E-Commerce Readiness and Diffusion: The Case of Brazil

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This research is part of the Globalization and E-Commerce project of the Center for Research on Information Technology and Organizations (CRITO) at the University of California at Irvine. The research is supported by a grant from the U.S. National Science Foundation (CISE/IIS/CSS, No. 0085852). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. The project in Brazil is also supported by a grant from the National Council for Science and Technology Development (CNPq). I am thankful to Ken Kraemer for his careful and insightful review of the initial drafts and to Ricardo Dickstein for his helpful assistance.

SUMMARY

- In Brazil, a poor telecommunication infrastructure was considered an important barrier for e-business diffusion. However, from 1998, when the telecom system was privatized, to 2000, telecom investments boosted to an average of 1.36% of GNP a year, a percentage well above both Brazilian and Latin American historical levels. There is now idle capacity and telecommunication infrastructure is no longer considered a major barrier for e-commerce.
- Brazil's financial sector is the clear leader in adopting information technologies, and is widely considered the leading user of the Internet for marketing, online sales, and service and support. The sum of the survey results suggests that the financial sector has capitalized on its experience with IT in order to adopt e-commerce technologies and to integrate them with existing information systems.
- E-commerce in Brazil is strongly anchored in information intensive sectors little affected by foreign transactions. Local forces seem to play a more influential role due to Brazil's unique economic history and government policies.
- For e-commerce diffusion, a factor more important than the sector itself is the scale of information flow among various agents within the economy. Information-intensity is, in part, related to the size of the business. The larger the firm, the easier it obtains scale benefits of digital services. However, some activities demand more information exchange than others.
- Distribution and finance face similar driving forces for e-commerce diffusion, but are different from manufacturing. The manufacturing industry is driven to achieve, by cost reduction, through inventory reduction and improved logistics. But while productivity growth is the most important driving force for manufacturing, the finance and distribution sectors focus on opportunities to expand and improve their relationships with clients.
- The Internet is increasing the intensity of competition rather than the number of competitors. Whereas in the recent past e-commerce was dominated by new companies, nowadays-existing market leaders seem to be rapidly gaining business through the new channel.
- Strong links between users and producers of IT solutions facilitate technological leadership. The case study on the banking industry showed that internal technological capabilities were key for e-commerce leadership, since they enhanced the user-producer links providing capabilities that are flexible and tailored to specific needs.
- Legal protection is a more important barrier than expected. This includes lack of business laws for e-commerce and inadequate legal protection for Internet purchases, barriers affecting more than 40% of the surveyed Brazilian firms.

INTRODUCTION

Countries are usually at very different starting positions in the task of building a digital infrastructure to develop and support e-commerce applications. The novelty of the Internet itself, associated with different environment and policy influences, results in idiosyncratic arrangements shaping particular diffusion paths among countries and regions. To identify what is unique and what is common among countries is an essential tool for understanding world e-business diffusion.

As a large developing country, Brazil combines particular obstacles and opportunities to diffuse the Internet across its economy and society. Perhaps the most remarkable aspect of the diffusion of IT and e-commerce in this country is that the lead has always been taken by the finance sector. The retail-banking sector, in particular, has been the most active economic agent in acquiring technological capabilities to develop and introduce IT applications. Despite the problems of the Brazilian economy as a whole, the local financial automation system is one of the most advanced in the world.

This paper is about the diffusion and impacts of e-commerce in Brazil. It discusses a number of questions related to early predictions about the Internet and e-commerce development. One approach to such analysis is to look at the various key themes emerging from the GEC project (The Globalization and Electronic Commerce (GEC) project, a multi-country study of the Center for Research on Information Technology and Organizations (CRITO)). Six themes may be distinguished as playing a key role in e-commerce diffusion, ranging from the infrastructure to drivers and barriers, to impacts and to policy implications.

Starting with the basics, telecommunication infrastructure is often a barrier for developing countries. Based on this assumption, countries lagging behind a certain level of telephone density would be severely handicapped for e-commerce development. However, recent technological developments drastically reduce the investment costs of the telecommunication infrastructure. Combined with institutional reforms such as privatization, how are these changes reducing the regional and international digital gap?

A second key theme is the role of size and information-intensity for e-commerce diffusion. Large firms usually enjoy the necessary economies of scale and scope to participate in the digital economy. The sector in which firms operate is also important for the e-commerce diffusion pattern. However, more important than the sector itself seems to be the scale of information flow among various agents within the economy. Information-intense sub-sectors dealing with a massive transaction flow, are more likely to adopt e-commerce than other firms of the same size but operating in sub-sectors less impacted by the need for fast, high scale information exchange. This paper will analyze the role of size, sector and information intensity for e-commerce diffusion, focusing on the banking sector. I will identify how firms coming from different sub sectors within an industry deal with information flow.

A third theme deals with the impacts of e-commerce on firm efficiency, competition and on the restructuring of value chains. We look at the GEC research question “are the Internet and e-commerce having an impact mainly on firm efficiency or are they restructuring industry value

chains and changing competition?" based on the evidence provided by the survey in Brazil. We expect that the main driving force of Internet technologies integrated with ICTs diffusion would be the rise of productivity. However, a firm's motivation may not fall exclusively on the reduction of costs associated with business management. It may also touch on the reconfiguration of networks, by attracting new partners and expelling others. This leads to another GEC question about impacts. "Are the Internet and e-commerce a leveling force for firms in different industries or do they largely reinforce existing patterns of industry concentration, market power and competition among firms?"

A fourth theme related to barriers and drivers for e-commerce diffusion is the role of education and technical skills necessary to develop, integrate and operate complex information systems. The role technical capability plays for technology diffusion is well established in the specialized literature. This paper extends this view by arguing that close links between users and producers of IT, involving equity partnership, may be key to adapting existing technologies to specific needs. Standard technologies are cheaper and ready to use, while complex applications may demand tailor-made technological development that demand long-term stable partnerships between users and producers.

A fifth theme is a globalization of production chains, which is reputed to be a major driver for e-commerce diffusion. Multinational corporations command global production networks of independent yet interconnected enterprises demanding high speed and reliable IT connections. In Brazil, however, the relatively low international integration of the local manufacturing industry, the large size of the country and its historical inward orientation may reduce the role of global factors as e-business drivers.

The sixth theme relates to policy implications of the overall findings of this paper. Policy issues influence the diffusion of e-commerce all over the world. In our previous paper (Tigre and Dedrick, 2002) we showed that, in Brazil, a fast diffusion occurred in the absence of specific laws. Government policies concerning protection of privacy and personal data, security of information systems and authentication services are still at an earlier stage of development. We argued that in the absence of legal protection, consumers have evolved their own strategies to protect themselves from negligence, fraud or simply poor service. We also argued that public agencies might play a more important role as users and inducers of e-commerce practices. By purchasing online, for example, the federal and some state governments created a strong incentive for suppliers to go online. New evidence collected by the CRITO survey, however, may question such conclusions. Do firms consider the lack of e-commerce laws a major barrier for e-commerce diffusion?

The following section reviews expectations about e-commerce diffusion according to the literature and previous GEC research. It discusses the six key themes associated with the diffusion process that will be analyzed in the paper. Section III briefly describes the methodologies adopted, while section IV discusses Brazilian e-commerce readiness. Key barriers and incentives are discussed in Section V based on the evidence provided by the CRITO survey. Section VI discusses e-commerce diffusion by size and industry sector and presents some examples of e-commerce and support activities created in Brazil. The impacts of the Internet and

e-commerce on industry structure are presented in section VII followed by a conclusion section. Finally, Appendix A presents a case study of the banking sector.

BACKGROUND AND A PRIORI EXPECTATIONS

Key Themes on E-Commerce Diffusion

The literature on e-commerce diffusion is very recent but has already established a basis for discussions. Recent empirical work, including the CRITO's Globalization and Electronic Commerce project (GEC), provides a good factual, cross-country basis for further examining earlier propositions and expectations. In the face of new evidence provided by this research, some realities and myths about e-commerce diffusion must be rethought. This section reviews six key themes that will be analyzed throughout the paper. It also reviews the dynamics of three sectors of the Brazilian industry, namely manufacturing, distribution and finance in order to draw expectations about e-commerce diffusion.

Theme 1: The telecommunication infrastructure gap

Conventional wisdom assumes that widespread penetration of the telecommunication network is a necessary condition for e-commerce development. Based on this assumption, countries lagging behind a certain level of telephone density would not be able to develop e-commerce. Recent technological developments, however, drastically reduced the investment costs in telecommunication infrastructure. Innovations in the fields of fiber optics, digital switching and wireless transmission are reducing the regional and international gap in telecommunications. Combined with deregulation, new technologies have reduced entry barriers and attracted new capital to a wide range of telecommunication services all over the world. This Schumpeterian wave of innovation-induced investments, associated with the incentives provided by the market, seem to be reducing the negative weight of telecommunication infrastructure for e-commerce development. The case of Brazil is emblematic of this. In only two years (1999-2001) the number of households served by a telephone line, either fixed or mobile, jumped from 37.6 percent to 58.9 percent. Private network operators are encouraged with incentives and obligations, to extend their services to geographic and socio-demographic areas deemed to be marginally profitable or unprofitable. In this paper we argue that in Brazil, the telecommunication diffusion problem is no longer due to infrastructure supply shortage. Rather, it now depends on the demand.

Theme 2:Information-intensity and e-commerce diffusion

Tigre and Dedrick, 2002 argued that e-commerce has a bias towards information intensive sectors. We proposed that, for e-commerce diffusion, more important than the sector itself was the scale and scope of information flow with clients and among various agents within the value chain. Zhu et al (2002) developed a related theme by arguing that firms with greater scope are more likely to adopt e-business.

The principle of scale economies is that there will be a decrease in the marginal cost of production as a firm's outputs increase. Scope economies occur when enterprises dilute costs by

increasing the range of products and services produced. Both concepts can be applied to reveal valuable insights into activities in the digital economy. The Internet supports scale economies because it has allowed activities with decreasing returns to scale to be replaced by activities that have increasing returns to scale. As information is costly to produce but very cheap to reproduce, the cost of information is dominated by the costs of the first copy. For instance, an e-business transactional homepage may require a considerable investment in design, organizational links, and data security to start with, but the costs of adding new customers can be very low.

Scope economies occur when the enterprise dilutes costs by increasing the range of products and services produced. Synergy effects between the nature of the required investment and the capability to produce and distribute different products with common inputs allow for scope economies. E-commerce offers several opportunities to obtain scope economies because it can share infrastructure, files, equipment, technological know-how and distribution channels. As an enterprise develops e-commerce, it can identify new opportunities to use its infrastructure and obtain scope economies.

The information economy offers some opportunities to small enterprises, while offering more opportunities to large scales of operation. The marginal cost to add a new client to a network is usually very low, whereas the benefits that clients have with the expansion of the network can be significant. This does not mean that there are no opportunities for small enterprises to enter e-commerce. We expect to find small successful firms in market niches, especially on specific sectors or regions. But as Zhu et al (2002) argued "larger firms are more likely to adopt e-business".

Theme 3: Key barriers and -driving forces for e-commerce diffusion

The impacts of e-commerce on efficiency are usually associated with their impacts on productivity growth, speed and reduction of transaction costs. Productivity gains include organizational improvements and other, more dynamic, learning effects that yield efficiency improvements in the shop floor, production, planning, marketing, and administrative levels. The successful introduction of e-commerce can produce cost reductions, enhance information and customer service, and develop new markets.

The positive impacts of e-commerce on efficiency are now well established in the specialized literature. For Mansell and When (1998), the new technology offers the potential not just to collect, store, process, and diffuse enormous quantities of information at minimal cost, but also to network, interact, and to communicate across the world. One OECD study (2000) has indicated that e-commerce could raise output levels by some 5 percent, through improved procurement, inventory control and reduced cost of intermediation and sales transactions.

For Brazil, as elsewhere in the world, the main driving forces for both large and small firms are probably cost reduction, expansion of existing markets, entering into new business, and improving coordination with customers and suppliers. Internet technologies may also touch on the reconfiguration of networks, both by opening up a channel for those that, for location reasons, did not participate in existing networks and by expelling those who have not adapted to the new operational methods applied to logistics and purchasing. These influences can impact the industry structure of some business sectors.

Theme 4: The role of skills in e-commerce diffusion

Technological capabilities are usually considered key drivers for e-commerce diffusion. Zhu et al (2002) shows that firms with a higher level of technological competence are more likely to adopt e-business. In this report we extend this view by arguing that ownership links between users and software producers may also play a very positive role on e-commerce diffusion. The case of Brazilian banks shows that users are particularly important to the innovation-diffusion process since the software component is flexible, open and well suited to user intervention. The availability of technology capabilities either within user firms or their associates allows users to insert the knowledge specific to their own process into the IT system. Ownership links between users and suppliers of technology may favor the development of tailor-made solutions that often can be more adequate than standard products, especially in new applications.

Since firms operate within specific institutional environments we must also look at the state of a country's educational levels and local readiness to enlarge the use of information technologies. A common indicator of such readiness is the literacy level. For e-commerce diffusion, however, we believe that a more suitable indicator is the local availability of skills to further develop and adapt information technologies to specific applications and business environments. The stock and growth of graduates with technical degrees in engineering, mathematics, telecommunications and computer sciences is usually taken as indicator of such potential.

Theme 5: Global and local forces

International trade and business alliances are important forces in the global environment that are driving the diffusion of e-commerce. The influence is, in fact, double edged. E-Commerce is not only influenced by globalization but it also contributes to the functional integration of internationally dispersed activities. As Gereffi (2002:20) puts it, "the new digital era of globalization is characterized by a dramatic increase in connectivity that is melting the information glue that holds corporations and global value chains together."

In the case of Brazil we do not expect globalization to play a key role as an e-commerce driver in comparison to other surveyed countries. Despite its recent openness to foreign trade and investments, Brazil is still relatively inward oriented. Few local firms are exporters, and even subsidiaries of multinational corporations rely less on international trade than their other branches worldwide. Part of the explanations resides in the continental size of the country, which encourages local firms to be parochial, focusing on the local market rather than on exports.

Also, historical development strategies based on import-substitution resulted in a relatively closed economy. Since the early 1990s, the Brazilian economy is shifting its development strategy from import-substitution industrialization to export-oriented industrialization. Buttressed by the policy prescriptions of the World Bank and IMF these policies opened up the Brazilian market for imports but so far have not produced a boom in exports. A number of factors have contributed to weakness of Brazilian balance of payments including overvalued local currency, high interest rates, and the fact that the bulk of recent FDI were directed to non-tradable sectors such as energy and telecommunication services.

Theme 6: Government policies: the role of the legal environment and user policy

The role of government policies and legal frameworks for e-commerce diffusion are not clear-cut. The shift to a digital economy directly affects the laws governing sales of goods and services. Among the key issues that need resolution are those dealing with electronic signatures, electronic contracts, intellectual propriety rights, jurisdiction, privacy, and consumer rights. For Simon (2000), without consistent cross-border laws and codes, "consumers and businesses will have little legal certainty on which to depend and many will be reluctant to engage in electronic transactions."

In our previous paper (Tigre and Dedrick, 2002) we proposed that, at least in developing countries government plays a more effective role by using and inducing those to use e-commerce practices than by just issuing detailed regulations. By purchasing and providing services online, for example, governments are providing incentives for suppliers to adopt e-commerce. The comparison between Brazil and other Latin American countries (such as Peru, where a detailed e-commerce legal code is already available) suggests that the regulations concerning protection of privacy and of personal data and security of information systems was not necessarily a key driving force for e-commerce diffusion. In the absence of legal protections, consumers have evolved their own strategies to protect themselves from negligence, fraud or simply poor service. This hypothesis however has yet to be demonstrated. New evidence collected in this research emphasize the role of legal protection and business laws to maintain e-business operations.

Expectations and Industry Sectors in Brazil

Manufacturing

Since the beginning of the nineties, the Brazilian economy has undergone a process of restructuring which has dismantled the industrial policy that gave priority to local production by shielding them from imports. New policies aimed at opening up the economy to foreign trade, technology and finance and to promote the privatization of public services is a move to review the role of the State and attract outside investment (Tigre et al, 2002). The results of these changes have deeply affected the sector. Manufacturing corporations have sought to adjust to stiffer international competition by respecializing, outsourcing phases of production and resorting to imports - a strategy that might be described as "defensive". In many companies, the streamlining of production has meant abandoning domestic production of components and more technologically sophisticated production lines that incorporate greater added value, resorting instead to imports.

This is tantamount to a downgrading of production. Production has thus been diverted into segments subject to lower market risks, widening the gap between Brazilian industry and the more dynamic sectors of international trade. Although it became more efficient, the Brazilian manufacturing industry shows a low dynamism of exports. The manufacturing industry became relatively smaller because its average rate of increase (1.4 percent per year from 1991 to 1999, see IBGE 2000:214) was below that of the economy as a whole. Brazilian exports are concentrated in food products and basic manufactured goods. Brazil has a 3.2 percent share of

global food exports and 2.5 percent share of steel products, while its market share for world exports of general manufacturing goods is only 0.61 percent (Abreu, 2002).

The impacts of this specialization pattern have not favored e-commerce diffusion in the manufacturing sector as a whole. If e-commerce has a sectorial bias towards information intensive sectors, as we argued earlier, the diffusion of e-commerce is relatively larger in more advanced segments of the industry where frequent data exchange and online coordination among various agents within the value chain are needed. By focusing on lower value added segments of the market such as paper and paperboard, wood products, mining and quarrying and food products, the Brazilian manufacturing industry would likely be less information intensive and less willing to introduce advanced e-commerce applications.

Distribution

In Brazil, there are more than a million[1] companies in the distribution sector, of which 93 percent are retailers and 7 percent wholesalers. The figures portray the predominance of small retailing forms: only 6 percent of the established companies own more than one retailing establishment. Despite the large number of companies, large chains of supermarkets have increased their market share in recent years and now account for 23 percent of total sales. Firms with more than 50 employees account for 57.3 percent of total salaries (IBGE, 2000:245).

In such a heterogeneous industry sector the actual nature and extent of Internet and e-commerce diffusion differ widely. For Stoneman (1987), the diffusion of a new technology is a reflection of differences between potential adopters. Potential buyers of a technology differ from each other such that the benefits they obtain from use, and thus the reservation prices for acquisition of technology, differ. Looking at the industry structure of the Brazilian distribution sector we can expect that the use of e-commerce for buying and selling online are concentrated on large multi-store retailing chains. These firms command buyer-driven chains and use e-commerce for network integration in order to improve logistics and obtain lean retailing. On the other hand, we expect that the millions of small retailing shops are either disconnected or use the Internet to exchange e-mails and obtain information about product availability only.

In addition, some differences may emerge across distribution sectors. Wholesale distribution is probably a heavier user of the Internet for managing the supply chain logistics than retailers. Wholesale companies receipts in Brazil are on average, nine times larger than retailing (IBGE, 2000:247), so they may have better access to the economies of scale required for e-commerce investments. This hypothesis is consistent with Zhu et al (2002), that "larger firms are more likely to adopt e-business."

We also expect that e-commerce is actually complementing rather than replacing traditional commerce. Technology diffusion is a reflection of the information and learning process. All potential users do not immediately adopt new technology either because not all of them know of its existence or because there is uncertainty as to the characteristics of the technology on the part of the potential users.

[1] 1,042,581 companies and 1,112,363 trade establishments (IBGE, 2000:247).

E-commerce pioneers were usually start-up companies managed by IT specialists. But once the technology becomes available and its benefits are proven, pre-existing distribution firms are likely to follow suit. They tend to adopt e-commerce gradually, aiming at preserving existing physical structures rather than replacing them. Well-known distributors take advantage of their established brand name and customers'trust to reap the benefits of e-commerce. Therefore, e-commerce constitutes an additional and complementary business channel rather than a substitute for brick and mortar business.

Finance

By all indicators, including those collected in our previous work, (Tigre and Dedrick, 2002), the finance sector leads in e-commerce readiness. This sector has probably more positive drivers and experiences higher levels of impacts from e-commerce use. As an information exchange-intensive sector, it also leads in network impacts. Another hypothesis is that the financial sector benefits from e-commerce more than any other industry in terms of efficiency and sales.

In Brazil, these opportunities for e-commerce diffusion were reinforced by specific macroeconomic conditions. As shown in our previous paper, the high inflationary environment prevailing until the mid 1990's was crucial for banks' automation strategies. Speeding up financial information and transactions flows usually paid-off in a scenario characterized by high inflation.

In Brazil, banks pioneered the use of IT and since the days of the Information Policy during the 1980's, some of the largest Brazilian banks have developed internal technological capabilities in service automation. By doing so, they created strong links between innovation and diffusion. Cassiolato (1992) argues that IT users are particularly important to the innovation-diffusion process since the software component is flexible, open and well suited to user intervention. This intervention allows users to insert the knowledge specific to its own process into the IT system (Aksoy 1990). The fact that technical problems arising during the innovation/diffusion process require joint collaboration between suppliers and users has some major implications, particularly in that competitiveness of the supplier becomes structurally linked to competitiveness of the user (Perez, 1988).

METHODS

Developed under the GEC project framework, this report incorporates the results of previous baseline papers and information collected in the last five years about e-commerce diffusion and its impacts. It is based on primary information obtained from the survey of 10 countries carried on by CRITO. In Brazil, the survey included 200 firms of different sizes, from three different broad sectors of the economy (manufacturing, distribution and finance). Secondary data included technical literature review, websites and non-printed information. Also, interviews with financial sector specialists were undertaken for preparing the case study on Internet banking.

E-COMMERCE READINESS

Information Infrastructure

The rapid evolution of IT infrastructure in Brazil shows that there are already grounds for e-commerce development in most regions and business sectors. Brazil was a latecomer in privatizing and opening its telecommunication network to new competition and it did so at the opportune time of the "dot com bubble". Encouraged by very positive worldwide market signals and a hungry unsatisfied local demand, new entrants heavily invested in new capacity. From 1998, when the telecom system was privatized, to 2000, telecom investments reached an average of 1.49 percent of GNP a year, a percentage well above both Brazilian and Latin American historical levels. In 2001, foreign investment in telecommunications declined, but still represented 20 percent of total FDI in Brazil. From 1994 to 2001, according to ANATEL[2], the Brazilian share of total Latin American fixed telephone lines jumped from 26 percent to 43 percent. Available fixed lines more than doubled from 1998 reaching 47.8 percent in 2001 and the network was almost entirely digitalized (97.5 percent). In 2002 there were 32 million cellular phones in service, representing the 8th largest installed base in the world. A surprising indicator is the recent upsurge of households with telephone services. In 2001, 58.9 percent of Brazilian households had telephone service (7.8 percent with cellular phones only), compared to 37.6 percent in 1999[3] (Table 1). Service quality has also improved substantially since privatization. These may be interpreted as encouraging indicators of e-commerce readiness.

However, the boom in telecommunications infrastructure investment in Brazil is now over. About 10 million lines were reported to be idle by mid 2002, since Telecom Operators could not find new clients able to pay the bills. Future expansion would occur mainly in lower income urban populations where paying telephone bills is obviously a secondary priority as compared to buying food, electricity and paying transport fares to go to work. Since the problem is now on the demand side, alternative solutions are needed to reduce costs and tariffs if universal access becomes a priority. These include public and shared facilities for telephone and Internet services, direct subsidies to reduce service costs, pre-paid telecom services and cost saving innovations. Some of these solutions are already in force. In 2001 there were already 1.4 million public telephone lines installed all over Brazil (compared to 300 thousand in 1994) due to contract universalization obligations assumed by telecom services incumbents.[4] Public phone density in Brazil is now 8 per 100 inhabitants as compared to 2.8 in the rest of Latin America and 2.0 in the world average.[5] Pre-paid service is already widely used for cellular (68 percent of total subscriptions in 2001) and is now being introduced in fixed telephone lines as well. These solutions, however, are oriented towards basic voice services rather than the Internet.

[2] www.anatel.gov.br/biblioteca/publicacao/balanco. 17 September 2002.
[3] Source: PNAD/IBGE, 2002. www.IBGE.gov.br/pnad. 20 September 2002.
[4] The privatisation program included universalization goals for main incumbents as a condition to enter in new services (such as cellular and long distance) and obtaining new concession areas.
[5] Source ANATEL (see note 1).

TABLE 1
Evolution of Telecommunication Infrastructures in Brazil

Telecommunications Infrastructure	1995	1996	1997	1998	1999	2000	2001	2002
Telecom investment as percent of GDP	0.63	0.88	0.86	1.35	1.25	1.49		
Main phone lines per 1,000 population	85.12	95.68	106.57	120.51	148.73	181.8	224[a]	280[a]
Cell phone subscribers per 1,000 population	8.25	15.82	28.46	46.79	89.49	136.31	170[a]	
Percent of digital phone lines	46.7	57.13	67.8	73.16	84.59	92.5	97.2[a]	
Percent of household with telephone line[b]					37.6		58.9	
Cable subscribers per 1,000 population	8.35	11.75	12.9	11.96	11.5	13.7		
Home satellite antennas per 1,000 population	.	.	2.46	3.69	5.17	7.02		

Source: International Telecommunication Union, Yearbook of Statistics 1991-2000. Geneva: International Telecommunication Union, 2001.
[a]ANATEL (www.anatel.gov.br)
[b]IBGE, PNAD 2002. www.ibge.gov.br

The Brazilian case illustrates the challenge of universalizing telecommunications services in developing countries where poverty and uneven income distribution do not favor a purely market oriented solution. When telecom services was a state owned monopoly, low telephone density was usually referred to as a supply problem. But when supply was enhanced through privatization and competition, the problem shifted to the demand side.

Whereas there are limits and opportunities of IT development in a large developing country environment, telecom infrastructure does not seem to be a major problem for e-commerce diffusion in Brazil anymore, since the relatively large absolute size of the market has encouraged private investments in sophisticated services such as corporate high-speed networks and wide band Internet services. These conclusions match the expectations explicated in *Theme 1* about the role of infrastructure.

Internet Infrastructure

Internet infrastructure may follow the same diffusion pattern presented by telecom services. It is still growing fast but may soon reach a ceiling. A national sample research on households (IBGE, 2001) shows that 12.6 percent of households had PCs and 8.6 percent had Internet access. Since this information was collected for the first time in 2001, comparisons over time cannot be made yet. Other sources (see Table 2) show that Internet infrastructure is growing at a very fast rate. Internet hosts per 1,000 people have been doubling every year, while the number of users is showing a positive but decreasing rate of growth. Investment in IT as percentage of GNP has been growing steadily and is the highest rate among Latin American countries. Along with Mexico, Brazil is the only Latin American country with substantial IT hardware production. However, Brazil produces mostly for the internal market and is also a heavy importer. Software piracy rates are declining steadily since Brazil joined the WTO's Trade Related Intellectual Propriety System Agreement (TRIPS) in 1996. By signing TRIPS, Brazil recognizes all patent rights for software and related products.

TABLE 2
Internet, IT and E-Commerce Evolution in Brazil

Internet and IT Infrastructure	1995	1996	1997	1998	1999	2000	2001
Internet hosts per 1,000 population	0.13	0.49	0.73	1.3	2.66	5.15	
Internet users per 1,000 population	1.09	4.69	8.19	15.07	20.83	29.39	
Percent of households with Internet access[a]							8.6
Internet access, 20 hrs, peak US$PPP[i]							5.95
Internet access, unmetered							7.81
IT as percent of GDP	0.98	1.15	1.47	1.61	2.21	2.38	
PCs per 1,000 population	17.33	21.54	26.27	30.15	36.31	44.09	82[b]
Percent of households with PCs[a]							12.6
IT hardware production, US$M	6,500	7,700	8,150	8,320	8,569	9,083	
IT hardware exports, US$M	186.00	205.00	257.00	249.00	321.00		
Software piracy rate	0.74	0.68	0.62	0.61	0.58	0.58	

Source: International Telecommunications Union (ITU), International Data Corporation (IDC_, World Bank, Reed Electronics Research, Netcraft, BSA Piracy Study, International Labor Organization (ILO), OECDSources: International Telecommunications Union (ITU), International Data Corporation (IDC_, World Bank, Reed Electronics Research, Netcraft, BSA Piracy Study, International Labor Organization (ILO), OECD.

[a]Source PNAD/IBGE. Information about PC and Internet were included in PNAD in 2001 only.

[b]Souce FGVSP (2002)

A recent survey (FGVSP, 2002) of 1,260 medium and large Brazilian firms shows that 70 percent of firms' staff has access to microcomputers and 46 percent to the Internet. Surveyed firms spent on average 4.5 percent of total sales in IT, against an estimated investment of 8 percent in the USA, 5 percent in Europe and 3 percent in Latin America. In Brazil, the service sector leads with 7 percent followed by manufacturing (3 percent) and distribution (2 percent).

E-Commerce Readiness

E-commerce readiness can be evaluated in terms of firm level measures by industry, type of technology and applications and integration with other systems. The survey conducted for the GEC project shows that readiness varies substantially across sectors and establishment size. As expected, large establishments are more equipped for e-commerce than smaller ones (see Table 3). Wide gaps can be noticed in Intranet use (36.8 percent in small versus 71.7 percent in large establishments), and Electronic Data Interchange - EDI (35.7 percent versus 71.9 percent).

Differences also arise according to industry sectors. The finance sector is the lead user in applications related to customer and information services, such as web-site availability (84.5 percent of surveyed establishments) and Extranet (46.4 percent). It is also the lead in Intranet (50.1 percent). The manufacturing sector is the larger user of EDI (38.9 percent) and call centers (46.8 percent). EDI is used to manage the supply chain, linking trading partners to source, manufacture and deliver products. This reflects the need for faster and more customized deliveries that require new inventory management policies and transportation choices among a relatively stable range of partners. Call center diffusion in manufacturing firms is oriented to

customer support services and sales. Finally, the distribution sector is a heavier user of electronic funds transfer than other sectors.

Internet banking requirements are usually different from both manufacturing and distribution sectors. While manufacturers and distributors use e-commerce for managing the supply chain, banks and other financial institutions need to interact with a large mass of clients. Enabling EDI based mechanisms such as standardized formats, protocols, authentication services, are more suitable to sectors that concentrate linkages across a particular industry, and have a relatively small number of business partners. Retail banking, in contrast, serves millions of people and needs open web solutions.

TABLE 3
Use of E-Commerce Technologies, 2002

	Establishment Size[a]		Sector[b]			Total	
Percent using …	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
E-mail	100.0	99.9	100.0	100.0	99.9	100.0	98.5
Web-site	70.4	80.8	77.7	67.1	84.5	70.7	74.1
Intranet	36.8	71.7	45.2	34.0	50.1	37.7	63.6
Extranet	32.9	44.6	41.4	29.2	46.4	33.2	32.7
accessible by suppliers/ business partners[e]	10.1	33.7	22.3	4.8	35.6	10.7	20.9
accessible by customers[e]	15.5	28.6	21.8	12.5	35.1	15.9	17.8
EDI	35.7	71.9	38.9	35.8	35.1	36.7	44.3
over private networks only[e]	7.0	25.8	4.2	9.2	2.7	7.5	19.4
Internet-based only[e]	6.9	10.4	11.6	4.6	15.6	7.0	8.4
both[e]	21.8	35.7	23.1	22.0	16.8	22.2	15.9
EFT	52.0	66.5	45.5	54.8	51.8	52.4	43.4
Call center	45.6	62.5	46.8	46.3	35.1	46.1	32.3

Source: CRITO Global E-Commerce Survey, 2002

[a] SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

[b] Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

[c] Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Brazil by sector are 68 establishments in manufacturing, 68 in wholesale & retail distribution, and 64 in banking & insurance; by size are 98 establishments classified as SME and 102 as large.

[d] Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

[e] Percentages based on total sample.

E-commerce readiness can also be measured by the degree of Internet applications integration with organization information systems (IS) and databases and with suppliers and customers. Table 4 shows that roughly half of the surveyed large establishments and of those coming from the finance sector presents a great deal of integration with their internal IS and databases. Manufacturing is the least integrated, since 83.6 percent of the surveyed establishments report little or no integration. Distribution falls in between.

Integration with suppliers and customers is not as advanced as with internal IS. About 90 percent of surveyed establishments show little to no integration and exceptions are again in large financial establishments.

TABLE 4
Enterprise Integration Strategy, 2002

	Establishment Size[a]		Sector[b]			Total	
Extent to which internet applications are electronically integrated with …	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Internal databases and information systems[e]							
Percent little to none	58.9	42.0	83.6	47.2	31.2	58.4	52.5
Percent some	12.0	10.3	.7	17.2	18.8	12.0	23.6
Percent a great deal	29.1	47.7	15.6	35.6	50.1	29.6	23.9
Those of suppliers and business customers[f]							
Percent little to none	90.0	70.2	95.8	87.3	70.4	89.4	72.1
Percent some	8.5	16.1	1.8	12.0	11.2	8.7	18.3
Percent a great deal	1.6	13.7	2.5	.7	18.4	1.9	9.6

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See Table 3
[e]Exact wording of question: Using a 5-point scale where 5 is "a great deal" and 1 is "not at all", please rate the extent to which your internet applications are electronically integrated with your internal database and information systems. Scores of 1 or 2 are categorized as "little to none", a score of 3 as "some" and scores of 4 or 5 as "a great deal".
[f]Exact wording of question: Using a 5-point scale where 5 is "a great deal" and 1 is "not at all", please rate the extent to which your company's databases and information systems are electronically integrated with those of your suppliers and business customers. Scores of 1 or 2 are categorized as "little to none", a score of 3 as "some" and scores of 4 or 5 as "a great deal".

As far as international comparisons are concerned, the survey on e-commerce readiness shows some surprising results considering the high level of economic development of most countries included in the GEC survey. Brazilian firms rank above the global average in e-mail, Extranet, EFT and call centers, but are below average in web-site availability, Intranet and EDI. The survey also shows a large percentage of Brazilian firms integrating with internal databases and information systems (29.6 percent) compared to the global average (23.9 percent). Integration with suppliers and business customers is below the global average. However, this is an advanced application fully adopted by less than 10 percent of surveyed firms worldwide.

KEY BARRIERS AND INCENTIVES

Drivers for Internet Use

The findings of the GEC survey on driving forces for e-commerce adoption in Brazil show that large firms perceive opportunities more clearly, since they are better prepared than smaller firms. Large firms usually have strong motivations for e-business, since they face several opportunities for cost reduction and market expansion. These findings support *Theme 2* expectations about the influence of size in e-business adoption. The only item which smaller firms attribute a higher importance than larger firms is that e-commerce is required for government procurement. In Brazil, the online federal government-purchasing site *Comprasnet* gives preference to small and

medium size firms. Also, government influences Internet diffusion by requiring tax payers to use online services, a finding that enlightens the questions raised in *Theme 6* about the role of government policies.
The industry analysis distinguishes driving forces, revealing different perceptions across sectors. The main driving forces for both large and small firms are cost reduction, followed by expansion of existing markets, entering into new business, and improving coordination with customers and suppliers. Firms coming from the banking, insurance and other financial sectors understand that e-commerce is a very significant factor for expanding existing markets (91.2 percent), second to the perception that customers demand it and that it improves coordination with customers and suppliers (67.8 percent). Internet banking is already a widespread business practice in Brazil and a major tool for reaching new customers. Internet is rapidly forcing change in this business sector by having 24 hours self-service systems in which customers look for information and transfer funds and investments.

In comparison to other industry sectors, retail and wholesale distribution firms attribute different weights for e-commerce driving forces. As intermediaries between producers and consumers they attribute the highest importance for improving coordination with customers and suppliers (62.6 percent). Also, as distributors, they are more sensible for government on-line procurement requirements than other industry sectors.

E-commerce in the manufacturing industry is driven, more than any other sector, by cost reduction perspectives (66.5 percent). Supply chain management is becoming a competitive weapon for inventory reduction and speed of business cycles. The manufacturing sector in Brazil is also sensitive to the demand of large customers, such as wholesale and retailing distributors commanding a demand-driven chain or large manufacturers buying components online.

These results fully support our previous expectations about key driving forces for e-commerce diffusion (see *Theme 3*). The CRITO survey for Brazil ranks cost reduction, expansion of existing markets, entering into new business, and improving coordination with customers and suppliers as major drivers. While productivity growth is the single most important driving force for manufacturing, the finance sector focuses on the opportunities to expand and improve their relationships with clients.

E-commerce usually changes existing business models and promotes a process of re-engineering the value chain (Fariselli, 2002). It improves the internal relationships within enterprises by integrating information flow, providing flexibility and increasing value from external relationships. Also, the digital market for goods and services opens networks to companies that are outsiders, without necessarily incorporating them into stable relationships. The question that arose in *Theme 3* regarding the reconfiguration of networks can be explored in Table 5. The Table shows that customer demand is a more important driving force for Brazil (44.7 percent) than for the global sample average (36.9 percent). This may be interpreted as pressure coming from global players for e-commerce adoption in less developed countries. It can be noted that large firms, usually more integrated to the external market through import and exports, are more savvy with customers and suppliers demands for e-business than SMEs.

In relation to Internet use, Brazilian firms seem to perceive more opportunities than their global counterparts. With only one exception (major competitors were online) they give more importance to suggested drivers than the global average. This is consistent with Zhu et al (2002) findings that "firms are more cautious in adopting e-business in high E-B intensity countries."

TABLE 5
Drivers For Internet Use, 2002

	Establishment Size[a]		Sector[b]			Total	
Percent indicating driver is a significant factor …[e]	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Customers demanded it	44.4	56.3	28.5	50.4	67.8	44.7	36.9
Major competitors were online	26.3	48.8	7.5	34.8	38.5	26.9	31.3
Suppliers required it	23.7	45.1	7.2	30.8	41.9	24.3	22.3
To reduce costs	60.5	71.6	66.5	58.3	63.7	60.8	35.7
To expand market for existing product or services	59.1	67.5	47.6	62.7	91.2	59.3	47.9
To enter new businesses or markets	53.8	64.1	36.4	61.8	67.1	54.1	42.0
To improve coordination with customers and suppliers	60.8	66.6	56.1	62.6	67.8	60.9	43.7
Required for government procurement	25.6	18.5	2.9	35.8	20.4	25.4	15.2
Government provided incentives	14.3	21.5	4.3	18.3	31.2	14.5	8.3

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See Table 3
[e]Exact wording of question: Using a 5-point scale where 5 is "a very significant factor" and 1 is "not a factor at all," please rate how significant each of the following was to your organization's decision to begin using the Internet for business. A score of 4 or 5 was classified as "a significant factor".

Barriers and Difficulties

The evidence provided in Table 6 explains the nature of barriers faced by different industries for e-commerce implementation. E-commerce implementation involves profound changes in business organization, government regulation, and human experience. Since these changes are of institutional nature, they are usually more difficult and time consuming to overcome than the introduction of new equipment and software. Overall, major barriers are related to government regulations, including concern about privacy of data or security issues (48.6 percent), lack of business laws for e-commerce (31.6 percent), and inadequate legal protection for Internet purchases (41.4 percent). These findings support *Theme 6* regarding the role of government policies and the legal framework for e-commerce diffusion. As e-commerce grows, firms face increasing difficulty dealing with electronic signatures, electronic contracts, intellectual propriety rights, jurisdiction, privacy, and consumer rights. Companies within the distribution sector seem to face larger legal barriers than those in the manufacturing sector.

Once e-commerce is implemented, some major problems with maintaining e-business operations were inadequate legal protection and business laws. The distribution sector seems to be more affected by these problems than other industries. Potentially everything on the Internet is intellectual property: movies and video clips, banner ads, legal documents, databases, articles, etc. The mechanisms to protect all these digital property are still developing by both legal and private means.

These results do not give support to our previous (Tigre and Dedrick, 2002) proposition that government plays a more effective role as user and inducer of e-commerce practices than just issuing detailed regulations. Although government may indeed play a role as inducer, especially for SMEs and the distribution sector, adequate legal protection is even more important for e-commerce diffusion. As Table 5 shows, 25.4 percent of total Brazilian firms consider online government procurement to be a driver for Internet use versus 15.2 percent for the global sample. Also, incentives such as tax rebates in IT purchasing plays a positive role for large firms and those from the finance sector. However, the GEC survey revealed that the absence of legal protections is considered a larger problem than expected. In relation to *Theme 6*, we conclude that, at least in developing countries, government policies must include both "demonstration projects" aiming at attracting new firms to the net and promotion and enforcement of legal measures to protect them from negligence and fraud.

Another conclusion is that small firms face more barriers than large ones. The only exception is the prevalence of credit card use that was considered to be more of an obstacle for large firms. This result gives additional support to *Theme 3* proposition of size as a driving force for e-commerce diffusion. The fact that customers do not use technology is also a barrier that affects SMEs rather than large firms.

As for industry sectors, it can be noted that retail and wholesale distribution face more obstacles than other sectors, except with credit card use. The use of credit card for e-commerce was the lowest reported obstacle overall. As shown in a previous paper (Tigre and Dedrick, 2002) Brazilian consumers are now the largest users of credit cards in Latin America and the country ranks 8th world wide, with about 30 million cards issued and over 1 billion transactions a year. In 2000, overall purchases by credit cards reached US$ 26.5 billion, equivalent to 7 percent of total private domestic consumption in Brazil[6]. Manufacturing seems to face lower obstacles, since they work with fewer customers and usually do not need to have face-to-face customer interaction.

Table 6 shows that finding staff with e-commerce expertise is a problem mainly affecting the distribution sector. Traditionally, this sector pays lower salaries than both manufacturing and finance. Consequently, this sector may face difficulties in attracting skilled people. It can be noted that there is a correlation between advanced use of e-commerce in the distribution sector and its difficulty in recruiting qualified staff. This finding gives support to the Zhu et al (2002) hypothesis of the role of firms' technological competence in e-commerce diffusion (*Theme 4*). "Firms with higher levels of technological competence are indeed more likely to adopt e-business."

Since the problem of finding staff with e-commerce expertise is larger in Brazil (34.2 percent) than in the global sample (26.5 percent), we must also look at the state of a country's educational levels and local readiness to increase the use of information technologies. There were 3 million university-level students in 2002, a 43 percent increase over 1998 (INEP, 2003). The problem of skill shortage seems to be associated to insufficient on-the-job experience to develop and adapt information technologies to specific applications and business environments, rather than to the

[6] Source: Gazeta Mercantil Latino-Americana, 12-18 Feb. 2001 pp.26.

lack of basic skills. In Brazil, the stock and growth of graduates with technical degrees in engineering, mathematics, telecommunications and computer sciences are likely to match industry demand. A positive indicator of the availability of IT capabilities revealed by the GEC survey is the level of ability to use the Internet as part of business strategy. This is considered to be less of a barrier in Brazil (22.4 percent) than in the global sample (24.8 percent).

TABLE 6
Barriers/Difficulties, 2002

	Establishment Size[a]		Sector[b]			Total	
Percent indicating statement is a significant obstacle[e]	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Need for face-to-face customer interaction	32.6	30.2	26.0	34.7	40.0	32.5	33.8
Concern about privacy of data or security issues	48.4	55.1	17.1	61.1	46.4	48.6	44.2
Customers do not use the technology	48.5	20.0	38.5	51.7	31.4	47.6	31.4
Finding staff with e-commerce expertise	34.3	32.2	16.7	41.0	29.8	34.2	26.5
Prevalence of credit card use in the country	22.9	33.8	26.3	22.0	22.3	23.2	20.3
Costs of implementing an e-commerce Site	33.4	39.3	18.0	39.0	35.6	33.6	33.6
Making needed organizational changes	32.6	41.1	16.5	38.9	40.5	32.9	23.9
Level of ability to use the Internet as part of business strategy	22.3	24.8	4.5	29.0	25.7	22.4	24.8
Cost of internet access	20.7	8.9	1.4	28.7	11.2	20.4	15.1
Business laws do not support e-commerce	31.9	22.2	26.1	34.3	22.2	31.6	24.2
Taxation of internet sales	27.1	17.6	3.3	35.8	36.3	26.8	16.5
Inadequate legal protection for Internet purchases	41.6	34.4	36.2	43.2	46.9	41.4	34.1

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See Table 3
[e]Exact wording of question: Using a 5-point scale where 5 is "a very significant obstacle" and 1 is "not an obstacle," please rate how significant the following obstacles are to your establishment's ability to do business on-line. A score of 4 or 5 was classified as "a significant obstacle".

As far as Internet costs are concerned, Table 6 shows that Brazilian firms experienced a barrier equal to that of their global counterparts with implementation of an e-commerce site (33.6 percent). The cost of Internet access is considered a large problem in Brazil, but it seems to be restricted to SME and the distribution sector. It was not considered to be an important problem for large firms or those from the banking sector. Internet dial-up prices in Brazil are less than US$ 10 a month for unmetered service, according to our survey of major providers (see Table 7).

TABLE 7
Internet Access Prices

Internet Provider	20h/month (US$ per month)	Unmetered (US$ per month)
AOL	5.51	9.20
UOL	7.09	7.88
Terra	5.24	7.87
BOL	-	6.29
Average	5.95	7.81

Source: Internet providers' websites. Converted to US dollar at R$ 3.80. Quoted on 09/30/2002

The Role of Globalization

The use of the Internet and e-commerce in Brazil is influenced by local forces rather than by global forces. For the most part, Brazil is not part of global production networks, but of local/regional networks. Brazil has a 2.74 percent share in the world GNP, but its participation in world trade is only 0.87 percent (Abreu, 2002).

The inward orientation of the Brazilian economy is somewhat similar to other large continental countries such as China, Russia, India and the USA. Kraemer, et al (2002) found that U.S. companies are not as global as other firms included in the global sample prepared for the GEC project. Table 8 shows that U.S. firms earn 5 percent of their total sales abroad, a figure above Brazilian firms, but well below the global sample. U.S. firm procurement spending abroad (8.2 percent) is even smaller than Brazilian firms (9.8 percent), showing a significant difference from the global sample (20.3 percent).

The CRITO survey widely confirms the inward orientation of the Brazilian economy (Table 8). Only 4 percent of companies have establishments abroad, compared to 23.9 percent in the global sample, showing that export and import operations are not as important in Brazil than in other countries. Overseas sales represented a mean of only 3.7 percent in the Brazilian sample, against 12.1 percent in the global sample, while the relation for procurement is 9.8 percent versus 20.3 percent. Also, Brazilian firms are perceived to be less affected by competitors abroad.

According to Gibbs, et al (2002), transformation theorists regard globalization as an uneven process involving elements of both convergence and divergence, in which countries around the world are experiencing a process of profound changes as they try to adapt to a more interconnected but uncertain world. Brazil seems to react to the uneven globalization in a particular way. The CRITO survey shows that manufacturing is the most globally integrated sector concerning both sales (14.6 percent) and procurement (24 percent) abroad. Since Brazil is a relatively small player in the global manufacturing industry, there are few incentives coming from the global supply chain. On the other hand, the leading e-commerce sector in Brazil, finance, is the least involved in foreign transactions according to the CRITO global sample. Overseas sales account for 8.1 percent of total finance corporations' turnover while procurement is only 4.6 percent.

TABLE 8
Globalization Indicators, 2002

	Establishment Size[a]		Sector[b]			Total	
	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Percent of companies with establishments abroad	3.5	22.9	2.5	4.3	11.4	4.0	23.9
Percent of companies with headquarters abroad	3.2	10.5	.9	4.2	6.2	3.4	8.5
Mean percent of total sales from abroad	3.3	17.9	9.3	1.8	3.7	3.7	12.1
Mean percent of total procurement spending from abroad	9.7	15.2	10.4	9.8	5.3	9.8	20.3
Degree affected by competitors abroad[e]							
Low	89.4	61.5	75.9	95.1	74.5	88.7	68.3
Moderate	3.8	13.1	11.5	.2	12.0	4.0	15.7
High	6.8	25.3	12.6	4.6	13.6	7.3	15.2

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See Table 3
[e]Exact question wording: "Using a 5-point scale where 5 is significantly affected and 1 is not at all affected, please tell me how much your establishment is affected by competitors from outside your country." Scores of 1 and 2 were classified as low, a score of 3 as moderate, and scores of 4 and 5 as high.

DIFFUSION OF E-COMMERCE

Diffusion by Size of Firms and Industry Sectors

Technological diffusion is the process of the spread and use of new technology. By all indicators, e-commerce is growing fast in Brazil. In only two years, electronic trade grew 20 fold, jumping from US$ 100 million to nearly US$ 2 billion. In 2000, it represented 0.32 percent of GDP and B2B was responsible for about 90 percent of total e-commerce. Secure servers, which constitute a good proxy for e-commerce development, reached 0.59 per 100,000 populations as Table 9 shows.

TABLE 9
EC Diffusion indicators in Brazil.

Indicator	2000
Secure servers per 100,000* pop.	0.59
B2B trade in US$M	1,720.78
B2C trade in US$M	202.86
E-Commerce in US$M	1,923.63
Percent E-Commerce sales of GDP	0.32

Source: IDC, Internet Commerce Market Model, Version 8.1 (2002).

The data provided by the GEC survey is quite clear about the nature of e-commerce use across industries and firms. In Brazil, the financial sector is the lead user for marketing, online sales, and after sales service and support. The manufacturing industry, in contrast, leads data exchange with suppliers, customers and business partners. The distribution industry does not lead any particular applications, but all three sectors share a similar level of online purchasing (see Table 10).

TABLE 10
Uses of the Internet, 2002

	Establishment Size[a]		Sector[b]			Total	
Percent using the Internet for …[e]	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Advertising and marketing purposes	58.6	59.1	73.9	50.7	90.8	58.6	57.6
Online marketing sales	28.0	32.3	13.4	33.6	43.1	28.2	29.9
After sales customer service and support	22.6	40.1	25.9	21.2	38.4	23.1	43.7
Making purchases online	54.7	63.4	56.7	54.1	55.7	54.9	46.8
Exchanging operational data with suppliers	51.6	62.4	64.6	46.7	50.1	51.9	48.1
Exchanging operational data with business customers	49.0	56.5	57.2	45.9	49.2	49.2	50.7
Formally integrating the same business processes with suppliers or other business partners	48.8	48.1	54.5	46.4	50.7	48.8	33.9

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See Table 3
[e]Exact wording of question: Does your establishment use the Internet for …

Table 11 shows that large firms have more intense e-commerce users in all applications. Overall, advertising and marketing are the largest application followed by online purchasing. Online sales are the least diffused application, especially in small manufacturing firms.

Most firms have already heard about the concept of an electronic marketplace but few participate effectively. Brazilian firms participate more as buyers and less as sellers than their global counterparts. Manufacturing firms are most active as sellers in specialized marketplaces.

TABLE 11
Participation in an Internet-Based Trading Community, 2002

	Establishment Size[a]		Sector[b]			Total	
	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Percent who have heard of the concept of an Internet marketplace[e]	84.5	76.6	87.4	83.4	75.6	84.3	80.0
Percent participating as a buyer only[f]	10.9	11.7	12.8	10.3	7.2	11.0	6.7
Percent participating as a seller only[f]	10.7	3.5	23.1	5.1	8.5	10.5	12.2
Percent participating as both a buyer and seller[f]	7.0	8.8	11.1	5.1	13.5	7.1	16.9

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See Table 3
[e]Exact wording of question: "Have you ever heard of the concept of an Internet marketplace, exchange or trading community, through which multiple businesses buy and sell goods and services?"
[f]Percents based only on those establishments which have heard of the concept of an Internet marketplace.

Diffusion of the E-Commerce Industry

E-commerce companies created

Whereas in the recent past e-commerce was dominated by new companies, nowadays pre-existent market leaders seem to be rapidly recovering business through the new channel. In Brazil some start-ups were able to keep growing fast in both retail and wholesale distribution. In the banking sector, *Banco 1* was the most successful virtual company created, but it was soon taken over by a "real" financial institution.

Universo Online (UOL), a locally owned ISP leads the Internet access market. Other large ISP's were taken over by telephone operators. These include IG (owned by Telemar) and Terra (a subsidiary of Telefonica). The links between telephone operators and Internet services providers are seen as unfair competition, providing free services using cross-subsidies. AOL failed to reproduce its worldwide success in ISP markets locally. Other U.S. companies, however, were successful in adapting their content to local language. Portals such as E-bay, Google and Yahoo are very popular in Brazil.

In retail, *Submarino* is probably the most successful Brazilian owned virtual shop. It was founded in 1999 and according to its website (www.submarino.com.br), holds 10 percent of the Brazilian B2C market share which corresponds to about US$ 40 million in sales. It sells 16 categories of products online including books, CDs, DVDs, audio and video equipments, home products, and tools. In 2001, *Submarino* handled more than 1.5 million orders and sent over 3.0 million items. Among almost 5,000 locations attended, 850 were outside the country. Over 720,000 people visit the site monthly. In only three years it managed to attract more than 1 million assigned customers. However, existing supermarkets and distribution chains (such as *Americanas.com and Pão de Açucar*) seem to be gradually gaining e-commerce markets as well.

Several new B2B firms have emerged in the last five years. *Mercosur Search* (www.mercosulsearch.com.br) is a prize winning Website oriented to both B2B and B2C markets. It provides technical services and market information to small and medium firms aimed at entering the Latin American and global markets. Their goal is to become a regional marketplace and to provide services and technological support for online business. It was created in 1996 as a local information site, but rapidly developed into the wider project of a Mercosur[7] industrial marketplace. It now has about 5,000 clients.

E-commerce development and support activities

In order to explore the rapidly growing e-commerce industry, many software firms have shifted their focus to support online activities. However, new firms have emerged in the last five years aimed at exploring recently created opportunities such as data centers, web hosting, web development, web applications, and consulting.

[7] Mercosur is a free-trade agreement uniting Argentina, Brazil, Paraguay and Uruguay.

In Brazil, traditional IT firms such as IBM and Unisys took advantage of their large customer base and technical expertise to enter the e-commerce support market. IBM probably leads e-commerce software and support activities by providing turnkey solutions and data center management services. Its CRM (*Customer Relationship Management*) system is reputed to be the best seller in Brazil, in a market fiercely disputed by local and foreign firms.

As for new companies, two success stories of supporting start-ups deserve to be mentioned: *Modulo Security Systems* and *Everysystems Informatics.* Not surprisingly, both are oriented towards the Internet banking market, which is the most successful sector in Brazilian e-commerce development.

Modulo Security Solutions leads the growing market for securing information and financial transactions in Brazil. It also secures the Brazilian electronic election system, a success that became an international case study for Microsoft (see www.microsoft.com/security/resources/bnecasestudy.asp). *Modulo* has developed solutions for Internet tax collection in Panama and is undertaking certification processes and legal procedures to start selling their security software to the American government.

Everysystems Informatics was founded in 1992 as a financial software development firm. Recently, it shifted to the Internet banking market and is now exporting software and services to 20 financial institutions in Latin American, Canada and Japan. It claims that more than 900,000 people all over the world already use their solution. *Everysystems* is now focusing on the smart card segment of the market where a boom is expected as a means of online money transfer.

In relation to the impacts of the Internet on industry structure we observed that e-commerce pioneers are successful when they are able to innovate by creating new services and business tools. Virtual firms oriented at traditional consumer markets such as books, CDs and home appliances are gradually loosing ground to pre-existent market leaders.

IMPACTS OF THE INTERNET AND E-COMMERCE

One remarkable phenomenon of the last ten years has been the rapid growth of business networks. Although this process started before the Internet was available for commercial use, e-commerce is reputed to have important network impacts (Table 12). Overall, about one-third of firms interviewed by the GEC survey in Brazil reported an increase in network impacts such as number of suppliers (39.8 percent versus 29.9% global sample) and distribution channels (35.2 percent versus 40.2 percent).

As for the effect of size, evidence shows that large firms, as opposed to small firms, more clearly perceive the opportunity of e-business increasing the number of distribution channels. They probably can rely on their well-known brand names to reach new online customers. About 40 percent of both large and small firms share the view that e-commerce has increased the number of suppliers. Small firms seem to be much more concerned with new competition coming from the net.

Two sectors of the Brazilian economy can be distinguished as perceiving the impacts of doing business online. The first is the banking sector where online competition is recognized to be important by more than half of surveyed firms. Most banks are using e-commerce to increase their client base, thus increasing the intensity of competition. The other is retail and wholesale distribution where e-commerce is perceived, more than in other sectors, as an opportunity to increase their supply base. The network impacts are least acknowledged by the manufacturing sector.

With regard to the impacts of e-business on industry structure and competition, more firms see e-commerce as increasing the intensity of competition (37.7 percent) rather than a facilitating tool to increase the number of competitors (27.7 percent). This result does not give support to the argument frequently raised in early e-commerce literature, that new technology would reduce entry barriers. On the other hand, it does support the expectation of increased competition.

Customer confidence is in fact an important aspect of e-commerce and brand names are likely to grant competitive advantages for established businesses facing new entry. There is already fierce competition based not only on products and services, but also on the operational aspects of the firm such as the ease of using web sites or the consumer's confidence in the security of transactions.

TABLE 12
Impacts of On-Line Business in Industry Structure, 2002

	Establishment Size[a]		Sector[b]			Total	
Percent indicating…[e]	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Number of distribution channels increased	34.8	48.5	26.6	37.7	56.6	35.2	40.2
Number of suppliers increased	39.7	40.5	36.6	41.2	36.9	39.8	29.9
Number of competitors increased	28.0	16.8	13.2	32.9	46.4	27.7	27.9
Intensity of competition increased	37.9	29.8	13.2	47.6	51.5	37.7	41.5

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See table 3
[e]Exact wording of question: "Please indicate whether the following have increased, decreased or stayed the same in your establishment since it began using the Internet for business."

As far as the impacts of doing business on-line are concerned, Table 13 shows that Brazilian firms feel more of an impact than the global sample of increasing staff productivity and sales, and improving customer services and coordination with suppliers. Also, they see the Internet as a procurement and inventory cost reduction tool by improving the management of the complex logistics of their supply, production and transportation chains. On the other hand, Brazilian firms showed lower benefits than the global sample in increasing international sales, widening sales areas and improving competitive position.

Large firms seem to be reaping more benefits from e-commerce than smaller firms by increasing internal efficiency, widening sales areas, improving customer service, coordinating with suppliers, and improving their competitive position. On the other hand, small firms seem to attribute more importance to inventory and cost reduction through e-commerce. Both large and

small firms tend to share similar perceptions about the impact of e-commerce on increased sales (2.6 points).

TABLE 13
Impacts of Doing Business On-Line, 2002

	Establishment Size[a]		Sector[b]			Total	
Percent indicating high impact[e]	SME	Large	Mfg.	Distrib.	Finance	Brazil[c]	Global[d]
Internal processes more efficient	32.4	52.6	38.8	29.6	57.0	32.9	33.9
Staff productivity increased	40.3	40.7	37.2	41.7	36.4	40.3	27.2
Sales increased	26.4	31.0	15.2	30.2	41.1	26.5	20.5
Sales area widened	27.4	40.8	5.8	36.2	39.4	27.8	31.4
Customer service improved	44.8	55.9	60.9	39.1	42.3	45.1	34.8
International sales increased	12.8	11.7	13.0	12.8	10.8	12.8	19.5
Procurement costs decreased	25.0	26.2	44.2	17.5	27.8	25.1	17.7
Inventory costs decreased	28.2	20.0	23.1	30.2	21.2	27.9	14.0
Coordination with suppliers improved	34.2	42.5	59.1	25.2	32.0	34.4	29.8
Competitive position improved	23.5	39.7	28.0	22.0	33.7	24.0	29.8

Source: CRITO Global E-Commerce Survey, 2002
Notes a to d: See table 3
[e]Exact wording of question: Using a 5-point scale where 5 is "a great deal" and 1 is "not at all", please rate the degree to which your establishment has experienced the following impacts since it began using the Internet for business. A score of 4 or 5 was classified as "high impact".

The finance sector is benefiting from e-commerce more than any other industry sector by improving internal efficiency, increasing sales and widening sales areas. The manufacturing sector, in contrast, recognizes the benefits of improving customer service, coordinating with suppliers and reducing inventory and procurement costs. These differences are typical of the nature of business. While banks and other financial firms use the Internet primarily as a marketing tool, manufacturing firms are looking for better coordination of the supply chain. All sectors are searching for improved internal efficiency through e-commerce, but the financial sector seems to enjoy more potential in this area, since it deals basically with information rather than physical products.

CONCLUSION

From the analysis of the six key-themes in the Brazilian context, the following conclusions emerge:

The telecommunication infrastructure is no longer a major barrier for e-business

In Brazil, the privatization of the telecom infrastructure coincided with the 1998-2000 "dot com boom." Technological innovations and existing unsatisfied demand further created an optimistic "Schumpeterian" wave that boasted telecommunications investments high above both historical and the Latin American average. As a result, basic and sophisticated services such as corporate high-speed networks and wide band Internet services are available. The problem of telecommunications is no longer on the supply side. Rather, the difficulties to further expand telecommunication services reside in the lack of effective demand by the predominantly poor

population. The international gap in most services seems to be closing and capacity in cables and digital switching is idle worldwide.

Retail banking is becoming a service supermarket

In Brazil, the financial sector is a lead user in marketing, online sales, and after sales service and support. Within this sector, retail banking is benefiting from e-commerce more than any other sub sector by improving internal efficiency, increased sales, and the widening of sales areas. Firms coming from the banking, insurance or other financial sectors understand that e-commerce is the most significant factor for expanding existing markets, second to the perception that customers demand it or that it improves coordination with customers and suppliers.

Brazilian banks enjoy economies of scope by acting as commercial, clearing, investment banks, building societies, security houses, insurance companies and stock exchange brokers. Moreover, the government in Brazil extensively relies on banks as intermediaries for its taxation and transfer activities. For this highly diversified range of activities, large banks can be described today as online "services supermarkets."

In contrast, the manufacturing industry leads in data exchange with suppliers, customers and business partners. It uses e-commerce to manage the supply chain, linking trading partners to the source, manufactures, and deliverer of products. The differences between finance and manufacturing Internet use are typical of the nature of their business. While banks and other financial firms use the web primarily as a marketing and data processing tool, manufacturing firms are looking for operational coordination and better logistics. Finally, the distribution sector attributes the highest importance to improving coordination with customers and suppliers. It does not lead any particular application since retail firms in Brazil are usually small and may face more obstacles than other sectors in regard to online sales.

High inflation drove IT use in the banking sector

Conventional wisdom assumes that a stable economic environment is a necessary condition for technology diffusion. In fact, economic uncertainties such as relative prices and market growth can be detrimental in investment decisions to incorporate new technology. However, IT seems to be an appropriate tool in dealing with unstable economic environments. By speeding up information flow, IT allows economic agents the ability to reap the benefits of high inflation rates. The case of the Brazilian banking industry illustrates this well. High inflation rates that prevailed for decades (until the mid-1990's) have provided an incentive rather than a barrier for banking automation. Banks perceived that an efficient information flow permitted them to capture extra revenue through online money transfers and overnight interest rates. Also, in a fierce competitive environment, firms seem to have incentives to search for new business tools to improve their access to markets and to reduce costs.

Information-intensity may be more important than size as an e-business driver

The Brazilian banking industry case showed, that for e-commerce diffusion, more important than the sector itself, is the scale of information flow with various agents within the economy. Information-intensity is, in part, related to the size of the business. The larger the firm, the easier it obtains scale benefits of digital services. However, some activities demand more information exchange than others. Retail banks dealing with small transaction amounts must have low-cost and reliable information systems if they are to remain competitive. In contrast, wholesale financial institutions deal with few high value operations that demand face-to-face contact rather than advanced e-business systems. While investment and development banks may present a similar turnover (as a measure of size) compared to retail banks, they are likely to be much less advanced concerning e-business.

The CRITO survey showed that large firms use e-commerce more intensely than SME's in all applications. It can be noted, however, that 70 percent of Brazilian surveyed SMEs already had a website and used the Internet as much as larger firms for applications such as advertising, marketing and online purchasing. Gaps are wider between small and large firms in Intranet and EDI only (applications that involve integration with internal databases and information systems and also to suppliers and business customers). The investments and capabilities necessary to implement such a system require a certain scale of operations to dilute fixed costs. Consequently, they may be beyond the will and possibilities of small firms.

Distribution and finance face similar driving forces unlike manufacturing

The findings of this study suggest that expansion of existing markets, entering into new business, and improving coordination with customers and suppliers are major drivers of e-commerce. However, there are important sector differences. The manufacturing sector is most driven by cost reduction perspectives, inventory reduction and improved logistics. While productivity growth is the single most important driving force for manufacturing, the finance and distribution sectors focus on the opportunities to expand and improve their relationships with clients.

Selling online is a much larger step than simply procuring

Overall, online sales are the least diffused application, especially in small manufacturing firms. There are three main barriers, according to the CRITO survey, for online business. First, selling online involves obstacles concerning privacy and security issues that require permanent investments in data security solutions. Second, most customers do not use the Internet for buying, especially the final user. Third, online sales require organizational changes and integration with internal systems. For most firms, the Internet is used as an auxiliary tool to direct the customer to a call center or a brick-and-mortar shop. The web sites inform the customer about products and services but few offer the possibility to do business online.

The Internet is increasing the intensity of competition rather than the number of competitors

Whereas past e-commerce was dominated by new companies, now pre-existent market leaders seem to be rapidly gaining business through the new channel. Since customer confidence is such

an important aspect of e-commerce, brand names are likely to grant competitive advantages for established businesses facing new entry. Also, the barriers between different types of service activities seem to be crumbling, opening room for economies of scope. The general purpose of the new technologies are likely to bring about further opening of market boundaries for many service activities, increasing both their domestic and international tradability.

Whatever the impact on industry structure, there will be fiercer competition on products and services and on the operational aspects of the firm, such as the ease of use of web sites or the consumer's confidence in secure transactions. This result does not give support to the argument frequently raised in early e-commerce literature, that the new technology would reduce entry barriers. On the other hand, it does support the expectation of increased competition.

Strong links between users and producers of IT solutions facilitate technological leadership

The case study on the banking sector showed that internal technological capabilities were key for e-commerce leadership, since they enhanced the user-producer links, providing flexibility and appropriation to specific needs. Equity links between the three largest Brazilian banks and major local IT companies have provided a testing ground and a market for IT innovations. By designing solutions for specific needs, they contributed to the banks differentiation strategies and provided efficient integration with banks internal organization routines. This pattern was not found in other sectors of the economy. In the past, some manufacturing firms invested in IT companies, but the lack of synergy and economies of scale in industrial automation systems drove them out of the equipment and software market.

The problem of finding staff with e-commerce expertise is larger in Brazil than in the global sample. However, looking at the fast growth of the Brazilian education system, we believe that the shortage of skills seems to be associated with insufficient on-the-job experience (in developing and adapting information technologies to specific applications and business environments) rather than the lack of formal training. This study also shows that finding staff with e-commerce expertise is a problem affecting a sector that traditionally pays lower salaries and is less innovative as a whole. The distribution sector in Brazil combines difficulties in attracting skilled people with lack of e-commerce leadership. The sector is unable to attract qualified staff either because it operates with low profit margins or invests less in technology. These findings give support to the Zhu et al (2002) hypothesis about the role of firms' technological competence in e-commerce diffusion. Firms with higher levels of technological competence are indeed more likely to adopt e-business.

Local rather than global forces drive e-business

E-commerce in Brazil is strongly anchored in information intensive sectors and little affected by foreign transactions. Local forces seem to play a more influential role due to Brazil's unique economic history and government policies, which have worked together to emphasize the use of IT over other economic sectors. Brazilian firms are not important global players. While Brazil has a 2.74 percent share in the world GNP, its participation in world trade is only 0.87 percent. The inward orientation of the Brazilian economy is somewhat similar to other large continental countries such as China, Russia, India and the USA.

Legal protection is a more important barrier than expected

The GEC survey revealed that the absence of legal protections is considered an important barrier for e-commerce diffusion. It includes lack of business laws for e-commerce and inadequate legal protection for Internet purchases, barriers affecting more than 40 percent of the surveyed Brazilian firms. These results do not give support to our previous (Tigre and Dedrick, 2002) proposition that governments play a more effective role as user and inducer of e-commerce practices rather than just issuing detailed regulations. Although government may indeed play a role as inducer, especially for SMEs and the distribution sector, adequate legal protection is even more important for e-commerce diffusion.

In relation to Theme 6, we conclude that, at least in developing countries, government policies must include both "demonstration projects" aimed at attracting new firms to the net, and promotion and enforcement of legal measures for protection from negligence and fraud. Government online procurement, for example, is an important driving force for small firms and those coming from the distribution sector, due to a policy designed to diffuse e-commerce in SMEs.

Appendix: Industry Subsector Case Study: Banking

Background and Evolution

In the last thirty years, Brazilian banks have evolved, through mergers and acquisitions, to become financial conglomerates with many branches scattered throughout a quasi-continental country (Cassiolato, 1992). In 2002, 186 banks had 17,300 branches and employed more than half a million people. In contrast to some developed countries where anti-trust legislation impedes commercial banks from diversifying their activities beyond certain limits, Brazilian banks are permitted to work as commercial, clearing, investment banks, building societies, security houses, insurance companies and stock exchange brokers. Moreover, the government in Brazil extensively relies on banks as intermediaries for its taxation and transfer activities. Public utilities also use the bank network as their single channel for issuing and receiving bills. Consequently, every citizen is a potential user of the system. For this highly diversified range of activities, large banks can be described today as online "service supermarkets".

Despite mergers and acquisitions the market is still very competitive. The largest private bank (Bradesco) holds 10 percent of the total market. State-owned banks, including national and regional development banks, hold 42 percent of the Brazilian market. Until the early 1990's, foreign bank subsidiaries operating in Brazil were restricted from expanding their branches and thus from entering some of the most lucrative niches in the market. Since the market opened, several more major international banks entered through acquisitions, but locally owned private banks still hold the top three positions. As compared to other countries, the Brazilian banking sector may be weighty but its share of GNP has been declining since high inflation was curbed[8].

[8] From 1990 to 2000, the sector GNP share was reduced from 12.8 percent to 4.7 percent. Instituto Brasileiro de Geografia e Estatistica: National Accounts. This information was obtained in O Globo, Oct.14, 2002, p.17.

In 2001, there were 63 million bank accounts, a 13 percent increase over the previous year. As Table 14 shows, the Brazilian banking industry has been consolidating at a slow pace. Deregulation brought new foreign competition and the need to further invest in service differentiation and cost reduction. From 1999 to 2001, the number of banks in Brazil fell by 6.2 percent. The goal of most mergers and acquisitions are to reduce operating costs and to enlarge the customer base. It can be noted that banks are mainly expanding through online services since the growth of call centers and ATM machines are much faster than brick and mortar branches.

TABLE 14
Recent evolution of banks and services network

Indicator	1999	2000	2001	Variation 01/00
Number of banks	194	193	181	-6.22%
Branches	16,158	16,590	16,847	1.55%
Call-centers	8,195	8,270	10,324	24.84%
ATM facilities	10,736	12,681	14,872	17.28%
Total	35,089	37,541	42,043	11.99%

Source: *Banco Central do Brasil.* Extracted from www.febraban.org.br/dados1.asp#, 10/18/2002

Key Environmental and Policy Influences

Traditionally, banks have been considered non-performers of R&D and 'passive' recipients of technology developed externally. In Brazil, however, the introduction of advanced technology in the financial sector has followed a significantly different pattern. The banking sector is not only the most significant private IT user but also a producer of technology. The three largest Brazilian banks (*Bradesco, Itaú* and *Bank of Brazil)* have been directly and indirectly involved in hardware and software production since the early 1980's. There were two major driving forces for this somewhat self-reliant strategy. One was technical and the other political.

The technical reason was that local banks, based on their early automation experiences, acquired technological capabilities to plan and develop their own IT strategies. Skilled managers in charge of system development demanded systems to match their specific solutions. In the early 1980s, IT multinational corporations (MNC) were used worldwide to supply the banking industry with standard mainframe-based solutions. The subsidiaries of these MNCs had neither the flexibility nor the required technology to design custom made systems. Consequently, some of the major banks in Brazil decided to enter directly into hardware and software production. The strategy was further facilitated by the existence of a critical mass of engineers in the banks' data-processing departments. According to Cassiolato (1992), the decision to adopt internally devised solutions was taken only after other alternatives failed (e.g. failure to convince traditional suppliers to make appropriate design changes to deal with poor results from imported equipment). Leading banks adopted a self-reliant strategy aimed at establishing strong links between users and producers of IT. While using IBM mainframes, they designed and manufactured terminals and other equipment locally. These capabilities were further explored by *Itaú Bank* to diversify into other branches of the electronics industry. Thus, the early diffusion of

IT production and use in Brazilian banks facilitated e-commerce development in this sector. The case of major Brazilian banks supports the T*heme 4* proposition that ownership links between users and software producers may also play a very positive role in e-commerce diffusion.

The political or policy reason for the banking sector leading in IT probably dominates the technical reason. Early government efforts towards the development of a domestic computer industry gave locally owned companies an important incentive to directly invest in hardware production. The protectionist policy adopted during the 1980s in the low end of the IT market provided an opportunity for diversification into a promising industry at its early stage of development. Also, since banks were major IT users, the strategy provided a user-producer link synergy. Since the early 1990's, when computer imports were liberalized, the local computer industry lost ground to imports, but the technological capabilities to introduce innovation in services are still present. Recent regulatory policies eventually stimulated innovation and the IT diffusion process. Brazilian banks have been continually subjected to changes in legal requirements specifically aimed at fostering automation. For instance, in 2002, the central bank forced the commercial banks to implement the Brazilian system of payments (an online money transfer system which replaces checks and money orders above a certain amount). This measure was taken on security grounds but is pushing financial institutions to further invest in IT. It also gives some light to propositions in *Theme 6* about the role of government and e-commerce diffusion.

Macroeconomic conditions, particularly the high inflationary environment, were also crucial for banks' automation strategies. Banks perceived that an efficient information flow permitted them to capture extra revenue through a system called 'float'. This was a system where banks could take funds in transit out of the system nightly and put them into overnight deposit accounts used to roll over the government debt. The central bank used to pay high nominal interest rates to these accounts. All the commercial banks had to do was to collect as much money as possible via their IT network during the period when the customer receives payment and the bank processes the customer's withdrawal. Large customers (and as the rate of inflation grew in the late 1980's, even smaller customers) were credited daily for part of this overnight revenue. However, banks retained a sizeable portion, which benefited their 'on-line' system. In Brazil's unstable economy, interest was compounded daily which was permitted by automation.

E-Commerce Readiness

The banking sector uses e-commerce essentially as a tool for customer relations. Online home banking started with dial-up services based on packaged software, but as Table 15 shows, Internet banking is replacing this service. In 2001, Brazil's web-based banking grew 56 percent, reaching 13 million clients (Table 2). The advantage of web-based systems is increased flexibility at the back-end to adapt to the new online transaction processing model. In contrast to packaged software, which offers a limited set of services, the web approach offers opportunities for e-commerce and other new online services without changing software. The Internet banking boom shows that consumers are becoming increasingly computer-literate and able to interact more easily with online financial service providers.

TABLE 15
Internet Banking Diffusion (millions of clients)

Type of Service	1999	2000	2001	Variation 01/00
Home clients with proprietary bank dial-up services	4.3	6.8	2.4	-64.09%
Office clients with proprietary bank dial-up services	0.6	1.5	1.3	-13.25%
Clients with Internet banking	-	8.3	13.0	56.63
Clients with access to bank call-centers	42.6	52.4	57.4	9.54%

Source: www.febraban.org.br/dados1.asp#, 10/18/2002

Despite large differences in wealth and market development, Brazilian banks are comparable to major international banks as far as Internet diffusion is concerned. *Bradesco*, with 1.5 million online clients, is third in the international Internet banking ranking, according to the consulting firm *Cluster*. Two other Brazilian banks are included in the top ten international web banking rating (Table 16).

TABLE 16
Worldwide Internet Banking

Position	Bank	Country	Users (millions)
1	Bank of America	USA	2.1
2	Wells Fargo	USA	1.8
3	Bradesco	Brazil	1.5
4	MeritaNordBanken	Finland	1.2
5	EGG	England	1.0
6	Royal Bank of Canada	Canada	1.0
7	Banco do Brasil	Brazil	0.9
8	CitiGroup	USA	0.8
9	Chase	USA	0.7
10	Itaú	Brazil	0.6

Source: Cluster. Extracted from Pagani, F. A Industria Brasileira de Software. Softex. www.softex.org.br., November, 25th , 2002.

Character of Readiness

Home and office banking began by EFT (electronic funds transfer), using proprietary software installed in client's computers. Communication was done through dial-up point-to-point modems rather than through the web. The system is similar to EDI based mechanisms using standardized formats and protocols. It is suitable for sectors that link across a particular industry, and have a relatively small number of business partners. The retail sector, in contrast, deals with millions of clients and needs more flexible access. As Table 18 shows, Internet banking in 2001 overcame EDI-like home and office banking. Internet based systems are better suited for home banking since they allow the bypass of subscriber-based online services and reach the customer's browser directly through the World Wide Web. The advantage of this model is the flexibility at the back-end to adapt to new online transaction processing models facilitated by e-commerce.

As compared to other sectors of Brazilian industry, the banking, insurance and other financial institutions are lead users of Internet for customer relations. The CRITO/IDC survey widely

confirms this perception of e-commerce strategies. Table 3 showed that 84.5 percent of financial establishments interviewed keep an organizational website accessible to the public. They use the Internet to attract new clients by providing information about existing services, simulating loans and opening new accounts. Web sites are becoming the most important show room for many financial institutions.

Most banks have developed an attractive online portfolio of products and services for customers. Now they offer a full range of financial services through the Internet. Customers can check their accounts, transfer money between accounts, pay bills electronically, review credit card account, buy and sell stock, and explore a wide array of services using interactive tools. Online external access to accounts and financial operations are more economical services than other methods (including ATMs) as the infrastructure costs (such as PC's) are shared with the customer.

Other data collected by the CRITO survey further support that the financial sector has the lead in customer online services. Banking, insurance, and other financial sectors lead the use of e-commerce in advertising and marketing (95.3 percent versus 58.6 percent in total), online sales (45.3 percent versus 28.3 percent), and after sales customer service (40.3 percent versus 23.3 percent). Major banks succeeded in establishing good customer service and developing effective back-office systems that support sophisticated retail interfaces. As expected, the banking sector is similar to both manufacturing and distribution in B2B e-commerce. These include exchanging operational data with suppliers, online purchases, and integrating the same business processes with suppliers and other business partners.

Type of Services Provided According to Bank Size and Ownership

Internet banking involves a range of services usually provided by other channels and other services that are exclusive to the Internet channel. A simple website cannot be classified as Internet banking. Rather, Internet banking includes not only information, but also transactions (such as a checking account, money transfers, and bill payments) and relationships (e-mail, data mining, chats with specialists and banks executives, and custom made software downloads).

Recent work on Internet banking has brought up the question of services offered online to the forefront. Diniz (2001) analyzed 81 Brazilian banks' websites from 1998 to 2000 according to the type of service provided (information, transaction, relational), which were further classified into basic, intermediate, and advanced. He also analyzed the effects of size and ownership (locally-owned, state-owned and foreign-owned) on web strategies. He found that large and state-owned banks are the most active with the Internet. Smaller banks are usually oriented towards the wholesale financial segment and usually keep a website with basic information only. Large banks provide free Internet services in a strategy designed to reinforce the use of new channels.

Until 1999, foreign-owned banks were lagging behind their large Brazilian competitors as far as web banking is concerned. Recently, they are investing in upgrading their virtual services, especially those oriented towards the retail and financial sectors. Smaller banks and those oriented towards the wholesale market may follow in the near future, as Internet banking becomes a differencing competitive tool.

Information Technology Investments

We can learn from an industry source (*National Federation of Banking Industry – FEBRABAN*) that investments in hardware are still growing, but at a lower pace than software. Now, hardware and software investments are almost at level terms. It can be noted that there is a growing preference for in-home software development, a fact that gives support to *Theme 7,* on the importance of user-client links in banking automation technology development.

Table 17 shows a decline in communication equipment and lines investment. There are two possible explanations for this decline. The first is that banks have already established a good communication infrastructure and, for the short term, no longer demand high investments. The second is that the cost of communication lines are declining in relation to their transmission capacity due to technological advance in fiber optics and related equipments.

Historically, Brazilian banks invest more in IT than other service sectors. Diniz (1999) estimated that in 1998, local banks invested 7.6 percent of their liquid assets in IT versus 5.4 percent in the service sector as a whole.

TABLE 17
Brazilian Banks IT Investments

Type of Investment	Investment in millions of R$			Variation
	1999	2000	2001	01/00
Hardware	1,283	1,331	1,476	10.9%
Equipment/Communication Lines	335	431	301	-30.1%
Software acquisition	299	517	509	-1.5%
In house software development	574	613	838	36.7%
Total	2,491	2,892	3,124	8.0%

Source: www.febraban.org.br/dados1.asp#, 10/18/2002

Key Barriers and Incentives

The growth of Internet banking in Brazil has been driven by a number of combined forces, as the data obtained from the GEC survey shows. Two factors seem to play a very important role in a bank's decisions to invest in the web (scoring more than 4 in a scale where 1 is not a factor at all and 5 is a very significant factor). These two factors are expanding existing markets (4.6) and customer demand (4.1). Large banks are following a growth strategy based on the new channel, while keeping the number of branches stable. As Diniz (2001:83) shows, despite rapidly increasing online transactions, banks that invested most heavily in the Internet are not reducing their branch network. They believe that brick and mortar agencies can provide a competitive tool vis-à-vis those banks that are essentially virtual. They want to divert transactions to the web while keeping their physical structure unchanged thus combining the speed and ease offered by the Internet with the eventual need for some face-to-face contact.

Cost reduction, that ranks 3.9 in the survey scoreboard, is another obvious driving force for Internet banking. The US Department of Commerce estimated that in 1998, a bank transaction costing $ 1.07 could be reduced to $ 0.27 using an ATM, and to only $ 0.01 using the Internet

(Gates, 1999). Interviewed banks confirmed that cost reductions are important, despite the need to continuously invest in web security, training, infrastructure, equipment, and software. Large banks seem to benefit more from price reduction than smaller ones, since they can spread fixed costs over a larger client base.

Also important is using the Internet for entry into new business or markets (3.9 points). Financial institutions are increasing their range of financial services provided on the web and also penetrating into new regional markets not widely covered by physical agencies. It can also be noted that banks are now selling consumer products on their websites. Bradesco, the largest private Brazilian bank, offers more than 500 products and non-financial services on the Internet. The bank's primary home page is accessed daily by millions of clients who can be diverted to shopping sites through banner links. Once the infrastructure is set, there is no major barrier to diversify into new business, either directly or through joint ventures with other firms. Other driving forces, according to the survey, were improving coordination with customers and suppliers (3.8), the fact that major competitors were online (3.2), and supplier demands (3.1). These forces are not particular to the banking sector and are common to firms in the manufacturing and distribution sectors as well.

The surveyed financial firms generally attributed a lower score for barriers than for drivers. According to Table 4, privacy and security (3.4 points) ranks first. Hackers are becoming more sophisticated, thus requiring continuous investment in security devices. An interviewed expert estimates that at least 20 percent of a bank's software investment goes to security systems. Also, some clients are still reluctant to pay bills and transfer money through the Internet.

The need for face-to-face customer interaction (3.1 points) is the second most important barrier to Internet banking diffusion. This mainly affects small financial institutions and those oriented towards the wholesale market. Banks operating with a small number of large clients believe that they must provide personal attention by visits and phone calls. Wholesale financial businesses are usually too complex and risky to be handled electronically. The high costs of implementing a website (2.9) was a concern for smaller financial institutions unable to reap economies of scale in Internet banking.

For financial institutions already using the Internet for doing business, the main obstacle for maintaining online operations is inadequate legal protection (3.1 points, see Table 5). This concern is likely to be associated with piracy, difficulty in suing hackers, and recovering eventual fraud losses. Also, high taxation of Internet sales (2.9) and weak business laws (2.6) were considered relatively important barriers.

Diffusion of Online Services

The diffusion of online services in the banking sector include automatic teller machines (ATM) installed both inside and outside banking facilities, home banking through proprietary software, Internet banking, and point-of-sale terminals for electronic fund transfers. Combined, these electronic transactions account for approximately three-quarters of the 20 billion transactions undertaken in Brazil in 2001 (see Table 18).

ATMs are the most used service, accounting for about 40 percent of all financial transactions. Banks strongly encourage ATM use, explicitly diverting clients to self-service terminals. All banking services can now be provided by ATMs, including cash dispensing, deposits, payments, transfers, investments, and checkbook printing.

In 2001, Internet and home banking represented nearly 8 percent of all transactions. It can be noted that since 2000 the Internet has been replacing home banking. Internet services, as a share of total transactions, more than doubled every year since its introduction in 1997.

TABLE 18
Diffusion of E-Commerce in the Banking Industry by Type of Transactions

Type of Transactions	1998 (%)	1999 (%)	2000 (%)	2001 (%)
ATM Self-Service (1)	32.4	37.3	40.3	39.2
Home and Office Banking (2)	3.4	3.9	5.0	3.7
Internet Banking (3)	0.3	0.9	2.3	4.2
Retails' point-of-sales (4)	1.3	1.8	1.9	1.9
Human mediated (5)	38.1	31.8	24.5	26.2
Other	20.1	24.0	26.0	24.7
Total	100	100	100	100
Millions of Transactions	12,799	13,982	16,412	19,791

Source: www.febraban.org.br/dados1.asp#, 10/18/2002 and Diniz, 2001

Notes: Operations made directly clients in bank's terminals. Transaction via PCs installed in residences or offices using dial-up modems and proprietary software rather than the web. Transactions via the Internet Electronic transfer via terminals installed in stores. Operations using cashiers in banking facilities.

Impacts on Performance, Industry Structure, and Competition

Performance

By most indicators, the banking sector has been successful in reaping the benefits of e-commerce. From the three sectors surveyed by CRITO/IDC, the impact of the Internet on the financial sector was level to or above average in all but one indicator (increase in international sales, see Table 13). The sector was first in the following items: increased internal efficiency (57 percent), sales increase (41.1 percent), improved competitive position (33.7 percent), and widening of the sales area (39.4 percent).

Internal efficiency improvement is a continuous process fueled not only by new technology, but also by learning. Early experiences in the financial sector with the Internet resulted in experimentation, experience, reflection and conceptualization. Many Brazilian banks have been successful in completing this cycle of continuous improvement that followed the radical change of online system introduction. Internet banking can deliver services far more economically than physical branches, as the costs of infrastructure and operational services are shared with the consumer.

An increase in sales is likely to be related to the use of sophisticated data mining techniques to understand customer needs. By cross checking accounts, credit card and other transactions, financial institutions became better able to fine-tune their marketing efforts to match specific demands. Also, with direct access to all financial services, consumers are becoming more

knowledgeable and able to make transactions themselves, further widening the range of financial services bought from banks. The widening of sales areas are a result of the reduced importance of geographical boundaries. Brick and mortar agencies are becoming less important to consumers and businesses than the simple and secure web sites and networks. Electronic banking offers an inexpensive alternative to expanding a bank's customer base, and many banks are using electronic banking, both to increase their customer base and to increase service to their customers.

Improved competitive position is another important benefit of Internet banking. Competition is now based not only on the financial products themselves, but also on the operational aspects of the firm. Examples are the ease of use of its web site or the consumer's confidence in the security of transactions. The development of electronic banking is increasing competition in banking markets and lowering bank operational costs. However, efficiency gains seem to result in more profits rather than lower tariffs. In 2002 the average profits of Brazilian banks were four times larger than other industrial sectors. The Bank of Brazil, for example, obtained 22.9 percent of profits over its liquid access, an 87 percent increase over the previous year.[9] In contrast, the average profits of non-financial corporations were little over 5 percent of liquid assets.

Industry Structure and Competition

The Brazilian case gives some support to Simon's (2000) argument that "as the Internet and its future manifestations become the core of finance, the barriers between the different types of financial institutions will crumble further and faster. Consumers and business seeking the best possible service, without regard to geographical or regulatory boundaries, will gravitate towards those firms that offer comprehensive service." In fact, as the CRITO/IDC survey revealed (see Table 12), the number of competitors and the intensity of competition in the financial sector increased more than in any other sector of the Brazilian economy as a result of e-commerce diffusion.

However, Internet banking does not seem to be affecting competition in some segments of the financial sector such as wholesale. Many small investment banks do not even have a website and have no intention to create one in the near future. Also, smaller retail banks, including foreign-owned, are in a less favorable competitive position since they do not have a large client base to invest in complementary assets such as ATM networks. In Brazil there is a pool of banks that share ATM facilities (*Bank 24 hours*), but services provided are more limited and expensive than single flag ATMs.

In sum, the impact of the Internet on competition seems to be very important in the large-scale retail sector only. Large banks can obtain better return on their investments in secure sites and with new online services. Since customer confidence is such an important aspect of banking, brand name images of fast, secure, and easy to use online services are becoming the most important marketing strategy of retail banks.

[9] O Globo, Feb. 12th, 2003 pp.21

This result gives support to the argument explained in *Theme 2* that e-commerce has a sectorial bias towards information intensive sectors but it also induces further qualifications. Within these sectors, the demand for data exchange and online coordination differ widely among banks and market sectors. Whereas wholesale investment banks deal with a limited number of high sum operations, and face-to-face negotiations are usually necessary, retail banks may deal with millions of transactions a day. Thus, information-intensive financial businesses enjoy economies of scale and scope to reduce costs and provide advanced online services.

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