The transnationalization of Brazil's software industry

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Transnational corporations from developing countries are now an important feature of the global business environment, as they compete with those from developed countries in several industries and markets. Over the past three decades, several Brazilian companies have developed transnationalization strategies, and the profile of Brazilian TNCs has changed significantly. Brazil is joining other developing countries, such as India, that are creating a new class of transnational corporations in the IT industry. This note analyses the Brazilian software industry and the transnationalization strategies of Brazilian software companies.

Key words: transnationals, Brazil, software

1. Introduction

Transnational corporations (TNCs) from developing countries are challenging the perception that they are mostly recipients – rather than creators – of technology. The development of indigenous technology has resulted in technology-based transnationalization by companies from developing economies, such as Brazil, India, Mexico, the Republic of Korea and Taiwan Province of China. The increasing technology outflows from developing countries and the emergence of developing country TNCs bear out this shift in the global economic landscape (Aggarwal and Agmon, 1990; Baer, 2002; Kuada and Sorensen, 2000; Rocha, 2003; UNCTAD, 2002; Vyas, 2003).

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The forces behind globalization (trade and investment liberalization, technological change, improvement in infrastructure) have led to an unprecedented increase in international knowledge transfer. These forces are also fostering and facilitating the expansion of emerging TNCs. Globalization is levelling the playing field, dismantling many traditional barriers to investment and making business environments more similar. The increasing flows of technology are also narrowing the technology gaps between developing and developed countries, at least as far as the more industrialized developing countries are concerned. The increased use of common platforms in software (Microsoft, Linux) around the globe is facilitating the expansion of software exports by developing countries (Albuquerque, 2000; Conceicao *et al.*, 2002; Feiman and Knox, 2002). Thus, the traditional North-South paradigm in which innovative technologies are assumed to flow from the North to the South is being challenged by emerging developing country TNCs as they enter more technologically sophisticated activities. Many companies from developing countries are contributing to global technological development and creating competitive advantages in high-tech activities like software development (Bell, 1984; Dalhman and Sercovich, 1985; Katz, 2001; Lall, 1983, 1990).

There is a growing realization of the role of the software industry as an important driver of innovation (Correa, 2003; Keeble *et al.*, 1998; Polzin, 1998). The software industry can positively impact all sectors of the economy, becoming a key feature in a developing country's quest for economic growth and development (Feiman and Knox, 2002).

The expansion of emerging TNCs abroad reflects both firm and (domestic) economic factors. On the firm side, the main factors are indigenous technological competence and other intangible assets, the appropriateness of process and product technologies, firm strategy; and cultural and ethnic ties with foreign markets. On the economic side, the factors are the size and growth prospects of the domestic market, regional economic

integration and home country policies (Lecraw, 1999; Maitland and Nicholas, 2002; Mathews, 2002; 1994; Wells, 1983).

Over time, emerging Brazilian TNCs have diversified the activities they undertake abroad. One important new area is information technology (IT) based services. In the last decade, Brazil has boosted its production of indigenously developed software, and Brazilian software companies are becoming increasingly active on a global scale. This article analyses the Brazilian software industry and the transnationalization strategies of Brazilian software TNCs.

2. Brazilian TNCs

The profile of Brazilian TNCs has changed significantly in the past three decades. During the first transnationalization phase (1970-1980), Brazilian TNCs were mostly engaged in licensing, consulting and technical services (LCTS), industrial projects and retailing. In this phase, companies like Norberto Odebrecht (LCTS), Pao de Acucar (retailing) and Petrobras invested overseas. In the second phase (1981-1990), Brazilian TNCs expanded the range of their activities to banking, telecommunications, transport and oil exploration; companies like TV Globo and Banco Itau went overseas. The first and second phases were marked by the transnationalization of mature companies and market leaders. These companies were large in size and, by Brazilian standards, strong in technological innovation. Their technological capabilities underpinned their transnationalization process (Birchal, 2002; Brasil *et al*., 1996; Diaz-Alejandro, 1977; Gouvea, 1991). The third phase (1990 to the early 2000s) saw a much broader range of Brazilian companies of different sizes and from different industries (including services) going international. A number of industry leaders like Votorantin, Cutrale, Ambev, Amil and Localiza ventured overseas (Dias and Camargos, 2003; Pimenta, 2004). The 1990s also witnessed the emergence of TNCs in the IT industry, mostly software producers (Chudnovsky and Lopez, 1999; Gouvea, 1995; Hessel, 2004; Iglesias and Veiga, 2002).

The 1990s was a turning point in the transnationalization of Brazilian companies. As the domestic market, which had been protected from foreign competition, was opened up, Brazilian companies were forced to change their business strategies radically to respond to the growing presence of foreign companies in the domestic market (Martinez, Souza and Liu, 2003). In addition, the privatization of the infrastructure (e.g. telecommunications) facilitated the transnationalization of Brazil's services sector. It allowed small and medium-sized service companies to grow and later to penetrate international markets. The creation of trading blocks, like Mercosur in 1995, and the prospect of the Free Trade Agreement of the Americas (FTAA) encouraged many Brazilian companies to develop international strategies (Gouvea, 1998; Rocha, 2003).

3. Brazil's emerging software industry

Brazil is rapidly becoming an important producer of locally developed software. In 2002, the size of the Brazilian software market was valued at $7.7 billion, the seventh largest in the world (Albuquerque, 2003). This is comparable to the size of the markets in India and China valued at $8.2 billion and $7.9 billion respectively. Over the period 1991-2000, the Brazilian software industry grew by 490%, compared to 360% for the United States (MIT/Softex, 2003; Haberkorn, 2002; Albuquerque, 2003; West, Wasserman and Poroger, 2003). In 2002, the Brazilian software industry comprised around 3,500 companies employing some 180,000 people. Two-thirds of these companies were created in the 1990s. Some 80% of them were small firms, with annual revenues of less than $1.5 million; 65% had less than 25 employees. The industry is mostly domestic market oriented. It has six main areas of specialization: finance, electronics, government procurement, information security, telecommunications and management software (Conceicao *et al.*, 2002; Coutinho, 2002; Humberto, 2002).

Table 1 compares the Brazilian software industry with its Indian and Chinese counterparts. Brazil and China have

developed inward-oriented software industries, whereas India has developed an export-oriented one.[1]

Table 1. The software industry in Brazil, China and India, 2001

(Billions of dollars)

Item	Brazil	China	India
Home market sales (products and services)	7.7	7.9	2.0
Products	3.6	3.6	..
Services	4.1	4.3	0.4
Exports (products and services)	0.1	0.4	6.2
Total	7.8	8.3	8.2

Source: Albuquerque (2003).

The Brazilian software industry has developed mostly in the past two decades. In the 1980s, its main products were in financial software, with the increasing needs of Brazilian banks to develop in-house software capability (Albuquerque, 2003; Correa, Erber, 2002; Hessel, 2004; Paduan, 2002, 2003a, 2003b; Nascimento and Marinho, 1999). The protectionist policies of the 1980s, however, discouraged the development of the indigenous software industry, reducing the exchange of technology with other countries (Alem, Mendonca and Gimabiagi, 2002; Tigre, 2002).

The liberalization of the 1990s changed the business mindset. As the market was opened up to foreign competition, research and development (R&D) became more important for

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[1] In fact, increasing technological cooperation between the Governments of Brazil and India is taking place. The Brazilian Ministry of Science and Technology and the Indian Ministry of Information Technology have developed a number of agreements to set up a Brazil-India task force on information technology. At the firm level, Indian companies like the Tata Group are increasingly penetrating the Brazilian market; the Group has a joint venture with the Brazilian company TBA. The company has set up software development centers in Brazil employing more than one thousand people (Teixeira, 2004; Somayaji and Varma, 2007).

Brazilian companies (Gouvea, 2004). Liberalization also stimulated the growth of software companies, helped by several government programmes. For instance, in 1993, the Sub-committee of Software Quality and Productivity (SSQP) was created to introduce international standards and to promote quality and productivity with a view to making the Brazilian software industry globally competitive. The Secretariat of Information Technology (SEPIN), based in the Science and Technology Ministry, was later made responsible for designing and implementing software policy; it launched training programmes, proposed guidelines for government procurement and started investment funds to support the software industry (Weber and Amaral, 1999; United Nations, 2003).

During the same period, several Brazilian universities created software development centres. For instance, Brazilian universities such as Unicamp, Universidade do Estado de Sao Paulo (USP), Pontificia Universidade Catolica do Rio de Janeiro e Rio Grande do Sul, Universidade Federal de Pernambuco, Universidade Federal do Rio Grande do Sul, e Universidade Federal de Juiz de Fora became important centres of software development.

The creation of software development centres was a result of this close collaboration between the State, universities and the private sector. This "triple helix" effect led to the emergence of several software "research poles" in the country. The Council on Information Technology (CATI) oversaw these research poles, several of which are geared towards software production. Software poles such as Recife Technology Centre (CESAR), the Softex Science and Technology pole of São Paulo, the Softex pole of Petropolis, Campina Grande, Centro Tecnologico de Belo Horizonte and Rio Grande do Sul are leading (Balbio, 2004; Taquari, 2003; Weber *et al.*, 2000).

The need to diversify Brazilian exports led the Government to set up programmes to boost exports of knowledge-intensive products and services in the 1990s (e.g. Progex, PNPE, Apex). The National Development Economic and Social Bank (BNDES) established the Prosoft Programme to

support Brazilian software companies selling their products and services overseas (Tigre, 2002). The Brazilian Society for the Promotion of Software Export (SOFTEX), created in 1992, played an important role in changing the mindset of the industry from an inward to a more outward looking orientation and, in persuading the Government to support software export. By organizing exporting seminars and encouraging domestic companies to participate in international meetings like CEBIT and COMDEX, SOFTEX helped companies to sell their products overseas. It created a trademark "Brazilian Software". Thus, a partnership developed between the infant software industry and Brazilian policy-makers, fostering the development of the industry.

The further development of the industry, however, faces new challenges. Many Brazilian software companies still lack CMM (Capability and Maturity Model) and ISO certification, a precondition for further penetration of the world market. Most Brazilian software companies are still small and lack the resources to develop their brands overseas.

4. Transnationalization strategies

Brazil is Latin America's leading exporter of software with the value of its exports reaching $115 million in 2002, up from only $1 million in 1990 (Behrens, 2003; Correa, 1996; Paduan, 2003; Valoso, Botelho and Stefanuto, 2003; MIT/Softex, 2003; Behrens, 2003).

To assess the transnationalization strategy of the Brazilian software industry more closely, data on a sample of 21 Brazilian software TNCs were collected from company websites, business newspapers, magazines and five interviews. These companies covered different areas of software and different entry levels and modes.

The Brazilian software industry is still primarily oriented to the domestic market, with exports currently accounting for less than 10% of sales. In the early 2000s, however, the industry felt the need to globalize to reap economies of scale and to access

foreign technology. Brazilian software TNCs, founded in the 1980s and 1990s, launched overseas operations much faster than traditional Brazilian TNCs. Table 2 shows their areas of specialization. For instance, Microsiga offers software in the area of corporate management systems; it is the Brazilian leader for corporate management software, accounting for 62% of Brazil's low-end market. Light Infocon develops internet solutions for text retrieval and document management. Ever Systems is the leader in Latin America in e-finance (e.g. e-banking, e-investment, e-payments); it created the first wireless banking software in Brazil and the first cell payment system in Latin America.

Table 2. Brazilian software companies: main areas of operation

Company	Main areas of operation
Akwan	Search engines; systems for organizing information
Apyon	Productivity solutions for application development process
CMP	Business intelligence data warehouse
Cyclades	Out-of-band management platforms
Cyrnel	Solutions provider for financial institutions
Disoft	Management of credit operations via the internet
Easycae	Automation and optimization of the engineering design process
Epsoft	Developing software for information processing
EverSystems	Development of financial transactions solutions
Impactools	IT solutions for the insurance industry
Itautec	Software for information systems
Light Infocon	Web solutions related to document management
Microsiga	Corporate management systems (ERP/CRM)
OpenConcept	E-payment management; cards validation systems
Politec	Total enterprise security, document management, imaging
SoftwareDesign	Financial, telecommunications and database marketing
Stefanini	E-procurement systems, infrastructure and network administration
RMS	Retail systems
Teknisa	Enterprise resource planning, vertical solutions, palm top systems
Vesta	E-government, procurement portals

Source: Compiled by the author from interviews, company web sites, business newspapers and business magazines.

The main motive for transnationalization at the enterprise level was the exploitation of a unique technological advantage. Each Brazilian software TNC had developed proprietary software: Microsiga's AP6ERP/CRM Master, Teknisa's TecFood software, Ever-Systems e-finance solutions and the Cyclades Linux AlterPath line of products. The pattern of markets served (table 3) shows that cultural and ethnic ties have facilitated overseas investment. Most of these TNCs set up affiliates in Latin America. Within the European Union, most Brazilian companies targeted Portugal and/or Spain. Over time, however, more software companies aimed to enter the United States market. For instance, software companies such as Politec, EverSystems and Stefanini have set up operations in the United States. Increasingly, economic ties with India and China are leading software companies like LighInfocon to seek to penetrate these markets in addition to Latin America.

Table 3. Brazilian software companies: Markets served

Firm/market	Latin America	North America	Europe	Asia	Africa	Australia
Akwan	•		•			
Apyon		•				
CPM	•	•	•			
Cyclades	•	•	•	•	•	•
Cyrnel	•					
Disoft	•					
Easy Informatica	•					
EasyCae		•				
Epsoft			•			
Ever Systems	•	•		•		
Impactools	•	•	•			
Intautec			•			
Light Infocon			•			
Microsiga	•					
Open Concept	•	•		•		
Politec	•	*				
Software Design	•			•		
Stefanini	•	•	•			
RMS	•					
Teknisa	•					
Vesta	•					

Source: Compiled by the author from interviews, Brazilian business magazines, newspapers and company websites.

On the economic environment side, the main factors driving transnationalization were the limited size of the domestic market, the structure of demand and the weak growth potential of the Brazilian market. Most companies were leaders in their product segment, and the saturation of the domestic market led them to look to overseas for growth. Regional trade agreements like Mercosur facilitated rapid expansion in neighbouring countries. The prospect of the establishment of the FTAA in 2005 is leading several companies to consider expansion in North America. More recently, Brazil's trade agreements with India and closer economic ties with China are leading these companies to search for opportunities in these countries.

Brazilian software TNCs have used different modes of entry (table 4). Most started by exporting their software, then moved on to forging joint ventures and finally, to establishing wholly-owned affiliates. For instance, Light Infocon established a joint-venture, Online Productivity Solutions, with the Indian company, Goan, to produce software; Akwan formed a joint venture with the Spanish group, Prisa; Epsoft is building a strategic alliance with TGK of Japan to expand its operation in Japan; Cyrnel International has developed strategic alliances with the Mexican PIP and with the United States company, Financiometrics. Alliances with established TNCs have also been used by these companies. For instance, Vesta Technologies, specializing in e-government, has entered into an alliance with Unysis to market its products in Latin America. On the other hand, companies like Cyclades and Microsiga have set up wholly owned foreign affiliates. In 2003, Microsiga acquired the Mexican software company, Sipros, establishing a wholly owned operation in Mexico. Cyclades has wholly owned operations in several countries, including Australia, France, Singapore and the United States.

These foreign affiliates are actively engaged in developing new products for foreign markets, conducting business environment assessments, and adapting and customizing existing products. Politec's foreign affiliate in the United States provides localized solutions for United States

companies and the Government, and its technological strength has attracted a wide array of clients, including the Federal Bureau of Investigation and the Department of Defence. Stefanini has foreign affiliates in Argentina, Chile, Colombia, Mexico, Peru, Portugal, Spain and the United States. They design local solutions that are developed and produced in the company's factories in Argentina, Brazil and Mexico.

Table 4. Brazilian software companies: entry modes

Company	Exporting	Joint ventures	Wholly-owned foreign affiliates
Akwan	•	•	
Apyon	•		•
CPM	•		•
Cyclades	•		•
Cymel	•	•	
Disoft	•		•
EasyCae	•		
Epsoft	•	•	
EverSystems	•		•
Impactools	•		
Inatel	•		
Iautec	•		•
LightInfocon	•	•	
Microsiga	•		•
OpenConcept	•		
Politec	•		•
SoftwareDesign	•		
Stefanini	•		•
RMS	•		
Teknisa	•		
Vesta	•	•	

Source: Compiled by the author from interviews, company websites, business newspapers and business magazines.

5. Sources of competitiveness

In the past two decades, some Brazilian software TNCs have become competitive at the global level. Several attributes have shaped the environment in which these local companies

compete and have fostered the development of firm-specific competitive advantages (Veloso, Botelho, Tschang and Amsde, 2003).

The Brazilian software industry has seen substantial transformations in the past two decades. The pre-1990 period was characterized by high levels of market protection, economic instability, low domestic market penetration by international software companies and intense indigenous technology development in the software industry. The post-1990 period has been characterized by the globalization of the Brazilian software industry with increasing penetration of the local market by foreign software companies, such as Microsoft, Oracle and SAP, and by the increasing globalization of Brazilian software companies (Nascimento and Marinho, 1999; United Nations, 2003).

One important characteristic of the Brazilian software industry has been the significant level of domestic competition. Brazil's extensive and dynamic market has resulted in the creation of thousands of software companies. Brazilian software companies have been competing not only with other local companies, but also with foreign companies operating in the Brazilian market. Because of this competition, they have developed distinctive technology and know–how, mostly providing software to Brazil's leading industries. Throughout the course of this process, they developed unique solutions that were later used overseas (Veloso, Tschang, and Amsden, 2003).

Brazilian software TNCs have focused their business on supporting the leading industries of the Brazilian economy. This specialization has resulted in the development of industry-specific technology and expertise. Brazilian software TNCs are competitive in the areas of banking, telecommunications, e-government, business management, data and network security, and large-scale customer management systems for the Brazilian private sector and Brazilian government agencies.

Brazil's large domestic market has been characterized by local clients with extremely sophisticated software demands. Over the past two decades, industries such as banking and telecommunications as well as the Government of Brazil have demanded state-of-the-art software from local companies, providing incentives for innovation and the development of unique solutions.

Brazil has the most sophisticated financial system in Latin America. Decades of high inflation and economic instability experienced by the Brazilian banking industry resulted in these institutions demanding sophisticated banking and financial software. Local software companies were given the opportunity to respond to these needs. As a result, they acquired the skills to develop complex systems. For example, Everystems developed the first home-banking system for the Brazilian bank, Unibanco. The company also introduced the first e-mail banking service in Latin America. Currently, the banking industry accounts for approximately 30% of Brazil's investment in IT. The relatively large size of these industries also allowed domestic companies to benefit from economies of scale in creating and adopting new product and process technologies (Botelho, Stefanuto, and Veloso, 2005).

The Government of Brazil has also been a strong supporter of local software development. The buying power of the Government has been used to promote the development of local software companies. E-government initiatives have led to the creation of new capabilities, such as electronic voting and e-filing for tax returns. In Brazil's last election, 114 million votes were counted in less than 12 hours, and 95% of Brazil's tax filing is done on-line. Local companies, such as Vesta, have developed a number of e-solutions for the Government, which are now being sold overseas. In addition, government programmes like the Society for the Promotion of Excellence in Brazilian Software promote and foster local industry, while the implementation of State-sanctioned projects, such as the "Sectoral Project for the Export of Software", has assisted the transnationalization of the Brazilian software industry.

Brazilian software companies have also undergone a radical managerial transformation. Market-oriented reforms, such as the opening of the Brazilian market to foreign companies, and the increasing role of venture capitalists in the software industry, promoted dramatic changes in the way Brazilian software companies manage their operations. For example, a more competitive market forced domestic companies to improve their managerial capabilities. Venture capitalists prompted domestic software companies to define and implement business plans and models. In addition, venture capitalists introduced outside business professionals to reinforce further the application of business models. Companies that emerged in the 1990s were strongly influenced and shaped by these new market forces (Veloso, Botelho, and Stefanuto, 2003). Prior to 1990, most software companies were managed by technical professionals. Since then, these companies have learnt to become more efficient.

Brazil's economic environment had the appropriate pre-conditions for the software companies to develop into a competitive industry. It had a large domestic market that functioned as an incubator of software companies; a well developed telecommunications infrastructure; and a large pool of qualified IT professionals. In addition, Brazil's entrepreneurial environment, coupled with a strong research and technical IT base and a pro-active government, created the conditions for software companies to thrive. Brazilian software companies invested heavily in indigenous technology, accumulated in-house knowledge and became innovative in a number of niche markets. These software companies developed products and services for leading Brazilian industries. Managerial reforms also contributed to the competitiveness and efficiency of these companies. Leading industries helped to structure and improve the competence of these domestic software companies. Brazilian software companies learned to be creative and flexible as a result of their domestic operations, further enhancing their international competitiveness (Veloso, Tschang, and Amsden, 2003; Botelho, Stefanuto, and Veloso, 2005).

6. Concluding remarks

Brazil is becoming a force in the global software industry. Unlike their Indian counterparts, Brazilian software companies have primarily targeted the domestic rather than the export market. However, this orientation is changing. Several Brazilian companies have developed unique ownership advantages that allow them to expand operations overseas. Some of them have had a strong global orientation from the outset. Brazilian software TNCs have a strong Latin American orientation, but are increasingly targeting the United States as well as European and Asian markets. Many of them have used joint-ventures with foreign companies to establish their presence overseas. The expansion of software TNCs is a new phase of the globalization of Brazilian companies and is likely to continue in the foreseeable future. ∎

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