, as table 10 shows.

TABLE 10**Human Resource Indicators**

Country	Mexico	Brazil	Korea	Taiwan	Malaysia
Population (millions) ^a	96.5	159	44.9	21	20.1
Adult literacy (%) ^a	90	83	98	n.a.	84
Mean years of education ^b	4.7	3.9	8.8	n.a.	n.a.
Secondary enrollment ratio (%) ^a	58	45	101	n.a.	57
Masters and Ph.D. in science and engineering awarded, 1990 ^c	5916	n.a.	7070	4011	n.a.
R&D scientists and technicians per 1,000 people ^a	0.3	0.2	2.9	n.a.	0.2
Number of software professionals ^d	321,482	549,840	340,168	140,070	53,389

a. UNDP, 1998.

b. UNDP, 1993.

c. Dedrick and Kraemer, 1998. For Mexico, CONACyT, 1995, *Indicators of Scientific and Technological Activities*.d. Jones, 1993, *Software Productivity and Quality Today – The Worldwide Perspective*. Data updated in 1995 in correspondence to authors.

In 1998 there were 680 undergraduate courses in information technology related subjects. About 22,000 students received their degree a year before, while nearly 200,000 students were registered. It can be noted, however, that other students from areas like applied sciences and mathematics eventually became IT professionals.

TABLE 11**Graduates and Enrollment in IT University-level Courses**

Area	Courses	Graduates	Enrollment
	1998	1997	04/30/98
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
Others (IT related)	61	1,167	9,168
Total	680	22,283	197,892

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

In 2000, about 3,000 students were undertaking post-graduate courses in computer sciences, of which 20 percent were awarded a doctorate degree.

TABLE 12**Post-Graduates in Computer Sciences, 2000**

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

Source: SocInfo, based on data provided by Brazilian Computer Society (2000).

According to IDC⁶, until 2004 there will be 403,000 job vacancies in Brazil in the area of networks. It estimates that only 155,000 people would be qualified to fill this demand.

Industry Structure

The structure of Brazilian business is shown in Table 13 below. While micro and small firms (MSFs) represent 99 percent of all business, they provide only 35 percent of total employment. Large firms, in contrast, employ 45 percent of the total registered workforce. However, taking into account that informal workers, who represent more than one half of total Brazilian workers, are mostly in small firms, the balance could, in fact, be quite different.

TABLE 13
Employment by Size of Firm, 1999

Size of firms	%, 1999
Distribution of Employment by Size of firms	
Small: under 100 employees	35.64
Medium: 100-499 employees	18.54
Large: 500 or more employees	45.78
Distribution of Business by Size of firms	
Small: under 100 employees	99.27
Medium: 100-499 employees	0.59
Large: 500 or more employees	0.14

Source: IBGE.

In the last decade, 2.7 million micro enterprises (less than ten employees) were established, according to the Support Service for Micro and Small Firms (SEBRAE). The micro and small firms are becoming increasingly important as the new information technology paradigm diffuses.

While in principle medium and large firms are more equipped and have more qualified human resources than small firms do, firm size does not necessarily define e-commerce adoption rates. In many cases, small firms can be more flexible to introduce organizational changes than larger bureaucratic firms. In our survey (Tigre, 2000), my colleagues and I show that small firms can operate more easily in market niches, which present high innovation rates due to risk taking behaviors and better motivation of the workforce. One of the main findings concerning firms' size is that the Internet opens opportunities to small firms to overcome barriers to market entry and access to information. The surveyed micro and small firms use the web more intensely in relative terms than larger firms in activities like procurement, access to information, technical assistance and customer service. The Internet facilitates communications with suppliers and clients thus favoring better supply chain integration, more value added, and a more efficient operational management.

Of course, their use of e-commerce is small-scale relative to larger firms. MSFs are heterogeneous in terms of capabilities, financial resources and access to IT. Government programs, such as the Internet Society, widely diffuse Internet access in small retailing businesses. The program coordinators believe that grocery stores, newsagents, lottery outlets and other small businesses could become Internet intermediaries to the low-income population.

⁶ Extracted from UFRJ online (www.ufrj.br), April 2001.

Instead of shopping online directly, a customer can order goods through a next-door shop. This strategy may be important for e-commerce diffusion in developing countries.

Infrastructure

Telecommunications infrastructure

Since 1998, when the Brazilian telecommunications infrastructure was privatized and the market re-regulated, telecom services have become one of the most attractive sectors for investments. In 1999, telecom investments as a percentage of the GDP (1.25 percent) were the highest in the Americas. ANATEL estimates that total investment in telecom infrastructure reached US\$ 9 billion in 2000, of which 77 percent was in fixed mainlines and 23 percent in mobile lines. In 2001, the total investment forecast is US\$ 13 billion. As a consequence, the availability of telecom services has increased dramatically in a wide range of services. In the last four years, fixed line teledensity doubled while cellular subscribers quintupled. In per capita terms, Brazil is now on track with the Latin American average, both in fixed line and cellular phones.

In late 2000, teledensity was about 23 fixed lines per 100 people, 15.5 percent of which were connected to the Internet. However, Internet distribution is extremely uneven in regional terms. The quality of service is still poor, since in many areas connections are dropped with noticeable frequency and are somewhat disruptive. A common problem is the stealing of copper cables, especially in rural areas.

TABLE 14
Teledensity Evolution in Brazil, 1995-2000

Teledensity per 1,000 people	1995	1996	1997	1998	1999	2000
Main phone lines	85.12	95.69	106.57	120.51	148.7	232 ^a
Cellular subscribers	8.25	15.82	27.52	46.8	89.5	141 ^a

Source: ITU Yearbook of Statistics, 2000.

^a*Source:* ANATEL.

The experience of most developed countries shows that price and availability of telecommunications infrastructure are clearly associated with competition and market access. Along with new regulation, technology change plays a key role in shaping new market structures in telecommunications services. Technology convergence in different media and forms of transmission opens new opportunities both for competition and market concentration. On the one hand, it boosts competition by providing alternatives to data, voice and image transmission at higher speeds and with better performance. By choosing among cable, radio, and satellite connections, eventually provided by different service firms, users can bargain for better prices and services. Technology and regulatory reform eliminated most natural monopolies, lifting entry barriers and enabling a multiplicity of operators to supply these services.

Liberalization of the public telecommunication markets in Brazil has not only enabled new players to enter the market, but has also encouraged the development of new ways of buying and selling. New carriers are bypassing the established method of connecting calls between telecommunication carriers in major cities. There are now new alternatives for trading transmission capacities and alternative rates for leasing circuits. These include discount prices from the telecommunications carriers, which face competition from new market entrants, lower market prices for leased capacity, and wholesale prices from infrastructure providers with excess capacity.

In Brazil, competition is already present in cellular phones, international calls and value-added services. However, in fixed mainlines and long distance data communications, competition has proven to be more difficult to take off. The reasons are both technical and economical. Natural monopoly seems to work in basic infrastructure services, and sunk costs provide overwhelming competitive advantages to existing firms. Fixed line telecommunications services fall into this category in most countries in the world. In Brazil, the state-owned telecommunication holding company (TELEBRAS) was split into three different regional companies and one long-distance company. These firms' access to the final user is a key competitive advantage not easy to replicate by new entrants.

The newly privatized operators benefited from a "natural monopoly," granted by the acquisition of existing network capacity. The price paid for acquiring the public communication operators (PTOs) in privatization bids were, in some cases, below the reproduction cost—the cost necessary to duplicate the capacity—since the risks, either technical, political and/or financial, of investing in emerging markets were considered high. Consequently, new competitors face entry barriers, since they have to pay a high, monopoly cost to interconnect to local backbones.

The so-called "mirror firms"—authorized telecommunication public service providers—have pursued a new technology strategy combining fixed and wireless through WLL (wireless local loop). It is cheaper to install, since it is based on radio, does not require a cable network, and is considered a short-cut alternative to wired networks. But the WLL technology has the disadvantage of not being as mobile as cellular phones. Also, it is not suitable for the Internet, a fact that severely limits its market growth potential. Brazil has now the largest WLL installed base in the world (600,000 terminals), but unless further technological efforts to solve interference and other technical problems are undertaken by equipment and systems suppliers, this technology could be pushed to small market niches, such as remote villages.

Cable TV is another technology that has not yet become a major Internet infrastructure. Unlike Argentina, Canada and the US, where cable TV is widespread in urban residences, Brazil has only 11.5 subscribers per 1,000 households. Globo, the largest Brazilian communication group, provides Internet services through cable TV in a few large cities. Competitors in the paid-TV market use satellite and other wireless transmission systems.

TABLE 15
Telecommunication Indicators

Telecommunications infrastructure	Telecom investment of GDP, 1999 ^a (%)	Main phone lines per 1,000 population 1999 ^a	Cell phone subscribers per 1,000 population, 1999 ^a	Digital phone lines, 1999 ^a (%)	CATV subscribers per 1,000 population, 1999 ^a
Argentina	0.61	201.13	121.22	100.0	163.05 ^b
Brazil	1.25	148.73	89.49	84.6	11.50
Canada	0.65	654.46	225.49	99.5 ^b	277.70
Chile	1.04	206.99	150.52	100.0	43.68
Mexico	0.84	112.23	79.41	99.6	20.38
United States	0.28	673.00	315.55	91.6	251.34
Venezuela	1.02	109.08	143.43	68.5	25.82 ^b
Latin America ^c	0.97	143.73	96.46	90.4	32.56
OECD ^d	0.54	508.28	325.44	93.8	140.02

^aSource: International Telecommunication Union, *World Telecommunication Indicators*. Geneva: International Telecommunication Union, March 2001. ITU definitions: *telecommunications investment* refers to the annual expenditure associated with acquiring ownership of property and plant used for telecommunication services and includes land and buildings; *main telephone lines* refers to telephone lines connecting a customer's equipment (e.g., telephone set, facsimile machine) to the Public Switched Telephone Network (PSTN) and those that 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 that provides access to the PSTN; *digital phone lines* refers to main lines connected to digital exchanges (indicator does not measure the percentage of exchanges that are digital, the percentage of inter-exchange lines that are digital or the percentage of digital network termination points); *CATV subscribers* refers to households that subscribe to a multichannel television service delivered by a fixed-line connection. The per capita values are calculated using the estimated mid-year population value.

^bData from 1998.

^cSee Table 2.

^dSee Table 2.

In some segments of the telecommunications market, especially fixed-lines and cross-national backbones, market mechanisms alone are not sufficient to grant widespread good access to the network, since a large part of the population lacks the required income level to subscribe to individual telephone services. The universalization program sponsored by ANATEL is designed to increase public phone facilities in low-income areas and expand services to small and remote communities. The universalization obligations include areas where telecommunications operators usually do not provide full access because of the reduced size of the market. Also, the telecommunication operators are required to contribute one percent of their total revenues to a universalization fund aimed at providing services to those excluded from the market.

Information technology infrastructure

Since the early 1970s, Brazil has developed capabilities both in production and use of information technologies. Prior to liberalization in the early 1990s, Brazil had a larger and more technologically advanced domestic IT industry, which produced a wide range of systems, peripherals and even components. Despite setbacks, the country is one of the few developing countries with extensive technology capabilities in both hardware and software design and manufacturing.

Mexico and Brazil are the only Latin American countries with a substantial IT hardware production. However, Brazil produces mostly for the internal market and is also a heavy importer. In 2000, account deficits in the electronic balance of payment reached US\$ 6.5 billion, according to the Electrical and Electronics Industry Association. As Table 16 shows, the IT sector represented 2.21 percent of total GDP, a level well above the Latin American average, and inferior only to the US and Canada in the Americas. There are 800,000 computers with permanent Internet connections (hosts). These figures indicate that computer diffusion is high as compared to the country's level of development. However, other per capita indicators, such as computer diffusion—36 PCs per 1,000 persons—fall behind other Latin American countries.

TABLE 16
IT Infrastructure in the Americas

IT Infrastructure	IT GDP, 1999 ^a (%)	PCs per 1,000 persons 1999 ^b	IT Hardware Production, 1999 ^c , (US\$M)	IT Hardware Exports, 1998 ^c , (US\$M)
Argentina	1.10	49.21	n.a.	n.a.
Brazil	2.21	36.31	8,569.60	249.00
Canada	3.81	360.73	3,232.43	4,780.41
Chile	1.64	66.58	n.a.	n.a.
Mexico	0.98	44.16	8,567.50	6,950.00
United States	4.14	517.07	85,085.21	37,967.00
Venezuela	1.48	42.18	235.20	2.00
Latin America ^d	1.51	41.68	17,372.30	7,201.00
OECD ^e	3.09	285.55	221,159.20	169,573.80

^aSource: International Data Corporation, *The 1999 IDC Worldwide Black Book*. Note: IT is defined as “the revenue paid to vendors (including channel mark-ups) for systems, software, and/or services.”

^bSource: International Telecommunication Union, *World Telecommunication Indicators*. Geneva: International Telecommunication Union, March 2001.

^cSource: Reed Electronics Research, *The Yearbook of World Electronics Data, 2000*. Surrey, UK: Reed Electronics Research, 2000.

^d See Table 2.

^e See Table 2.

The Brazilian IT market reached US\$ 18.79 billion in 1999. The large Brazilian market offers opportunities for start-ups to target niche markets at home, as government programs actively support local entrepreneurs through export assistance and incubator programs. According to Dedrick et al (2001), the fact that Brazil had a domestically-owned computer industry before liberalization meant that many professionals gained experience in financing, launching and managing their own companies.

TABLE 17

Brazilian IT market (US\$ millions), 1991-1999

Year	Hardware	Services	Software	Total
1991	5.200	1.600	290	7.090
1992	5.900	1.700	380	7.980
1993	6.100	1.800	490	8.390
1994	7.100	2.100	600	9.800
1995	8.100	2.500	700	11.300
1996	9.000	2.900	810	12.710
1997	10.300	3.300	1.110	14.710
1998	11.700	3.700	1.320	16.720
1999	13.200	4.100	1.490	18.790

Source: ABES – Associação Brasileira das Empresas de Software.

Internet infrastructure

In Brazil, Internet infrastructure is quite heterogeneous. Usually, subscribers in more developed regions have some options between various Internet packages and it is usually possible for users to establish a good dial-up connection to a local ISP. Few urban areas count with higher bandwidth solutions, such as DSL (digital subscriber line) and cable modem access. In “teleports” and newly developed business centers, customers can tailor services to meet different demands for speed, service, security, quality and cost. A competitive and sophisticated web design market exists, incorporating the latest development technology. Table 18 compares Internet indicators in different countries in the Americas.

TABLE 18

Internet Infrastructure in the Americas

Internet infrastructure	Internet hosts per 1,000 population, 1999 ^a	Internet users per 1,000 population, 1999 ^a	Access cost, 40-hours, off-peak, 2000 ^b (US\$)
Argentina	3.90	24.61	n.a.
Brazil	2.66	20.83	n.a.
Canada	54.75	360.73	29.74
Chile	2.68	46.61	n.a.
Mexico	4.16	18.71	25.89
United States	195.00	271.74	35.40
Venezuela	.60	22.15	n.a.
Latin America ^c	3.08	21.86	n.a.
OECD ^c	62.63	180.05	n.a.

^aSource: International Telecommunication Union, World Telecommunication Indicators. Geneva: International Telecommunication Union, March 2001.

Note. ITU definitions: *Internet hosts* refer to the number of computers that are directly connected to the worldwide Internet network (the statistic is based on country code in host address and may not correspond with actual physical location); *Internet users* are an estimate of the number of Internet users.

^bSource: OECD, Working Party on Telecommunication and Information Services Policies, Local Access Pricing and E-Commerce, July, 2000, Table A6. Note: The 40-hours, off-peak refers to 40 one-hour calls with the measurement taken at 20:00.

^c See Table 2.

^d See Table 2.

Competition in leased line provision for business has been introduced in most large urban areas and prices are falling, but are still high. A variety of hardware and software solutions are usually available locally. But, competition is not yet developed in some markets, such as long distance services. The case of Embratel⁷ can well illustrate this argument. It is responsible for 70 to 80 percent of all Brazilian Internet traffic, because its IP network consists of only one, which covers the entire country. Before privatization, it monopolized long distance telecommunications, both domestically and internationally. In January 2001, Embratel charged up to nine times the US price for leasing high-speed circuits to ISPs and other telecommunications service providers (see Table 19). Another international service provider—Intelig, a subsidiary of Sprint—obtained a concession to compete in long distance services, but since it has not yet developed its own nationwide infrastructure, it relies on the Embratel network to link its routers and servers inside Brazil. Facing exorbitant interconnection fees, Sprint has complained to the Brazilian telecommunication regulatory agency ANATEL, which recognized its right to link up to the existing network at fair prices. However, Embratel refuses to comply under the argument that linking IP routers is not a legally recognized form of interconnection and that Intelig must pay full price. Under these conditions, the competitiveness of local e-commerce business is seriously affected, since the cost of basic access to the IP backbone can represent as much as 80 percent of total ADSL services.

TABLE 19
Internet Price Comparison Between the US and Brazil, 2000 (\$US)

Services	US (\$)	Brazil (\$)	Price difference (%)
Fixed line subscription fee ^a	16.00	10.20	- 36.3
Mobile phone (one minute) ^b	0.35	0.23	- 34.0
Pentium 3/800 Mhz/64Mb	924	1,080	+ 17.00
1 Mbps connection to IP network (minimum price) ^c	700	7,200	+ 900
1 Mbps connection to IP network (maximum price) ^c	1,200	7,200	+ 500

Source: Empresas Valor 12-14 January 2001.

^a US subscription is in fact cheaper because it includes all local calls, while in Brazil, an extra pulse is charged for each additional minute exceeding 3 minutes.

^b No limited tariff in the US and average Telesp Celular price in Brazil.

^c UUNet prices in the US and Embratel prices in Brazil.

The situation is considerably better for international links, since there are options to use alternative infrastructures developed by independent international carriers like Global One, Global Crossing and Genuity. These firms are developing their own cable and satellite infrastructures and can provide, in some cases, international telecommunication services, which bypass local PTOs. Also, in segments of the market where, for technical reasons, competition is more easily enhanced, such as mobile cellular phones, ISPs and other value-added services, the prices have already come down.

⁷ Privatized in 1998 and now owned by MCI.

Transport infrastructure

The transport system in Brazil is heavily dependent on roads. Air transportation also plays an increasing role, due to the country's large size. While railways have received little investment in the past four decades, government attention has been directed to integrate the country through roads. This policy is often referred to as a driving force behind the development of the automobile industry. However, since the 1980s the investment in roads faded, as stabilization policies became a priority. Brazil has an extensive road network linking all of the country, except in Amazon where fluvial and air transportation is the only reliable routes. But only 9.7 percent of Brazilian roads are paved, and most lack good maintenance. The concentration of the population in cities will facilitate the delivery of goods ordered online, and in part compensate for the vast distances that separate Brazil's many urban centers.

Financial Resources

Use of credit cards, debit cards and stored value cards

Table 20 reveals that the use of credit cards in Brazil has been growing at a fast pace since the early 1990s. Two factors were key driving forces to the boom—the liberalization of credit card use by Brazilians traveling in foreign countries, and the stabilization of the national currency, which improved the acceptance of credit cards by the retail sector. 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 one billion transactions per year. In 2000, overall purchases by credit cards reached US\$ 26.5 billion, equivalent to seven percent of total private domestic consumption in Brazil.

There is a significant correlation between income level and the use of credit cards. According to a survey conducted by Credicard, about two-thirds (65 percent) of consumers with an income level above US\$ 1,250 a month are credit card holders, compared to only 19 percent of people with an income level between US\$ 150 to US\$ 250. About 34 percent of the Brazilian population 16 years or older living in metropolitan areas with an income level above US\$ 150 a month, hold a credit card.

The use of debit cards was pioneered by Banco do Brasil. Debit card diffusion has been slow, since the system requires a special terminal installed in shops. Also, it does not provide credit.

As far as stored value cards are concerned, there are several scenarios being tested. Metrocard is one of the most advanced and is being used on an experimental basis in the São Paulo transportation system. However, there is not yet a widely accepted stored value card system for general use in Brazil.

TABLE 20

Credit Card Use in Brazil, 1992-2001

Year	Number of credit cards in use (million)	Number of transactions (millions)	Value of transactions (R\$ billions)
1992	7.8	151.6	5.1
1993	8.4	199.9	6.3
1994	11.2	210.3	10.3
1995	14.3	319.0	21.3
1996	17.2	437.1	25.5
1997	19.3	516.7	27.8
1998	22.0	641.2	32.0
1999	23.6	770.0	41.6
2000	27.9	1,038.0	50.4
2001 (Feb)	29.6	-	-

Source: ABECS. www.abecs.org.br/indices.htm.

Venture capital

A report from Latin Venture Partners⁸ says that private equity investment in the Brazilian “new economy” more than tripled to US\$ 3.5 billion in 2000. Despite the slowdown in investment estimated for 2001, Brazil remains the region's bellwether for technology initiatives. Latin Venture says the country will continue to be the primary focus for Internet and other new economy investment because of its lead in e-commerce. The report notes that more than half of Latin America's online e-commerce transactions last year were made in Brazil. Mobile e-commerce, for example, is expected to boom in the next few years, the company says, though current wireless devices are still far from replacing personal computers for Internet access in Brazil. Most investments earmarked for those initiatives will come from outside the country, the report says.

An ongoing research study on venture capital in the Brazilian IT sector⁹ collected a wide range of information about mergers, acquisitions and investments, both from foreign and local capital. It covers the period from January 1999 to May 2001. As Table 21 shows, of 406 transactions that could be classified by type, 144 were the issue of shares to the general public, 108 were acquisitions, and 106 were direct investments by one or more investors. Less than 50 percent of these transactions reached more than US\$ 10 million.

TABLE 21

Venture Capital in the Brazilian IT Sector

Type of Transaction	Number	%
Acquisition	108	26.60
Concession	5	1.23
Merger	9	2.22
Shares Issue	144	35.47
Joint Venture	34	8.37
Investment	106	26.11
Total	406	100.00

Source: Basques, M.F.D (2001).

⁸ www.latinventure.com⁹ Maria Fernanda Diamante Basques. MSc Dissertation, Institute of Economics, UFRJ, 2001.

Table 22 shows sectors of both receivers and investors. While the financial sector is the major investor (about 40 percent of cases), Internet sites are the main receivers (54 percent of cases). It can be noted that investment strategies include horizontal integration (acquisitions in the same sectors), diversification, vertical integration, and portfolio investments.

TABLE 22
Investors and Receivers in Brazilian IT by Sector

Investor by Sector	Receivers →										
	Communications	Equipment and Infrastructure	Finance	Holding internet	IT Services	Not available	ISP	Sites	Telephone Services	Traditional	Total
Investors											
Communications	4	0	0	0	1	0	5	6	0	0	16
Equipment and Infrastructure	2	10	0	0	4	1	4	4	0	0	25
Finance	4	14	3	4	29	5	34	136	4	0	233
Holding internet	0	1	0	0	2	1	0	8	0	0	12
IT Services	1	0	0	0	19	1	1	9	0	0	31
Internet	0	1	0	0	2	0	1	7	0	0	11
Independent	0	0	4	0	2	0	2	10	0	0	18
Not available	1	1	2	2	6	4	9	51	2	0	78
Portfolio	1	0	1	0	1	0	1	5	0	0	9
ISP	0	1	0	0	1	1	15	5	1	0	24
Sites	1	0	4	1	1	0	2	34	0	1	44
Telephone Services	2	1	0	0	2	0	10	2	24	0	41
Traditional	2	1	0	2	0	0	1	45	1	0	52
Total	18	30	14	9	70	13	85	322	32	1	594

Source: Basques, M.F.D (2001).

Business Environment and Readiness

The 1990s witnessed significant changes in Brazil's foreign trade policy. A wide-ranging process of trade liberalization that began during the Collor administration and extended to the government of President Fernando Henrique Cardoso characterized the period. Brazil's commercial integration was based on the model of the so-called "new regionalism," that is characterized most notably by the integration of countries through bilateral and multilateral agreements (free trade zones, customs unions and common markets). The new Foreign Trade Policy abolished most of the non-tariff barriers inherited from the period of import substitution, and reduced import tariffs to a maximum of 35 percent. Within Mercosur, no tariffs are applied.

The liberalization of investment and trade has contributed to e-commerce development in at least four different ways. First, import liberalization facilitated online shopping overseas. Import taxes now average less than 20 percent and goods costing up to US\$ 50 are imported duty-free. Second, previously to liberalization, credit cards were valid in Brazil only. International credit cards are of fundamental importance for e-commerce, since about 90 percent of B-to-C

transactions adopt this form of funds transfer. Third, there are no longer restrictions to foreign direct investment and profit remittance. This has encouraged new foreign ventures, both in e-commerce and associated services. Fourth, liberalization strengthened trade links between local and international supply chains. Consequently, there is an increasing demand for the B-to-B type of e-commerce.

NATIONAL POLICY

Policy Institutions

Ministry of Communications / National Telecommunications Agency (ANATEL)

ANATEL is the agency in charge of telecommunications regulations. It was established in 1998 to conduct the privatization program, set universalization goals, authorize telecommunications services, control tariffs, and enforce the implementation of policies by incumbent service providers. It is an independent agency organized after the United States Federal Communications Commission (FCC) model.

Ministry of planning

The Ministry of Planning coordinates several government actions, including the e-government project. The project includes the implementation of public electronic information and services, management of public Intranets and Extranets, and government procurement. It also promotes investment and business opportunities.

Ministry of science and technology

MCT has been responsible for the development of Internet and IT infrastructure since the 1980s. It coordinates public-private programs like the Information Society and RNP, and is the main financial agency for R&D and post-graduate training.

Ministry of industrial and trade development

The MDIC recently became involved in e-commerce promotion. It established the Executive Committee of Electronic Commerce, aimed at resolving existing technical and legal problems and proposing new policies. The committee has six representatives from the private sector, coming from different industry associations, six representatives from different government agencies, and one from the scientific community.¹⁰ MDIC is also in charge of intellectual property issues through INPI.

¹⁰ The author of this paper is representing the scientific community in the Committee.

Ministry of finance

This agency is responsible for implementing the online taxation system, maintaining the national electronic fund transfer system (through the Central Bank), and proposing legal actions for facilitating fiscal procedures in the net. It has a data processing center (SERPRO), which handles most of the IT services for the federal government.

The table below indicates where each of these agencies plays a role.

TABLE 23
Stakeholders and Issues in E-commerce

Stakeholders	Electronic Signatures	Telecom Regulations	Intellectual Property	Cryptography	Government Purchase	Internet Infrastructure
ANATEL		X				X
Ministry of Industry	X		X			
Ministry of Planning					X	
Ministry of Finance				X	X	
Ministry of S&T						X
Business Associations	X			X		
National Congress	X	X		X		

Enabling policies

Enabling policies are undertaken both by government and independent associations. Two government policies may be distinguished in Brazil as relevant to Internet diffusion:

Program for Information Society

The Information Society Working Group was established in June 1997 to develop a new generation of Internet networks and to diffuse advanced information and communication technologies throughout the country. It is structured in several action lines, each one relying on its own policy instruments and financial resources. It may be considered an enabling element for e-commerce, since the program is becoming more focused on the diffusion of Internet and e-commerce in societal segments that are not likely to become IT users through market mechanisms alone. These include micro and small firms, low-income consumers, public schools, and health centers. The program is developed in partnership with government agencies, NGOs and private firms, and gets financial resources from FUST (Telecommunications Universalization Fund). In 2001, FUST's average monthly receipts were US\$ 13 million¹¹.

The first objective was to make available an affordable computer, since equipment and software costs are major barriers to the diffusion of the Internet in most segments of Brazilian society. Universities and computer manufacturing firms designed several versions of a "popular

¹¹ R\$ 28.9 millions, www.ANATEL.gov.br

computer” with a target price of US\$ 300. The design specifications were based on the network computer concept, using upgradeable minimum hardware¹², operating in connection with local or remote servers. For software there are versions using either free operating systems (LINUX 6.0) or open codes based on GNU oriented towards the Internet environment (using Netscape Navigator 4.76 browser). The advantage of using free software is twofold. First, it costs less than US\$ 5 rather than US\$ 50 for Windows. Second, users will not be exposed to frequent changes in versions and thus not obliged to buy new software and hardware, as happens to proprietary software users. However, free software has the disadvantages of poor technical support and low availability of applications. The software to be used in these popular computers has yet to be decided. Microsoft is reacting by offering discounts on licensing fees.

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 Oi00 service. It enables Internet users to pay local call fees when dialing long distance to any ISP within the country.

Another goal is to develop a financial package to support the sale of millions of these systems to small business and domestic users. The target monthly payment is US\$ 15, including hardware, software and an Internet service provider. The program also aims to create economies of scale in hardware manufacturing in order to make the system competitive in the export market.

However, the universalization of Internet access in Brazil cannot rely solely on individual PCs. While a potential demand for e-commerce exists even in lower segments of urban society, poverty is a barrier for diffusion in many domestic households. The Information Society Program intends to fill this demand by introducing the Internet in small businesses, such as newsstands, post offices, and lottery and convenience stores. These shops 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.

Electronic government

The federal government has played a role as a pioneer Internet user in Brazil. In addition to information, services and procurement, there are demonstration projects designed to stimulate the use of the Internet in business and society. A recent initiative is the program [Br@gov](#), which aims to boost Internet use in three main areas:

¹² Microprocessor 64 Mb RAM, flashdisk 4 Mb, CD-ROM 24x, modem 56k, network board Ethernet 10/100, keyboard, mouse, sound box. Prices range from US\$ 199 (without monitor) to \$299 (with monitor). Source: O GLOBO, May 21, Informática, page 3.

- **Information and Services:** The goals of this electronic government project are to provide universal access to public services and more transparency to government actions, achieve more efficiency in the use of information technology, and integrate the communications networks of public administration. Until December 2002, all public services that could be provided electronically would be available on the net. A showcase is the national elections, which are almost fully electronic. In the 2000 county elections, which involved more than 80 million voters, the results were known a few hours after the polls closed;
- **Procurement:** Federal and state government procurement through the Internet is saving millions and supporting transparency in public goods and services supply management. The federal government estimates that US\$ 900 million in “common goods and services,” i.e., those which can be objectively defined, will be bought in 2001 through reverse auctions. It expects a cost reduction of 20 percent (US\$ 180 million) due both to more bargaining power and the reduction of “intermediaries.” The cost reduction estimate is based on tests conducted in December 2000. The federal government has more than 4,000 excess purchase points, which denotes mismanagement, but it hopes to better control its purchases through the centralized e-procurement site www.compras.net.gov.br. There are still legal problems concerning government purchases through the Internet. In 2000, the government issued a provisional measure (# 2018), which makes the process legal until a definitive law is passed in Congress; and
- **Taxes:** The technologies underlying e-commerce offer significant opportunities for improved taxpayer services. The Brazilian tax system is progressively moving online. In 2001, 90 percent of the income tax declarations received by the Federal Tax Authority were handled through the Internet. Taxpayers either send forms directly from a domestic computer or take a floppy disk to a nearby bank or post office and transmit from specially installed terminals. Several other taxes and contributions are migrating to the Internet, but some state taxes have yet to be regulated to legalize operations.

TABLE 24

Evolution of Income Tax Declarations Handled Through the Internet

Year	Number of declarations (1,000)	Percentage of total declarations
1997	706	6
1998	4,422	30
1999	11,296	62
2000	13,500	90

Source: MF/Receita Federal.

Another important government initiative is a Central Bank-managed, online national money transfer service. The system is a substitute for checks, since it provides immediate transfer (as opposed to the three days required for check compensation) and is secured against lack of funds and fraud.

Private and community initiatives

Independent committees working in cooperation with government, universities and business direct some Internet diffusion programs. These include:

- **National Research Network:** RNP¹³ is now run by academics and business associations. The program was designed in 1989 by the Ministry of Science and Technology and was responsible for Internet introduction in Brazil. It provides high-speed backbones to universities, hospitals and other social institutions by wholesale purchasing and reselling of spare capacity available from private infrastructure providers. Since private institutions are now well established in Internet services, RNP is now moving to social and scientific organizations through the implementation of the Internet II project. The aim 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 contribute to the improvement of the private networks, since it will divert most of the university and research centers' Internet traffic from existing networks. Also, it may contribute to the development of new applications and help these institutions to use e-commerce for their management and procurement activities; and
- **SOFTEX:** The *Program to the Software Sector* is now an independent society to encourage the development of software firms. It gives financial support for software development and marketing activities, as well as acquisition of equipment and training. The program is funded by a credit line from the National Development Bank (BNDES). SOFTEX also runs an incubator program for start-ups. By the end of 2000, 155 new ventures were established under the GENESIS program.

E-commerce Policy

There is not yet specific legislation covering e-commerce. The rules governing online sales are the same as those applied to the "Code of Customers Defense." However, there is a project in the legislature – Project of Law number 1589/99 – to regulate electronic commerce and the authentication of digital signatures. The project has been approved by the Commission for Science and Technology and is waiting for plenary decision. The proposed law includes¹⁴:

- Certification of electronic signatures by a public notary and their annexation to electronic documents;
- The use of a cryptographic system based on a public or asymmetric key. The codified message will be received using a private key de-codified by the correspondent public key; and
- The provision that foreign certified documents would only be accepted if Brazilian contracts receive the same treatment overseas.

¹³ Rede Nacional de Pesquisas in Portuguese.

¹⁴CFF, Veirano & Advogados Associados. *Gazeta Mercantil Latino Americana*, 25th Sept to 1st October 2000, page 18.

National legislation is vital to the development of e-commerce, especially in free-trade areas like Mercosur. In Argentina, the Decree n. 427/98 is already in force, regulating digital signatures and cryptographic systems based on an asymmetric key. However, its application is restricted to the public administration.

Within Brazilian federal government agencies, official document exchange is already done electronically using a Public Key Infrastructure. The 3585 and 3587 presidential decrees established that starting January 2001, official documents for normative acts must be transmitted electronically.

Revenue authorities have an important role to play in realizing the full potential of e-commerce. Their twin objectives in this respect are to provide a fiscal environment within which e-commerce can flourish, while also ensuring that e-commerce does not undermine the ability of government to raise the revenues required to finance public services for its citizens (*OECD 1999, 'Taxation Principles and E-commerce'*).

The issue of e-commerce taxation depends on international agreements rather than local decisions. It is very much dominated by the OECD countries. The World Trade Organization Secretariat is proposing a widespread liberalization of trade in services. Within WTO, developing countries have raised concerns about possible tariff revenue implications resulting from a ban on customs duties on electronic transmissions. Any decisions that Brazil may take on modifying its tax legislation to accommodate e-commerce will have to take into account the significant role of tax and tariff revenues in its national budget, as well as bilateral concessions in other trade areas. Brazil is reacting against proposals for an origin-based consumption tax for intangibles (e-services), which would be collected from the supplier and not from the consumer. Brazil as a net importer of e-commerce would not benefit from an origin-based tax, since it may erode the tax base system. Developing countries usually rely more on import tariffs and consumption taxes rather than income taxes. In the case of Brazil, tariffs are not relevant, but unlike developed countries, consumption taxes are more important than income taxes.

In short, the needs and problems posed by leading countries and international business should not necessarily dictate the policies in less developed countries. Brazil must follow the international debates closely and adjust its own legislation to accommodate e-commerce and preserve tax revenues. This could include adaptation to OECD agreements, harmonization at the international level, and entering into bilateral treaties to attract e-business. Unresolved conflicts over transborder taxation may be an inhibiting factor for e-commerce. The lack of international agreements does not yet affect e-commerce, but it may affect future development in Brazil.

E-COMMERCE DIFFUSION

Diffusion Rates

As elsewhere in the Americas, the diffusion of e-commerce in Brazil has increased rapidly in the last two years. However, statistics on Internet diffusion differ widely, according to different sources. A basic distinction that can explain these differences is that between active and eventual users. An active user is defined as an individual who has accessed the Internet during the last

month. The wider definition may eventually double the number of users. Table 25 shows the evolution of active Internet users in Brazil.

TABLE 25
Evolution of Internet Diffusion in Brazil

Indicator	Unit	1995	1996	1997	1998	1999	2000
Internet users overall ^a	Total 1000	170	740	1,310	2,500	3,500	
Internet users overall ^b	Total 1000					5,800	
Internet users overall ^c	Total 1000	170	740	1,420	2,930	3,420	3,900
Internet users per 1000 people ^a	Per 1000	1.09	4.69	8.19	15.07	20.83	
Internet users by categories ^d :							
a) Home	Total 1000					2,048	
b) Office	Total 1000					528	
c) Education and government	Total 1000					764	
d) Total	Total 1000					2,737	

^aSource: ITU Yearbook of Statistics, 2000.

^bSource: Jupiter Communications.

^cSource: eMarketer.

^dSource: IDC.

An alternative way of evaluating Internet diffusion is to count the number of hosts in each country. This is more reliable information than the number of users, since it is based on registered domains rather than on estimates. Table 26 presents the figures for major Latin American countries.

TABLE 26
Number of Hosts in Latin America Registered Domains

Country	1997	1998	1999	2000	Domain
Brazil	77,148	122,814	224,916	461,875	br
Mexico	9,764	49,764	120,967	424,811	mx
Argentina	12,688	20,924	68,978	162,686	ar
Colombia	9,054	10,397	16,322	41,905	co
Chile	15,885	18,779	31,083	41,512	cl
Uruguay	1,823	10,338	16,823	26,798	uy

Data for January each year.

Source: Internet Software Consortium (<http://www.isc.org/>).

A third e-commerce diffusion indicator is the availability of secure servers, a necessary condition for transactions on the Internet. Brazil presents a relatively high diffusion of these servers in relation to other Latin American countries, although well behind the United States and Canada. It should be noted that the figures for B-to-B (US\$ 2.2 billion) and B-to-C (US\$ 170 million) in the table below do not match with other estimates presented in the following sections.

TABLE 27
E-Commerce in the Americas

E-Commerce	Secure servers Per 1,000,000 Population 1998 ^a	Secure Servers with strong Encryption per 1,000,000 pop. 1998 ^a	B-to-B trade in US\$M 2000 ^b	B-to-C trade in US\$M2000 ^b	% users who purchased online in past month 2000 ^c
Argentina	0.58	0.11	617.80	47.18	n.a.
Brazil	1.06	0.38	2,230.263	170.50	15 ^f
Canada	30.66	21.82	15,867.52	1,496.00	n.a.
Chile	1.28	0.20	142.50	10.88	n.a.
Mexico	0.27	0.08	3,018.52	230.51	n.a.
United States	54.29	38.39	449,900.0	38,755.0	27
Venezuela	0.34	0.04	213.27	16.29	n.a.
Latin America ^d	0.74	0.24	6,224.72	475.36	
OECD ^e	17.77	11.47	588,900.8	52,184.17	

^aSource: Netcraft. <http://www.netcraft.com>. Strong encryption is defined as having a key length greater than 40 bits (systems limited to a 40-bit key are classified as 'weak' since it has been shown that messages encoded using a 40-bit key with RC4 can be broken in about a week by a good computer science student, using facilities available in a good computer science lab).

^bSource: Forrester Research Inc., Global eCommerce Model, 2000.

^cSource: Taylor Nelson Sofres, *Global eCommerce Report*, 2000. Data are from a survey conducted in 27 countries. An Internet user is defined as someone who has personally used the Internet in the past month; an online shopper is an Internet user who has bought or ordered goods or services on the Internet during the past month.

^d See Table 2.

^eOnly countries included in the 44-country sample are used in the classification. See Table 2.

^f Source: Ibope Midia.

Business-to-Business Electronic Commerce

B-to-B development

Business-to-business is widely recognized as the most important sector for e-commerce. Firms are more likely to buy through the Internet than individuals since they traditionally shop at a distance using communications means such as telephone and fax. Individuals, in contrast, are more likely to go shopping physically. Also, considering the number of transactions throughout the value chain, there is much more business between firms than sales to final consumers.

Excluding government transactions, approximately 90 percent of electronic commerce by value is conducted between businesses. Large enterprises have used Internet technologies to develop networks between their business operations. Small to medium-sized enterprises (SMEs) are rapidly exploiting the ways in which the Internet can be used to gain access to new domestic and overseas markets.

Statistics on B-to-B vary greatly, and cannot be taken alone. While Forrester Research estimates that total B-to-B in Brazil reached US\$ 2.2 billion in 2000, IDC estimates only \$ 379 million for the same year. In some cases, it is not clear if EDI is included or not, a fact that can substantially

alter statistics. Leadership in Latin America is also not clear. According to Forrester, Mexico is the leading country in B-to-B, while IDC and BCG rank Brazil as first.

TABLE 28

B-to-B Electronic Commerce in Latin America (\$US millions)

Country	1999	2000*	2001*	2002*	2003*
Argentina	48.7	149.2	355.6	699.2	1,223.5
Brazil	211.2	379.0	800.7	1,547.7	2,700.8
Chile	19.6	53.0	121.0	236.7	418.7
Colombia	22.4	56.2	134.2	269.9	475.3
Mexico	80.9	237.8	575.8	1,126.5	1,877.2
Venezuela	14.8	31.4	73.7	163.9	302.9

Source: International Data Corporation

* Estimate

Usage pattern

The usage pattern of e-commerce was observed in two recent surveys on the diffusion of the Internet in Brazilian business. Although these studies are based on limited samples, they have the advantage of relying on empirical information rather than on estimates.

The first source of information is my own research covering 220 firms from different business sectors, including retailing, banking, information services and manufacturing (Tigre, 2000). The survey was completed in June 2000 and was designed to study the diffusion stages of e-commerce in different sectors and sizes of firms. It shows that the vast majority of the surveyed firms were already linked to the Internet, but they were still at an early stage of user development. More than 50 percent of the firms used the Internet for e-mail and to access information only, a user pattern more typical of individuals, rather than corporations.

The study proposes a taxonomy of use pattern based on three stages. An Initial Stage is characterized by use of the web for mail and information-gathering only. Firms at this stage are usually small and conservative. They do not fear that the Internet will become a threat to their current business practices and use it just for exchanging e-mails and accessing information in web sites. About 35 percent of the surveyed firms are still in this stage.

The second is the Interactive Stage. Firms in this stage do have a web site, presenting products, services and institutional information. Yet, users cannot complete transactions online. At this stage, firms are testing Internet potential and waiting for customers' response. Gradually, new information and services may be added to the site and, eventually, it can become transactional. About 50 percent of the surveyed firms are at this stage.

The third is the Transactional Stage, in which e-commerce effectively takes place. At this stage, users can access web sites and make transactions. These include the direct sale of products and services, money transfer, and logistic integration with suppliers and customers, as well as special web services. Firms at this stage are usually large and aim to increase productivity and to develop new market channels. They count on their bargaining power to induce business partners to follow their standards and operational practices. About 15 percent of Brazilian surveyed firms have reached the transactional stage. They are usually in the financial and information sectors.

The Sao Paulo Industrial Federation (FIESP)¹⁵ conducted the second survey in October. Of the 807 respondents (87 percent of which were small-sized), only 5 percent undertook e-commerce transactions. However, the majority of these businesses believe that they will introduce e-commerce in the near future, as the Internet becomes an important channel for trade between firms. The driving forces behind B-to-B expansion are market access and cost reductions. Since an increasing share of interfirm business is migrating to the web, firms are encouraged to enter into B-to-B, especially in hierarchical networks and complex value chains.

The two surveys are difficult to compare for at least three reasons. First, while the FIESP survey dealt with manufacturing firms only, my survey included all sectors. Second, my survey was somewhat biased toward firms which already use information technologies, since the questionnaire was distributed by an IT magazine. Third, while the FIESP survey covered the state of San Paulo only, my survey included other states as well, although the leading Brazilian state represented the majority of answers.

Table 29 below is an attempt to compare these two surveys. The data were adapted to fit similar samples. From my survey, I considered only industrial firms. From the FIESP survey, I excluded those firms that were not IT users. The results are significantly similar, thus giving some credibility to both studies.

TABLE 29

Comparative Internet User Pattern in Brazilian Industry

Stage	Tigre (2000) (%)	FIESP (2000) (%)
Initial	47.7	45.4
Interactive	46.2	50.6
Transactional	6.1	5.0

Source: Tigre (2000) and FIESP.

Sector distribution

Unfortunately, the empirical evidence is not very helpful in defining the sector distribution of e-commerce in Brazil. From the data collected from different reports on the diffusion of e-commerce in individual sectors, combined with some sort of “educated guess,” we propose the following ranking:

¹⁵ FIESP represents more than 40 percent of total Brazilian industrial production.

TABLE 30**Top E-Commerce Users in Brazil**

Sector	How E-Commerce is Used
1. Finance	Transactions, investments, B-to-C
2. Government services	Information services, tax collection, elections, procurement
3. Retailing	Procurement, logistics, B-to-C
4. Automobile industry	Supply chain management, components trade, online sales
5. Transport and Distribution	Auctions for idle capacity, transport supply sites
6. Construction	Bidding, subcontracting, material trade
7. Pharmaceutical	Supply chain and distribution to retailers
8. Electronics	Supply chain management, distribution, B-to-C
9. Agriculture and Food	B-to-B marketplace, equipment and parts supply
10. Petrochemicals	Sales of intermediary goods, plastics and chemical products
11. Office equipment, parts and stationary	Supply of stationary, computer supplies, spare parts

A recent survey (Symnetics, 2001) found that 26 percent of B-to-B sites in Brazil are horizontal, attending users from different sectors (Table 31). Business sectors tend to concentrate their e-commerce in a limited range of sites. Thus, there is not much space for several different sites in each major segment of industry, except in vertical market niches.

TABLE 31**Distribution of B-to-B Portals by Business Sector in Brazil**

Sector	% of sites
Horizontal	26
Logistics	12
Agribusiness	10
Construction	9
Textile and Fashion	7
Retailing	6
Health	5
Chemical Industry	4
Shoe industry	3
Foreign trade	2
Others	16
Total	100

Source: Symnetics¹

TABLE 32**Internet Usage Pattern According to Business Sector**

Internet Usage (%)	Retailing	Manufacturing	Information Services	Finance	Others	Total
Access to information	94.8	96.9	96.1	85.7	95.8	95.9
Electronic mail	94.8	96.9	94.1	85.7	93.0	94.5
Procurement	37.9	23.1	25.5	21.4	39.4	31.4
Intranet	34.5	30.8	45.1	64.3	38.0	41.4
Extranet	10.3	18.5	5.9	28.6	11.3	13.2
Online sales	29.3	18.5	33.3	21.4	26.8	27.7
Information services	32.8	23.1	56.9	71.4	40.8	38.6
Technical services	20.7	4.6	21.6	-	21.1	14.1
Advertising	43.1	36.9	39.2	35.7	40.8	37.7
Average	44.2	38.8	46.4	46.0	45.2	43.8

Source: Tigre (2000).

Table 32 presents the sectoral data collected in my previous research. It shows that the use of the Internet as a business tool is more noticeable in information related sectors. Transactions realized within and among business areas like finance, communications, information services, and other services can be easily digitized. Consequently, they are naturally high potential users. Business sectors where the diffusion of e-commerce is relatively large have in common the fact that they are transaction-intensive sectors. They rely on frequent data exchange and need online coordination among various agents within the value chain.

Financial sector

In Brazil, the financial sector has been the largest IT and e-commerce user. While inter-sector comparative information is not available, there is plenty of evidence about the leading role of the banking sector in both IT and e-commerce development. Since the days of the Information Policy during the 1980s, some of the largest Brazilian banks – like Itaú and Bradesco – have developed internal technological capabilities in service automation. Speeding up financial information and transactions flows usually paid-off in a scenario characterized by very high inflation. These capabilities were further used to pioneer Internet banking. Today, more than two-thirds of all banking transactions conducted in Brazil (67.1 percent) are labeled as “electronic,” according to FEBRABAN, the national banking association¹⁶. This includes the Internet, automatic teller machines and call centers. This percentage was expected to further increase after August 2001 with the introduction of the new “Brazilian System of Payments” by the Central Bank. The system will permit nationwide online funds transfer among banks, businesses and consumers. It will substitute for checks in B-to-B and B-to-C transactions. The Central Bank estimates that 14 million transactions a day, involving US\$ 7 billion, will migrate to the new system. The main advantages of the system are security and immediate transfer of funds from one account to the other.

TABLE 33

Electronic Banking Services in Brazil (in thousands)

Type of Service	1998	1999	Difference (%)
Clients using home banking	2,600	4,300	65.0
Firms using office banking	500	600	20.0
Automatic Cash Dispensers	100	120	20.0
Clients with access to call centers	40,400	42,600	5.4
Consults to audio answering units	598,700	744,000	24.3

Source: Ceneban/Febraban.

Recently, major banks have entered the e-commerce business, taking advantage of their existing infrastructure. They are diversifying the service range available in their sites to include both B-to-C and B-to-B. In addition, banks are taking over many cash starved dot.coms. As shown in Table 21, the financial sector in Brazil invested in 136 sites and 34 ISPs during the last two years. These represented more than 40 percent of all transactions in the local venture capital market. The banks are regarded as more solid and trustworthy than start-up Internet firms, and are following a strategy designed to use these advantages to obtain a competitive edge in e-commerce.

¹⁶ O Globo, 9th April 2001 page 15.

Among business sectors, financial institutions represent the highest percentage of advanced forms of usage. About 43 percent of the surveyed financial institutions may be classified as in a transactional stage. In comparison to other sectors, the financial sector is a leader in Intranet, Extranet, and information services.

Government

The role of the federal government as an e-commerce user has already been discussed. In all probability, the value of procurement through reverse auctions (US\$ 900 million) and tax collection through the Internet, confer a leading position to the state in the Brazilian e-commerce ranking.

Retailing

Retailing is probably the third largest user of e-commerce in Brazil. While B-to-C is still at an early stage of development, major supermarkets such as Pão de Açúcar, Carrefour and Lojas Americanas are already heavy users of e-commerce to manage their procurement and logistic operations. Manufacturing follows suit, especially in hierarchical networks such as the automobile, electronics and petrochemical industries. Transportation and distribution are also intensive users, since they play a key role as supply chain integrators. Agriculture is rapidly increasing e-commerce operations, mainly in commodities markets. Finally, non-hierarchical networks, dealing with standardized products such as construction materials, office equipment, parts and stationary suppliers, are discovering the web as an important marketplace.

Manufacturing

As Table 29 shows, the results of the two surveys on the manufacturing sector reveal that only a small percentage of firms (from 5 to 6 percent) are in the transactional stage. Within my sample of various sectors, the manufacturing sector was the least advanced as far as e-commerce is concerned. However, manufacturing firms are potentially intensive users of B-to-B applications for supply chain coordination. According to Booz, Allen & Hamilton¹⁷, in Brazil, the firms with the highest potential are those in construction (for inputs procurement) and food and beverages (for distribution). They argue that sectors like the automobile, chemicals and pharmaceutical industries follow as potentially high users. However, they consider manufacturing sectors such as textiles and steelworks to have a more limited potential for e-commerce. In the case of the textile value chain, firms are too conservative to change their business practices at a fast pace. Herring, for example, a leading textile manufacturer, introduced online sales in 1998 but so far less than 1 percent of its business is undertaken through this channel.

The type of value chain or business network in which the firm is involved influences the level of e-commerce in the manufacturing sector. In hierarchical industrial networks such as the automobile and electronics industries, where a few assemblers monopolize the market, e-commerce has already become a necessary condition for participants. In Brazil, large corporations like Volkswagen, Fiat, General Motors, IBM, Itaútec, and BASF, among others, are

¹⁷ Citado na Gazeta Mercantil, 27 de Abril de 2000 pg. C-1.

both pioneers and leading users of e-commerce. They use their bargaining power to induce their suppliers to follow suit.

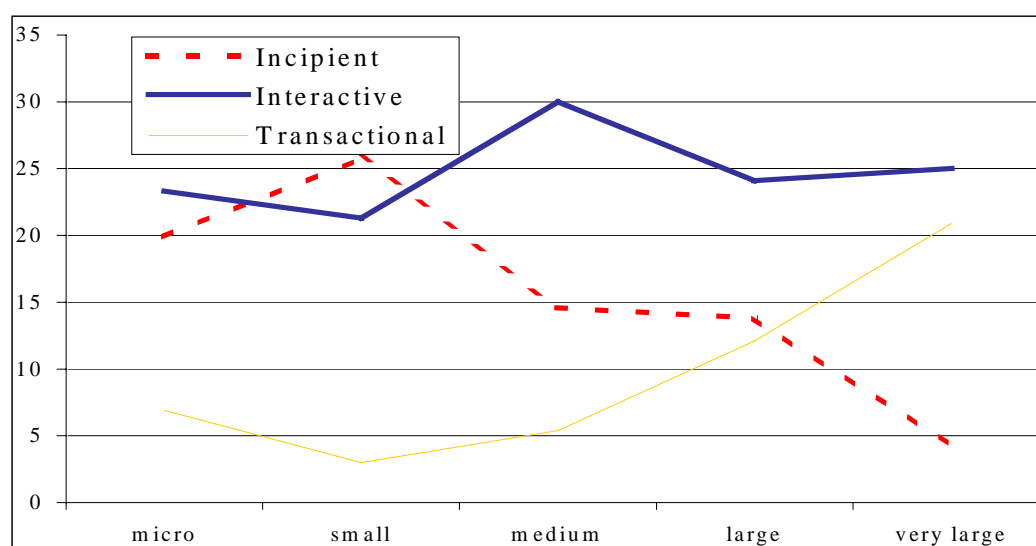
User pattern and size of firms

The evidence from the surveys suggests that in competitive attempts to adopt e-commerce, size in itself does not affect the outcome very much. However, it is apparent that there are some applications that are particular to very large firms (more than 500 employees). These include Extranet and Intranet. On the other hand, it was found that micro (less than 10 employees) and small firms (from 10 to 50) buy more often through the web and tend to provide more technical services online than larger firms.

The micro firm (less than 10 employees) is a special case. The survey shows that there are many sophisticated Internet users among software and information micro enterprises. The diffusion of e-commerce in micro and small firms is reinforced by the surge of virtual shops where almost all business is undertaken through the web. Small virtual shops seldom sell commodities, since they cannot compete with large established businesses in these market segments. Rather, they are specialized in niche markets, serve specific business communities, or supply customized services.

The findings of my previous study show that a significant share of the surveyed small firms (12 percent) realizes more than 50 percent of their total sales through the Internet. These are usually high-tech firms operating in areas like software, consulting, and specialized products and services. The survey shows that there are many sophisticated Internet users among micro enterprises. It also shows that medium size firms are not important e-commerce users. They use the Internet for information access and e-mail (100 percent of surveyed firms), but fall behind larger and smaller firms in typical e-commerce applications. They are usually in the interactive phase. Medium size firms often do have a web site containing institutional information, but they rarely undertake transactions online. The main reasons are the lack of organizational flexibility, risk aversion, financial constraints, and a shortage of IT qualified people.

As far as large firms are concerned, they are relatively intense users of Intranet (65.5 percent), Extranet (27.6 percent), and online sales of products and services (34.5 percent). They also use the Internet as a marketing tool. Very large firms (over 500 employees) are usually the most advanced users. The survey revealed that 76 percent of these firms are Intranet users, 40 percent sell products or services online, 50 percent provide online information services, and 42 percent use the Internet as an advertisement tool.

FIGURE: User Pattern and Size of Firms

Source: Tigre, 2000.

Very large firms (over 500 employees) are usually the most advanced users. The survey revealed that 76 percent of these firms are Intranet users, 40 percent sell products or services online, 50 percent provide online information services, and 42 percent use the Internet as an advertisement tool.

The FIESP survey generally supports the findings that e-commerce use is not necessarily associated with the size of the firm. As Table 34 shows, micro enterprises use e-commerce more than small and medium size firms, while large firms are more intensive users than very large firms. However, these data are not easily comparable to the other survey, since it was based on industrial firms only.

TABLE 34

Use of E-commerce According to the Firm Size (%)

Applications	Micro	Small	Medium	Large	Very Large	Total
Internal Email	13.1	27.3	58.4	84.1	88.2	42.3
External Email	57.4	78.1	87.1	93.2	88.2	81.6
Web site	70.5	81.4	88.5	94.7	100.0	84.6
E-Commerce	4.9	3.8	4.4	11.4	5.9	4.7
None	24.6	9.0	2.4	0.8	0.0	6.7

Source: FIESP (2000).

Barriers to e-commerce diffusion

According to the FIESP survey, the main difficulty in using the Internet in business transactions is the need to first implement organizational changes. Fifty-eight percent of the firms understand that they have to “reinvent” their operational structures in order to take full advantage of e-commerce. The existence of few trading partners in the Internet is also a barrier for 45 percent of firms. Thirty-seven percent agree that the investment required to introduce e-commerce is a barrier, considering not only equipment and software, but also marketing and organizational

costs. As expected, this barrier affects small firms more than large. About one-third of firms agree that integration with business processes (procurement, stocks, distribution and accounts), access to information about technology and business models, and security and privacy are important concerns. The availability of ready-to-use solutions, service providers, and technology packages, as well as hiring qualified people, are not considered to be major problems.

TABLE 35
Difficulties for E-Commerce Development

Type of Difficulty	Agree (%)	Neutral (%)	Disagree (%)	Total (%)
Organizational changes required	58	13	29	100
Few B-to-B partners	45	12	43	100
Investment required	37	23	40	100
Integration with business process	34	28	38	100
Access to information	33	20	47	100
Security and privacy	32	26	42	100
Availability of technical solution providers	27	27	46	100
Access to qualified personnel	21	24	55	100

Source: FIESP.

As for my survey, the nature of barriers to e-commerce diffusion is somewhat different, at least concerning their relative importance. The survey shows that security is considered the main obstacle to 39 percent of the firms. Firms avoid realizing transactions that involve online transmission of confidential information. The second major obstacle is the lack of qualified personnel to introduce and operate the new channels. Third is the telecommunications infrastructure, considered inadequate for 27.7 percent of surveyed firms. These include access to high-speed digital lines and quality of transmission.

Marketing costs were also quoted by 27.7 percent of firms as a major barrier to e-commerce. Most sites lack appropriate promotion and become almost unknown to Internet users. Building an online brand is expensive. Marketing costs currently account for 64 percent of revenue¹⁸, almost three times the level in the United States. This restricts the number of players who can afford to build a strong brand online.

Another major obstacle was the high cost of equipment, software and telecommunication services (25.5 percent). While Internet access costs in the last year have fallen 23 percent, 20 percent and 8 percent in Argentina, Brazil and Mexico respectively, these declines are not enough to entice a critical mass of consumers online. Even with WebTV and free ISP, more than half of the population will not be able to afford online access.

¹⁸ Boston Consulting Group report, "Online Retailing in Latin America: Beyond the Storefront."

TABLE 36**Barriers to the Introduction of Electronic Commerce**

Type of barrier	% of answers
Network security	38.6
Human resources	28.7
Marketing costs	27.7
Telecommunications infrastructure	27.7
Equipment costs	25.5
Adequate partners	24.8
Low awareness	21.8
Information on technology	18.8
Technical assistance	7.9
Integration	5.7

Source: Tigre (2000).

Lack of appropriate partners (24.8 percent), low awareness inside the firm for e-commerce importance (21.8 percent), and lack of information about technology (18.8 percent) were also cited as barriers.

Technology sources

The FIESP survey reveals that only very large firms develop e-commerce solutions in-house. Ready-to-use software packages and outsourcing are the main technology sources for most businesses.

TABLE 37**Sources of E-commerce Technology**

Source of E-Commerce Application	Micro %	Small %	Medium %	Large %	Very Large %	Total %
None	78.6	71.9	69.6	66.4	41.2	70.7
Own Development	7.1	6.5	7.6	7.5	23.5	7.1
Outsourcing	4.3	12.5	11.9	16.4	23.5	12.4
Package	10.0	9.1	10.9	9.7	11.8	9.8

Source: FIESP (2000).

The survey also shows that, with the exception of very large firms, a dial-up connection is the most used connection link. This may be seen as a limitation for more intensive e-commerce use, since dial access is limited to 56 Kb only. Dedicated access (of up to 2 Mb) and their own servers are used mostly by large and very large firms.

TABLE 38**Internet Connection and Size of Firms**

Internet Access	Micro %	Small %	Medium %	Large %	Very Large %	Total %
Free Dial Up	22.4	17.2	14.6	6.0	0.0	15.5
Paid Dial Up	68.7	85.8	76.1	44.8	17.6	78.1
Dedicated Access	3.0	8.4	16.3	38.1	23.5	13.2
Own Server	0.0	1.9	11.1	30.6	58.8	7.6
None	19.4	2.8	0.7	0.7	0.0	2.6

Source: FIESP (2000).

Business to Consumer

B-to-C in Latin America

There is relatively little convergence on data available about the size of the e-commerce market in Latin America. In 2000, online retailing in Latin America reached US\$ 263 million according to the IDC, and US \$580 million according to The Boston Consulting Group (BCG)¹⁹. For BCG, Brazil continues to be the largest online market in Latin America, accounting for US \$300 million in revenues and just over half of the entire market. The Mexican and Argentinean markets, however, have grown out of their nascent stages and in 2001 will generate US \$91 million and US \$82 million in sales, respectively.

The BCG report also shows that online retailers are experiencing operational difficulties. They still have to develop business models suited to the unique challenges and characteristics of the Latin American market. Mystery shopping exercises in Argentina, Brazil and Mexico revealed that many Latin American online retailers need to improve their product selection, customer service capabilities, and on-time delivery performance in order to succeed. For example, out of 118 sites tested, 52 did not respond to e-mail inquiries. In addition, 42 percent of goods ordered arrived after their promised delivery date.

The Boston Consulting Group study shows that, *"Whether it's in Brazil, Mexico, Argentina...or throughout the rest of the region, successful online retailers must focus their attention on improving operations, including customer service, delivery, price, selection and, of course, payment"*²⁰. Other findings of the report include:

- The popularity of consumer-to-consumer auctions has surged dramatically, making it the largest category in the Latin American market. These transactions will likely reach US\$ 192 million by the end of the year. Their success can be attributed, in part, to their massive marketing campaigns and the fact that they do not require an elaborate delivery and payment infrastructure;
- The second largest category, computer hardware and software, accounts for US\$ 72 million in sales. Financial services follow, generating US\$ 61.5 million - a reflection of the aggressive moves by financial institutions (particularly in Brazil); and
- Books-music-video is the fourth-largest category, at US\$ 59 million, representing a staggering 800 percent growth rate.

Looking forward, the report predicts that the Latin American market will be characterized by a small number of dominant players using a variety of channels to reach middle- and upper-class consumers. There are indications that private purchasers prefer to deal with entities that have established a degree of credibility and trust. This would seem to indicate that the greater part of e-business would continue to be accounted for by a small number of high-profile operators. These players will be much more focused on serving individual country markets than delivering products and services across the entire region. The market today is highly concentrated among a few retailers, with the top 20 players accounting for roughly 73 percent of total online sales. This

¹⁹ With the support of Visa International, Latin America and Caribbean Region.

²⁰ Mario Mello, senior vice president, products, Visa International, Latin America and Caribbean Region.

concentration will decrease as the market begins to mature and more traditional retailers migrate their offerings online. It is clear, however, that the market will not be able to support all 1,300 Latin American online retailers currently in operation. Only the top performers among these will survive.

According to a recent I-Best survey, about one-third of Internet users in Brazil have already bought products or services online. Consumers are concentrated in the upper income level. IBGE random research on household consumption (PNAD) shows that the top 10 percent of the richest families owned 60 percent of domestic microcomputers.

Online consumer demographics

According to a survey of 7,200 people in 12 countries conducted by Ernst & Young in January 2001, the typical Internet consumer in Brazil is younger than in the US (34 years of age as opposed to 42), less wealthy, predominantly male (75 percent), and usually holds a university degree.

TABLE 39
Comparative Consumer Demographics

Consumer Demographics	Brazil	US	World
Average age	34	42	37
Annual average income (US\$)	40,000	52,300	45,000
Percent male	75	40	67
Percent female	25	60	33
Percent married	40	59	46
Percent with university degree	67	35	47

Source: Ernst & Young, Trends on Online Shopping, January 2001.

As expected, Brazilians buy less frequently online than Americans do, both in terms of average number of purchases (9 versus 13), and in value terms (US\$ 493 versus US\$ 896). In both countries, most consumers increased their buying frequency in the previous 12 months.

TABLE 40
Comparative Online Shopping

Online Purchases*	Brazil	US	World
# of purchases in the last 12 months			
1-2 (%)	17	13	18
3-4 (%)	29	21	26
5-9 (%)	27	23	26
10+ (%)	22	38	26
Average number of purchases	9	13	10
Increased buying frequency (%)	79	77	79
Same buying frequency (%)	14	19	18
Reduced buying frequency (%)	7	4	14
Average expenditure last 12 months	\$ 493	\$ 896	\$ 653

Source: Ernst & Young, Trends on Online Shopping, January 2001.

* Excluding financial services, ticket reservations and magazine subscriptions.

The comparison between the type of products purchased online reflects different consumer habits. In both Brazil and the US, CDs, books and computers are the best sellers, although in a different order. But while Brazilians buy electronics and videos, Americans are more likely to use the Internet to buy clothes and airline tickets. The world average is between the two countries.

TABLE 41
Comparative Online Bestsellers

Best Selling Products	Brazil	US	World
1	CDs	Books	Books
2	Books	Computers	CDs
3	Computers	CDs	Computers
4	Electronics	Clothing	Air tickets
5	Videos	Air tickets	Videos

Source: Ernst & Young, Trends on Online Shopping, January 2001.

Table 42 below shows the impact of online shopping on traditional business. The results are not significantly different among the countries surveyed. Online shopping diverts some of the business that would otherwise be done in shops. However, information available on the net has a positive impact on traditional business, since most people buy more in shops after consulting web sites.

TABLE 42
Impact of Online Shopping on Brick-and-Mortar Business

Impacts of Online Shopping	Brazil	US	World
Buy more in shops (%)	65	57	54
Buy less in shops (%)	7	4	7
Buy online goods that would otherwise be bought in shops (%)	50	59	56

Source: Ernst & Young, Trends on Online Shopping, January 2001.

Regional and Institutional Factors

E-commerce was born as a worldwide business. Recent data, however, shows that consumers are increasingly demanding products from web sites located in their own countries. In 1995, about 95 percent of Internet flows were international (Brazilian users accessing a foreign web site). In 1997, access to foreign sites went down to 60 percent, and two years later, more than half of all B-to-B transactions (about US\$ 70 million) were undertaken by Brazilians in local sites. This trend can also be verified in American sites that are redirecting their sales to the domestic market. In 1996, external markets represented 35 percent of Amazon.com's total sales, while in 1997 and 1998 exports represented 26 percent and 21 percent respectively (*OECD, 1999:87*).

One of the findings of the Boston Consulting Group report is the weakness of US English-language players in Latin America. Their market share was expected to drop from 32 percent of the market in 1999, to a mere 7 percent, or US\$ 40 million in sales, in 2000. Also, the report argues that pan-regional plays are proving to be much less attractive than originally anticipated. In most cases, they are too difficult to implement. The cost of entering a number of Latin American markets at once will not generate the kind of scalability that leads to profitability.

There are at least three reasons for customers' preference for local rather than international virtual shopping. The first is language. Brazil is the only Portuguese-speaking country in America, and people are not usually willing and able to use Spanish language sites, despite the similarities between the two Iberian idioms. The English language is more diffused among people with a higher level of education. But as a survey conducted by Forrester Research shows, consumers are more willing to buy in sites designed in their own language. It can be noted, however, that language does not necessarily define web site location, since information can be written in different languages and hosted in any country in the world.

The second reason is logistic. A locally based site can deliver faster than an overseas site without local operations. In addition, it can avoid time delays caused by customs inspections. Local distribution networks are becoming a major competitive advantage for local sites dealing with physical goods. For example, Cultura.com, a traditional Brazilian bookshop, competes both in price and speed of delivery with Amazon.com, even in foreign published books and CDs, due to its nationwide physical distribution network.

The third reason for customers' preference for local sites is the legal and statutory factors. They refer to regulation of transactions, privacy protection, security, and intellectual capital protection. Users are more familiar with local rules and practices, and may feel insecure buying from a foreign country. Consumer protection laws are country-specific and customers using foreign sites have nowhere to complain in case of dissatisfaction. On the other hand, for security reasons, consumers are concerned more with credibility than nationality. Of course, well-reputed multinational firms enjoy much more consumer trust than little-known local sites. In Brazil, like elsewhere, brand names and good service reputation are important competitive advantages in the virtual market.

These arguments do not necessarily go against the conventional wisdom about borderless, open commerce created by the Internet. In the case of Brazil, they simply mean that, in order to succeed in the e-commerce market, multinational ISPs have to invest in local content and distribution networks, either directly or by subcontracting and establishing business alliances with local web sites and distribution firms.

SOCIAL AND ECONOMIC IMPACTS

Globalization and Business Opportunities

The benefits of the Internet for increasing productivity and competitiveness are associated more with B-to-B, rather than B-to-C. E-commerce provides opportunities for cost reductions, through access to market information, less bureaucracy and better supply chain management. The benefits of transaction cost reductions and coordination between trading partners are so evident that e-commerce is becoming a compulsory tool to participate in several international economic activities.

Another major impact of B-to-B electronic commerce is the growing globalization trends of value chains. Most multinational corporations all over the world have already transferred at least

part of their procurement operations to the Internet. Consequently, new opportunities are created for international trade. However, large firms are acquiring more bargaining power through the association of several buyers (or suppliers) in a single site.

For developing countries this is a double-edged sword. On the one hand, it reduces barriers of entry in the international market, by increasing access to market information. On the other hand, the concentration of e-commerce in only a few developed countries increases the import bias of firms in developing countries. Table 43 shows that in countries where e-commerce is well developed, such as the United States, the import share of Internet purchasing operations is limited to 10 percent. In Latin America, by contrast, 74 percent of Internet procurement was the result of imports.

TABLE 43
Import Share in E-business

Region	Import share (%)
Latin America	74
European Union	41
Asia	65
United States	10

Source: International Telecommunication Union. Extracted from Folha de São Paulo, July, 9th 2000, pg. B11.

Online purchasing involves both B-to-B and B-to-C. It includes hardware, software, services (such as consulting, web design, web hosting, and ASPs), and other products and services. A Brazilian manufacturing firm revealed that online international prices for components, services and equipment are usually 10 percent cheaper than local prices, even after adding import tariffs and transport costs. From the microeconomic point of view, this is a source of cost reduction. From the macro level, however, this trend can be detrimental to the balance of trade.

These arguments may apply to B-to-C, too. With better access to the world market, consumers may be encouraged to buy more imported products. Apparently, this is a contradiction with the point made earlier, which shows the preference of customers for buying from local sites. But despite these preferences, there are many more options for international shopping online than in brick-and-mortar shops. Also, customers can buy imported products from local sites.

Whatever the short-term impact, firms need to link up to e-commerce in order to participate, both as suppliers and buyers, in major international value chains. Online upstream links with suppliers and downstream links with customers and distributors, as well as with service suppliers such as transportation, banking and information services, are essential to competitiveness.

Impact of Tax-free Environment

Developing countries could be much more affected by fiscal losses resulting from e-commerce in view of their greater dependence on tariffs and taxes as revenue sources for their national budgets. There is a concern by governments, especially in the least developed countries, over the potential erosion of their tax base resulting from e-commerce.

According to Telcher (2000:01), taxation “is the particular concern to developing countries, where import duties comprise higher shares of government revenue and a shift to other revenue

sources is economically less feasible....Findings show that developing countries will be the main losers as far as import duties from e-commerce products are concerned, while both developing and developed countries would suffer major revenue cuts from lost consumption taxes.”²¹ She argues that “from a developing perspective, the immediate advantage of a ban in Internet taxation is not clear....Rather, from the developing point of view, other issues that ensure the effective liberalization of e-commerce should have priority. These include resolving the classification issue (i.e. the definition of electronic transmission as goods, services or something else), identifying e-services in which developing countries have export potentials, and reviewing national commitments under GATS that concern e-services.”²²

She further argues that “tariff revenues are more important for the developing countries as a source of government revenue, while most developed countries’ Governments depend primarily on income from VAT. In addition, developing countries often have difficulties in implementing an efficient VAT system. They would therefore be more affected by a cut in tariffs on electronic goods, while developed countries would be more affected by lost consumption taxes (an exception is the United States, which depends more on income taxes than on consumption taxes). This explains why, on the other hand, many OECD countries support the customs ban, while, on the other hand, they are particularly concerned with finding a solution to e-commerce taxation that would guarantee their continued tax revenues” (Ibid. page 37).

There are major differences between developing and developed countries in tax sources: “for the former, import duties as a share of tax revenue are 21.2 percent (compared with 3 percent for developed countries). The combined tax revenues from goods and services and those from imports account for 54 percent of tax revenues (all countries) or 58.3 percent of developing countries and 37 percent of developed countries’ tax revenue. Hence, they make up a major source of government revenue in most countries” (Ibid. page 1).

Social Impact

The diffusion of the Internet presents many opportunities for social development, notably in the fields of education, health and information. E-commerce in particular can reduce living costs for those people living in remote regions and communities poorly served by local businesses. The diffusion of e-commerce in Brazil has been relatively rapid as compared to other developing countries. However, the future growth of e-commerce may be limited by social and economic factors like income level, income distribution and education.

The uneven distribution of Internet access encourages public and private diffusion programs. In order to reduce the digital divide, Brazil needs to implement policies designed to improve Internet access in public institutions such as libraries, local and regional government facilities, schools, and post offices. Subsidies to schools must receive a high priority since this would contribute to building the future skill base of the work force. Also, for equity reasons and to enhance overall economic efficiency via network effects, Internet diffusion policies are required

²¹ Tariffs, Taxes And Electronic Commerce: Revenue Implications For Developing Countries, 2000, Susanne Telcher, page 01
 Tariffs, Taxes And Electronic Commerce: Revenue Implications For Developing Countries, 2000, Susanne Telcher, page 35

to facilitate access for under-privileged groups, such as the disabled, the elderly, and those in rural remote and low income areas. In Brazil, social applications of the Internet are still at an early stage of development. Ongoing initiatives are at different stages; in most cases, they are still at an awareness, discussion and planning stage. Few formal proposals are emerging from both public and private programs such as the Information Society. Consequently, it is too early to evaluate their impact on society.

As far as SMEs are concerned, a number of factors can drive the adoption of e-commerce. These include reductions in transaction costs; improvements in product quality and customer service; reaching new customers and suppliers in existing markets; and expanding in new markets. A growing number of large businesses require that their suppliers link into their e-commerce systems as a condition of doing business.²³ Policies for encouraging the participation of micro, small and medium sized enterprises in e-commerce are also important for overall efficiency. Since SMEs are rapidly adopting the Internet, policies should shift towards that use. Small firms usually have a limited understanding of the e-commerce potential. They also lack the skills to fully explore opportunities and overcome barriers to entry. Also, SMEs lack the trust and confidence to move toward e-commerce implementation, since they are more vulnerable than large firms to problems linked to authentication, data security and confidentiality, and the settling of commercial disputes²⁴.

²³ See OECD, Final Report, 2000, p. 5.

²⁴ See OECD, Final Report, 2000, p. 3.

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