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Final Report of Challenges and Opportunities for the Software and Information Services in Brazil and Argentina A study of clusters

ANEXO II

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Final report

February 22, 2009

Published by: Instituto de Economia da Universidade Federal do Rio de Janeiro

Rio de Janeiro

***IDRC Project Number: # 102497-003**

***IDRC Project Title: Latin American and Caribbean Knowledge Economy Research**

***Country/Region: Argentina and Brazil**

This publication reports on a research project financed by
Canada's International Development Research Centre (www.idrc.ca).

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Abstract:

This project analyzes the dynamics of selected software clusters in two South American countries. Three questions are highlighted in the research concerning economic and institutional aspects of SIS clusters and their impacts on local economic development driving forces behind SIS multinationals' locational decisions; network effects among large and small firms, universities and research centers; and local SIS industry development perspectives. The main hypothesis of the Project is that the development of SIS local productive systems and the growth of software outsourcing are complementary phenomena that generate organizational and learning synergies as well as new institutional setups that can contribute with the exploitation of new opportunities and with a larger insertion of the region in international trade and ICT investment flows. The theoretical approach was based on the fields of proximity economies, evolutionary economics, neo-institutionalism, and industrial economics. The research methodology was based on case studies, developed by four different research teams. In order to identify key locational driving forces and categorize related resources required, we propose a new taxonomy of SIS clusters. Similarities concerning firms' ownership, market segment and geographical scope of operations enabled us to group them as *Outsourcing Platforms*, *Technology Clusters*, and *User-Producer Network*.

Keywords: Software and information services, Clusters, South America, Outsourcing, Networks.

Síntesis del Proyecto

Software and information services (SIS) have become a field of increasing opportunities for international trade due to the worldwide diffusion of a combination of technological and organizational innovations. Since information goods can be processed, stored, distributed and consumed wherever good infra-structure and technical capabilities are available; the location of SIS is becoming less attached to market factors. This trend is further encouraged by organizational innovations which drive corporations to focus on their core competences and outsource information and communication technology (ICT) operations to specialized providers.

The research project “Challenges and Opportunities for the Software and Information Services in Brazil and Argentina” analyzes the dynamics of selected software clusters in two South American countries to attract operations, develop technology, create qualified jobs and reinforce user-producers networks. Its main hypothesis is that the development of SIS local productive systems and the growth of software outsourcing are complementary phenomena that generate organizational and learning synergies as well as new institutional setups that can contribute with the exploitation of new opportunities and with a larger insertion of the region in international trade and ICT investment flows.

The theoretical approach was based on the fields of proximity economies, evolutionary economics, neo-institutionalism, and industrial economics. The project compares the dynamics of SIS enterprises in local productive systems and their relations with local agents such as small firms, universities and local authorities. The research methodology was based on case studies, developed by four different research teams in Córdoba and Rosario (Argentina), Blumenau, Hortolândia, Porto Alegre, Petropolis, Recife and Salvador (Brazil). A common theoretical, conceptual and methodological approach was developed, aiming at reviewing the pertinent literature, selecting cases, formulating research questions and building common views. Qualitative and structured interviews with managers, local public authorities and university professors were conducted using similar questionnaires. It resulted in 14 reports, a fore coming book and several articles either

published or submitted to academic journals. In order to identify key locational driving forces and categorize related resources required, we propose a new taxonomy of SIS clusters. Some similarities concerning firms' ownership, market segment and geographical scope of operations enabled us to group them as *Outsourcing Platforms*, *Technology Clusters*, and *User-Producer Network*.

Problema objeto de investigación

Our major research problem was to investigate how Latin American cities, that have already developed policies to attract SIS business, are reaping the opportunities to become major software centers. We know from literature review and previous work that services, rather than products, presents the best opportunity for Latin America, since they escape the software-product logic of "the winner takes all". Opportunities are particularly present in ICT outsourcing and on developing services that particularly match local users' needs. There are different strategies available according to the geographical range of operations (local, national, and international), ownership patterns (locally-owned or multinational), firms' size and type of product or services (low/high values-added) and institutional arrangements. The research proposes a new taxonomy to deal with these differences, analyze the resource most needed in each category and raise policy implications.

Three questions are highlighted in the research concerning economic and institutional aspects of SIS clusters and their impacts on local economic development. Firstly, we examine the driving forces behind SIS multinationals' locational decisions. Several cities have developed regional policies to attract SSI firms but few effectively succeeded. Secondly, we look at the network effects among large and small firms, universities and research centers. Are knowledge intensive firms able to transmit technology to the local economy, favoring productivity and innovation? Thirdly, we examine the local SIS industry development perspectives. Policies designed to promote the software industry usually aim at creating qualified jobs, to develop local technological capabilities, and produce positive externalities by strengthening

user-producer relationships. In the case of SIS clusters in Argentina and Brazil how this aims have been fulfilled?

Information and communication technologies (ICT) can potentially eliminate barriers related to distance and re-define strategies and spaces of action of enterprises. Two main phenomena are observed in this process of re-definition: 1 - the constitution of local productive systems, based on proximity economies and 2- the growth of offshore outsourcing in industries where intensive use of ICT allows for the acquisition of information services provided by enterprises that are not located in the same region or country

Diseño y puesta en práctica del proyecto

This project was a good opportunity to join efforts of senior researchers in the field of the economics of information technologies and clusters in Brazil and Argentina. Also, it contributed to reinforce an informal network involving other researchers, students and policy makers not only in the selected countries but also in the UK, Canada, Mexico and Italy.

Four institutions participated in the project, involving 7 main researchers and 7 research assistants:

Institution	Members	Qualifications	Function
Instituto de Economia - Universidade Federal do Rio de Janeiro http://www.ie.ufrj.br	Paulo Bastos Tigre	PhD, Professor Titular	Project Leader
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	Alessandro Maia Pinheiro	PhD Student	Research Assistant
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	Daniela Ramos	PhD, Senior Researcher	Researcher
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Escola de Administração - Universidade Federal da Bahia http://www.adm.ufba.br	Francisco Lima Teixeira	PhD, Professor Titular	Researcher
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	Glaudson Bastos	PhD Student	Research Assistant
Independent Researcher	Néstor Bercovich	MSc	Researcher

The Project was initially designed by the project leaders and discussed in a two-day in-deep meeting in Rio de Janeiro (see the proceedings of these workshops are presented in Annex 2: *Technical Reports 1 and 2*) and further polished through Internet conference calls. The researchers prepared discussion papers reviewing the literature on the economics of SIS industry and clusters and reviewed the SIS industry development in Brazil and Argentina. We managed to fix common objectives, develop a methodology and get a compromise on concepts and theoretical references.

The case studies were developed independently by the research groups and consolidated in another meeting in Rio in March, 12th and 13th, 2008. Part of the team was also involved in discussion of results in the IV Workshop Latinoamericano de Clusters de TICs, in Buenos Aires in November 2008. This workshop involved more than 100 Argentinian IT enterprises and was jointly sponsored by Argentinian and Brazilian institutions. The research project deliberately excluded the three largest cities within the region - São Paulo, Rio de Janeiro and Buenos Aires - in order to focus on the relationship between large transnational corporations and local institutional environment formed by universities and local firms. A preliminary study on Rio showed that

in big cities the natures of the local relationships are usually hidden by technological externalities associated both to specialization and diversity.

Another last methodological aspect must be clarified: In this study, we use both the concepts of local productive systems and clusters. Although we understand that there are controversies about these concepts, these controversies were discussed during the two workshops held in Rio and as a result of these discussions we chose to use the concepts which were more adequate for each case.

The IDRC donation enabled us to finance work-in-progress meetings, acquiring books, to support research students, develop field work, and fund the participation of the research team in seminars and congresses. A seminar and a book are being presently prepared. The project was based on an interdisciplinary approach and will contribute to both academic and policy making goals. The results are being discussed with government authorities, business leaders in a series of seminars.

Logro de Objetivos

According to the research proposal submitted to IDRC, the first aim of the project was to study the software and information services (SIS) sectors. This goal was effectively reached and summarized in the following reports, available at the B-107 project site at www.continentedigital.org, as “Resultado de Investigaciones”.

1. *Economia do conhecimento: elementos para compreensão e desafios para países em desenvolvimento*. Alessandro Maia Pinheiro e Paulo Bastos Tigre.

The report discusses both empirical and theoretical dimensions of the knowledge economy and its implications for developing countries. We review recent theoretical and conceptual discussions about the competitive process based on information and knowledge. On the empirical realm, we review and discuss existing initiatives (mainly from the OECD and UN) to measure and systematize economic indicators related to the knowledge economy. Finally, we identify challenges and implications for developing countries.

2. *Características Econômicas do Software e dos Serviços de Informação.* Paulo Bastos Tigre e Felipe Marques.

The report reviews the main economic characteristics of the software and information services industry. It examines the competitive dynamics of its main segments - software products, IT services and outsourcing - in order to identify difficulties and opportunities for developing countries participation in global markets. Finally it discusses the implications for both Brazil and Argentina.

3. *Território e aglomerações de empresas no setor de TI.* By Renata Lèbre La Rovere.

The aim of this paper was to make a brief review of the literature on the benefits and challenges related to agglomerations of enterprises. It starts noting that these agglomerations were described by different concepts such as clusters, local productive systems and industrial districts. The paper recognizes that all concepts are not very precise; nevertheless all authors agree that agglomerations of enterprises provide positive externalities to firms and promote local development. These positive externalities are related to proximity economies and to innovation processes. Therefore the first section of the paper discusses proximity economies in a territory and the second section discusses the role of the territory in innovation processes. Finally, the third section of the paper discusses how positive externalities linked to agglomeration of enterprises may occur even in industries where production can easily flow across the space as is the case of the ICT sector.

The second, third and fourth aims were to review the development of the SIS industry in Brazil and Argentina and propose support policies for both countries. We effectively undertook field research reviewing industry development, identified support policies and also proposed new initiatives. The results are included in the two countries overview papers:

4. *La industria de software y servicios informáticos argentina. Tendencias, factores de competitividad y clusters.* Andrés López y Daniela Ramos.

La primera sección de este informe preliminar analiza las principales características del desarrollo del sector de SSI en la Argentina, su evolución

reciente y las tendencias más destacables de los últimos años. La sección 2 presenta un detalle de la morfología del sector, su estructura empresarial y los diferentes segmentos que componen esta industria. La sección 3 está dedicada a analizar el desempeño exportador de las empresas, en particular a partir de la devaluación del año 2002. Las secciones 4 y 5 se enfocan sobre dos temas que son novedosos dentro del sector en la Argentina: los recientes flujos de inversión extranjera directa (IED) orientados a la exportación de actividades vinculadas a la industria de SSI y los fenómenos del *offshoring* y el *outsourcing*. La sección 6 repasa brevemente algunas cuestiones que impactan sobre el nivel de desarrollo del sector y su competitividad a mediano/largo plazo: la oferta de recursos humanos, la conformación de *clusters* y polos, el financiamiento, la infraestructura de TICs, la innovación y las políticas públicas de apoyo a la industria que se han implementado recientemente. En la sección 7 se presentan las principales conclusiones del trabajo.

5. *Características da Indústria de Software no Brasil*. Paulo Tigre e Felipe Marques.

The report analyses the development of the software and services industry (SSI) in Brazil, aiming at identifying challenges and opportunities for exports. It reviews the local market structure, exports performance and the characteristics of major firms.

The fifth aim was to develop case studies in Brazil and Argentina and to compare outsourcing practices in the different clusters. This aim was effectively reached, and resulted in the following papers:

6. *O caso do cluster de TI em Blumenau* (Santa Catarina, Brasil). Néstor Bercovich e Charles Schwanke.

7. *El caso de Porto Digital y CESAR en Recife*. Néstor Bercovich y Marcos Suassuna.

8. *El caso del Cluster de Córdoba*. Andrés López y Daniela Ramos

9. *El caso del polo tecnológico de Rosario*. Andrés López y Daniela Ramos

10. *Caracterização do arranjo produtivo de tecnologia da informação de Salvador e Feira de Santana*. Francisco Teixeira e Trajano Lima

11. *Estudo de Caso TECNOPUC: a capacitação como chave para a criação e atração de empresas* Silvio Vanderlei Araújo e Francisco Teixeira

12. *Estudo de Caso HORTOLÂNDIA: Condomínio Tech Town.* Ricardo Furtado
13. *Estudo de Caso: Petrópolis-Tecnópolis.* Renata La Rovere e Ricardo Furtado.
14. *Knowledge Cities: a Taxonomy for Analyzing Software and Information Services Clusters.*

Resultados del proyecto

The main contribution to the existing knowledge in this theme is the development of a new taxonomy aiming at grouping clusters according to their dominant pattern of market segment firms' ownership, geographical scope of operations. This segmentation provides a tool for recognizing locational driving forces and identifies key resources and policies required by each type of cluster.

The SIS clusters studied were Córdoba and Rosario (Argentina), Blumenau, Hortolândia, Porto Alegre, Petropolis, Recife and Salvador (Brazil). The research project deliberately excluded the three largest cities within the region - São Paulo, Rio de Janeiro and Buenos Aires - in order to focus on the relationship between large transnational corporations and local institutional environment formed by universities and local firms. A preliminary study on Rio showed that in big cities the natures of the local relationships are usually hidden by technological externalities associated both to specialization and diversity.

Some similarities concerning firms' ownership, market segment and geographical scope of operations enabled us to group them as Outsourcing Platforms, Technology Clusters, and User-Producer Network. Those clusters which could not fit in only one category were classified as Mixed Cases.

Outsourcing Platforms

When close interactions between user and suppliers of SIS are not important there is the option to locate operations elsewhere if this represents an opportunity to lower costs, especially labor costs. In this business model the services provided are relatively sketchy in terms of knowledge, such as the generation of code and call centers, and can be carried out on a relatively

large scale. The tasks to be carried out are simple and specified by the client, which facilitates the division and outsourcing of tasks. What is important to attract SIS business in this case is the pool of qualified workforce, process management capabilities and good infrastructure.

Outsourcing platforms are usually dominated by large firms which provide services both to national and global clients. Competitive pressures have led these companies to look for new locations for their IT operations with the aim of reducing costs and gaining access to qualified human resources. Given the possibilities for the decentralization of software and service production, large SIS companies are fragmenting their operational bases, both in the countries where they are originally from (*inshore*) and abroad (*offshore*).

Outsourcing platforms may be seen as “enclaves” since major firms don’t need to keep close links with either regional users or suppliers. Their location may be a result of path dependency, a search for new supply of qualified human resources at competitive costs and fiscal benefits. Since their production chain is too short, they usually do not seek out for local suppliers of IT services.

In Brazil, two cases protagonized by the same corporation may illustrate the characteristics, challenges and opportunities faced by SIS platforms. The first is Hortolândia, where IBM runs its larger Global Delivery Centre in Latin America. Counting with 7,000 employees, it is located nearby Campinas in the state of Sao Paulo. The IBM Centre in Hortolândia was opened in 1971 as a computer and printer manufacturing plant, but during the 1990s the company changed the focus of its operations from hardware to software. Currently 90% of company operations are services, segmented into outsourcing services; development and maintenance of applications (software factory); business process outsourcing (BPO); and the Americas Delivery Centre, responsible for monitoring all IBM units in the Americas. Interviewed managers reported that, due to increasing global demand, the site could actually double the employed workforce if qualified people were available.

IBM developed, in association with the relevant local authorities, the *Tech Town Condominium* which housed various technology companies,

including a new Dell manufacturing plant. Firms share services such as transport, security and catering but there are few commercial relations between them in the ICT area since they do not operate in the same productive chain. IBM has qualification programs involving partnerships with universities where training is carried out with academics in disciplines related to technology of interest to the company. However, these teaching institutions are not necessarily located in the Hortolândia region.

In search for new sources of qualified people, IBM has been taking part in another initiative (ALTIS) to build a software cluster in Salvador (Bahia) to promote support for IBM's international operations in the mainframe software field. After being partially displaced by small scale equipment, mainframes have recovered market share, especially because of the better price/performance relationship, flexibility of use and the virtualization of servers. Since it is not economically viable to transport applications from mainframe platforms to another type of hardware/software architecture, IBM has considerable expectations for the spread of the use of this type of equipment.

ALTIS presents an alternative business model: it is a social institution, a kind of cooperative, resulting of an articulation between the state government of Bahia, IBM and local professionals. In this partnership ALTIS was responsible for assembling the infrastructure and contracting labor. IBM was the integrator of the process, with teams monitoring implementation and quality, as well as initially being the sole customer. ALTIS occupied a building ceded by the government of Bahia located in the old commercial centre of Salvador a site intended to become a software cluster.

Up to now ALTIS is far from reproducing Hortolândia success. The business plan estimated that it would generate four thousand jobs at the top level within five years but after two years of operations only one hundred jobs had been created. The principal setback is the deficiency of qualified people. Mainframe professionals are no longer available and although there is a local offer of IT training courses these are less and less sought after. Among professionals in the area there was a high level of dissatisfaction with the local work market which, despite low pay, demands much from professionals.

Salaries¹ are considered incompatible with the high level of demands, especially in relation to fluency in English. The result is that there is a deficit of professionals, which increases every year. The absence of better structured initiatives to motivate and qualify human resources in an area of specialization considered by students to be less attractive (mainframes) is the principal cause of the relative failure of the initiative.

Technology Clusters

In this model the services provided have a relatively high aggregation of knowledge, albeit on a small scale. They are characterized by the use of local technological skills and a more integrated university-business relationship. The principal cases refer to software customization, contract based R&D and specialized consultancy. Among the clusters studied three explicitly assume the status of technological centers: Tecnopuc (Porto Alegre), Porto Digital (Recife) and Tecnópolis (Petrópolis).

Tecnopuc is a *Pontifical Catholic University of Rio Grande do Sul* (PUC-RS) project which essentially aims at expanding research activities and work opportunities for teaching staff and the student body. Located in the southern city of Porto Alegre, the Technology Park employs approximately 2300 people, 40% of whom are PUC graduates or students. Currently there are 34 companies operating in the IT, bio-technology, energy and health areas, as well as R&D centers. DELL was the first company to set up in the Park, creating the first software development unit for the internal use of the company outside the United States. Shortly afterwards Hewlett Packard also set up a R&D centre and a software factory there. Tecnopuc, designed as a form of integrating the activities of IT companies and a university in relation to R&D efforts, also has an important role in sustaining a privileged habitat for the generation of technological innovations. The centre has received public resources for R&D projects and IT training and qualification.

By setting up in Tecnopuc companies seek to exploit the availability of highly qualified human resources, technological infrastructure and services, access to the knowledge base, new business opportunities and the use of

¹ According to ALTIS in São Paulo the average salary of a mid level programmer is US \$20,000, while in Bahia this falls to approximately US\$ 6,500 a year.

fiscal incentives in partnership with the university. Although the subcontracting of local companies by multinationals does occur, principally for test related activities, there is intense competition for human resources that generally favors the larger companies. The offer of professionals with post-graduate qualifications implies an increase in wage and training costs and increases the risk of loss of capacity due to high turnover.

The second technology cluster studied is Porto Digital, a successful case based on two initiatives: the first was the creation at the end of the 1990s of the Centre of Advanced Studies of Recife (CESAR), a spin-off from the Information Technology Centre of Federal University of Pernambuco (UFPE) and which was largely responsible for the vigor with which R&D activities were carried out in the centre. The second was the granting of physical infrastructure and fiscal incentives by local and national governments for companies and research centers located in the remodeled old port area. The success in the promotion of an important geographic agglomeration of companies and support institutions through various incentives and the provision of services facilitated a dynamic based on greater articulation between local actors, the greater circulation of information and knowledge, the creation and consolidation of new companies and alliances. There are about 200 SIS small companies in the cluster, employing 3,000 people.

The quantity and quality of human resources trained in Recife explains and at the same time is the result of this process. CESAR is both the innovative core and main engine of the cluster. The connections between CESAR and other companies and institutions in the cluster now form a network through which flows knowledge, business, and new training and internationalization projects. CESAR's principal clients are multinational companies that work in the ICT area in Brazil, both in relation to the subcontracting of services and the development of R&D projects. This relationship was favored by the Informatics Law which provides fiscal incentives for R&D activities in the northeast of Brazil.

Despite its institutional and technological success, Porto Digital faces the challenge of conquering international clients without the incentives of the Information Technology Law. Incentives are temporary and local firms must

find other markets in addition to existing Brazilian ICT clients. The scalability of the project can also be limited by the lack of highly qualified human resources, as well as the excessive concentration of R&D activities in CESAR.

Among the technological clusters analyzed Tecnópolis is the least successful. It was created in 1999 with the objective of transforming Petropolis into a technological centre, taking advantage of the proximity to the metropolitan region of Rio de Janeiro and the good quality of life. The centre managed to attract some companies, as well as a small Microsoft centre for the development of the XLM language. However, it has not reached the critical mass that could characterize it as a technological centre.

The centre's main problem is the absence of a large research and post-graduate university capable of training high level human resources and serving as a R&D infrastructure. Its designers tried to use the *National Scientific Computing Laboratory* (LNCC), a public advanced research institution which was transferred to Petropolis in 1997, as a central anchor. However, LNCC is not primarily a teaching institution and its research is essentially aimed at the scientific area without creating many opportunities for commercial spin-offs. Therefore, the objective of inserting companies in flows of knowledge generated at local and regional levels appears not to have been achieved.

This result is reinforced by the analysis of company responses to questions about the advantages and disadvantages of the location. The only advantages considered to be of great or average importance by the majority of companies interviewed were the service infrastructure available and the cost of labor, while the disadvantages mentioned were the reduced availability of labor, the absence of governmental programs and the lack of fiscal incentives. Advantages normally associated with technological centers such as proximity to universities and research centers, communication and transport facilities and the quality of labor were not considered important by companies. The profile of the companies involved was not strongly associated with the characteristics of a technological centre aimed at R&D. Nor does it have important connections with local customers or constitute an outsourcing platform.

User-Producer Networks

This software clusters model is mainly oriented to attend local or regional demands which are not always provided locally by multinationals. Since most IT services require interaction between the client and the supplier, the contracting of local companies is an obvious option. SIS firms serving exclusively the regional market are usually locally-owned and have a good user-supplier relationship through the development of specific solutions for local needs. In this way they contribute to technological diffusion and the increase in the productivity of local industry. Among the clusters analyzed Blumenau and Rosario are the ones that best fit this classification.

Blumenau is a mid-sized city whose economy is based on the textile and food industry. An important characteristic of Blumenau is the existence of strong institutional ties, associated with the German culture of the immigrants who founded the city at the end of the nineteenth century. The software industry emerged out of an initiative by textile companies which created a data processing centre (CETIL) in 1969 to provide information technology services for local companies. The availability of human resources with qualifications from the regional university and the capacity to create custom-made solutions converted CETIL in the 1980s into the largest Brazilian company in this area.

In 1992 BLUSOFT was created, a technological centre which articulated software entrepreneurs with local support institutions. In the last two decades many small and mid-sized companies have been created, especially in the production of horizontal software². Currently, a tendency towards the incorporation of products and services with greater added value can be observed, such as integrated management systems (ERP), various specialist systems and industrial automation services. The software sector now employs 5% of the labor force and concentrates approximately 7% of software companies in Brazil. Local companies now have a national profile and there has been a sustained growth in the number of software companies with export revenues, the number of persons employed and tax revenues.

² A specific software application that could be applied in different user sectors.

A relevant fact was the arrival of T-System, a German subsidiary of Volkswagen specialized in on-board software for the automobile industry. The factors that motivated the move of this company to Blumenau were the availability of human resources fluent in German, the region's history of software activities and the institutional support of local entrepreneurs. Although it has reputation as being reclusive the company has established partnerships with local companies that provide software services.

Despite its success, Blumenau suffers from the lack of highly qualified labor in light of the growth of demand, especially after the arrival of foreign companies. On the other hand, the local market is no longer sufficient to sustain growth, while expansion to other markets requires that local companies expand in size.

Rosario, the third most important city in Argentina, with a population of around one million inhabitants, is a case that presents similarities to the user-producer network cluster. Counting on important industrial companies, an institutional and educational base (around 15% of its population have a third level education), the governing philosophy of Rosario for the IT sector has been to support the development of a favorable environment that can attract possible investors, promote synergies with local actors and provide potential investors with attractive and appropriate services to encourage them to set up in the city. The government does not seem interested in converting Rosario into an export platform for services (presumably with a low added value) unless they create connections with local firms.

During this decade when the SIS market has shown great dynamism, which has stimulated the creation of many new companies, the joint work of companies, the university and the local government has accelerated. This resulted in the creation of the *Technological Centre of Rosario* (PTR), a private non-profit making organization with public and private participation. One of the most important initiatives was the implementation of quality programs in software processes, as well as the rebate of a local tax³ to promote the SSI sector.

Rosario may not be characterized as a type of technological cluster

³ Known as “ingresos brutos”.

because although there is some interaction between PTR and universities, the connections are weak and there is no joint systematic work aimed at developing specific local capacities in the area of software and information technology services. Nor can Rosario be characterized as an outsourcing platform aimed at foreign markets. Thus, neither the city nor the province counts on a range of subsidies or incentive to attract ICT companies. Despite that, three transnational companies - Neoris, EDS and Accenture - have set up in the city to take advantage of the availability of qualified human resources and an environment favorable to this type of activity. The first foreign company to establish itself in Rosario was Neoris, a company formed as a technological arm of the Mexican cement maker Cemex which purchased the Rosario software company Amtec.net. EDS (recently taken over by HP) came to Rosario because of one of its big customers, the automobile company General Motors, whose industrial complex is on the outskirts of the city. In 2006 Accenture opened a Software Development Centre which has approximately 200 consultants. The multinationals created the possibility for exporting services through the integration of their respective global network. Despite this, interaction between local and foreign companies is rare and local companies are concerned about the dispute for qualified human resources.

Mixed cases

Another SIS cluster studied - Córdoba - do not fit in only one definition and is rather a combination of them. Like other large cities it counts with good technology resources, important local markets and also attracts outsourcing operations.

Córdoba is one of the most important development centers in Argentina. Various industrial activities are concentrated in it - such as food, metallurgy and automobile sectors -, and it also has a wide range of financial, business, commercial and tourist services. In addition, Córdoba is a city of great academic dynamism, with prestigious colleges, universities and third level institutions. In recent years it has won great renown through its dynamism in some service sectors, especially the call and contact centre

area, information technology services and the development of software and electronics. This has intensified in recent years with the arrival in the city of some large IT corporations. Official estimates indicate that the technology sector employs around 20,000 people in call and contact centers and 4,500 in the *Cluster Technology Córdoba* (CCT).

During the 1990s the software sector witnessed a process of growth linked to the development of business by client firms (telecommunications companies, financial system, retail, etc.) and the diffusion of technology among companies, which in turn generated a strong process of innovation in SIS companies, characterizing a user-supplier centre. The 2000s witnessed the arrival of technology companies, the creation of Cluster Technology Córdoba (CCT) and the consolidation of the sector. CCT was created by local private firms and was further reinforced by the results of the provincial government tax rebates and policies aimed at the attraction of foreign companies, insofar as the arrival of those companies improved the reputation of Córdoba as an attractive location for producing software and information services. This resulted in the arrival of large-sized transnational companies, such as Motorola, Intel and EDS. Motorola currently has 260 employees and has obtained the CMM 5 certification (López and Ramos 2007a). At present 100% of what is developed is exported. The Intel centre in Córdoba forms part of the corporation's *Software Centers Network*, which is already operating in the United States, China and Russia, and has the objective of specializing in the development of software to optimize the performance of applications that run on Intel architecture. Motorola and Intel's activities in Córdoba have a relatively high added value and serve as the basis for a "type A" technological cluster. Nonetheless, some are of the opinion that the lack of human resources with masters or doctoral qualifications and low level of cooperation with local companies can harm this process.

The third case we mention is EDS. This company opened its *Global Services Centre* in Córdoba at the beginning of 2007. Currently the company has 800 employees and expects to reach 1,500 in 2009. The Centre carries out software maintenance activities as well as developing projects in Java and Dotnet. It counts on three much differentiated areas: application

development and support, BPO and infrastructure technology outsourcing. EDS' activities are very close to that of an outsourcing platform, as is done in another seven centers around the world.

Main Findings

Locational decisions: path dependence and institutional development

Our first research question was “why some cities attract SIS firms?” We found that, in many cases, local operations are merely dependent on previous location decisions taken by hardware firms which shifted to software and services production. Large cities such as São Paulo, Rio de Janeiro and Buenos Aires have always concentrated IT activities. Recent investments in SIS activities however, seems to follow more specific driving forces. In general, decisions to invest in a particular cluster were clearly associated with the availability of qualified human resources with the relevant technical skills, the existence of nationally prestigious universities, public policies and fiscal incentives and also the fact that the location counted on a friendly institutional environment. Another essential component is related to the long term consolidation of an institutional foundation in which IT activities are prioritized and their development occurs in a more planned and sustained manner, involving the convergence of policies and business interests.

The existence of local markets is an important factor in the genesis of some clusters, especially when they demand services and specific developments. The case of Blumenau illustrates how sound institutional arrangements of SIS users can help to create locally-owned firms and strong user-producer relationships.

No cluster can aspire to play a significant role in the regional SIS industry without strongly investing in the training of human resources. The majority of clusters studied were shown to be facing growth problems due to the dispute over qualified labor, especially between foreign and local companies. Since the former are able to offer better salaries and career prospects, they recruit the best professionals, many of whom were trained with the support of local companies.

However, human resources are not just about a question of quantities,

since there are also discussions about the quality of the professionals graduating from university. Several companies have found that there exists a gap between university education and the world of work. For others university education varies depending on the university. The high qualification of human resources is especially critical in services of high added value. The technological clusters which successfully developed R&D activities came from initiatives based in universities with strong post-graduate and research sectors, counting on financial support from local and national governments. The setting up of R&D groups by key companies and access to benefits for investment in research projects complete the list of requirements for the consolidation of technological clusters. Initiatives aimed at creating technological clusters not supported by strong technological skills were not successful, as the case studies presented here have shown. To sum up, the relative local shortage of skilled people represents a central problem for all clusters and is highlighted by directors of large companies interviewed for this project as the major hindrance to investment. The qualifications lacking include not just technical skills, but also fluency in other languages and knowledge of business processes.

Public policies aimed at attracting companies have a complementary force, especially in the face of competition between different cities. To illustrate this claim, the cases of Córdoba and Rosario differ significantly in relation to policies for attracting SIS global companies. While numerous foreign companies have set up in Córdoba, most strongly supported by fiscal incentives, in Rosario foreign companies have arrived without been granted important benefits for setting up. As a result, while in Córdoba the arrival of the technology companies is strongly associated with public policies, in Rosario these companies came without special public incentives. It can be noticed, however, that Córdoba has been more successful than Rosario in attracting foreign companies.

Network effects

As far as our second research question is concerned, the research findings indicate that network effects may exist in some cases, especially when there

is a technological pole engaged in high level activities. The cases of Tecnopuc and Porto Digital show that there are some subcontracting and joint research projects between universities, multinationals and smaller firms. In Brazil these projects receive tax rebates provided by the Informatics Law and probably would not occur in the absence of such incentives.

In Porto Digital in Recife the predominant mode of operation of the multinationals operating in the SIS area has been through alliances with local actors -CESAR and CIN-, both for the subcontracting of services and for the development of R&D projects. This strategy was favored to a great extent by the incentives included in the Information Technology Law which favored investment in the region, but also because of the presence of local actors and capacities with which they could articulate, and also the development of a favorable environment from the point of view of networking. This type of articulation between large international companies and local actors has very positive effects on the latter in terms of technological learning and the accumulation of management capacities - although somewhat less in relation to the internationalization dimension - which has allowed local actors to enter new business sectors.

In Tecnopuc the cooperative relations between companies and the university have sought to exploit advantages such as the availability of special services, infrastructure, the local knowledge base and new business opportunities via outsourcing. However, the case study also found a low propensity for cooperative projects, dependence on a single customer, and problems in staffing and contract management, amongst others.

The cases analyzed here show that geographical proximity between large and small SIS firms does not necessarily encourage cooperation and positive externalities. Rather, it may increase competition for short supplied qualified human resources. The evidence collected in this study shows that out of the scope of technological centers, there is less space for subcontracting and technological cooperation. The main barrier for local subcontracting is that the SIS production chain is too short, and the whole cycle of product or service development can be provided in a single operation. Also, large corporations do not resort to subcontracting because

they fear to lose control over undisclosed information and to face managerial problems with smaller firms. Good reputation is a key asset in the outsourcing business and large firms tend to avoid transaction costs by internalizing the whole business cycle. They usually resort to subcontracting either to hire temporary people or to have access to specialized knowledge not available inside the corporation.

In Córdoba and Rosario the arrival of technology companies has had a strong impact on the respective regions, even though these companies do not seem to have important inter-relations with local industry. However, within this general situation it is necessary to distinguish the cases of 'labor intensive' technology companies from those which can be described as 'knowledge intensive'. In the first case it is clear that the entrance of these companies has shaken the labor market and has resulted in strong pressure on the salaries paid in the sector. In the second case the arrival of this type of company, which have lower labor requirements and work with more 'complex' segments from the technological point of view, tends to be better welcomed by local companies as an important contribution to the visibility of the industry at the international level and a potentially positive factor for the improvement of the technical capabilities available in each region.

In Blumenau there appear to exist important obstacles to a greater articulation between large and small local companies. The latter have faced negative experiences with the allocation of labor which ends up being directly contracted by customers. From the point of view of large firms subcontracting involves problems in relation to the long term and the high cost involved in familiarizing contract staff with the systems used, especially in complex operations.

Local SIS Industry Development Perspectives

Finally, our third research question concerns the challenges and opportunities for development, taking employment generation as the main indicator. By paying better salaries technology intensive activities can create a demand for better qualified workers and in the long term sustain higher growth rates in added value and employment (ARCHIBUGI & IAMMARINO, 2002).

Our study shows that these benefits are not necessarily connected and that they depend essentially on the availability of specialized workforce, on business strategies pursued by major operations, and the type of local institutional arrangements. The generation of qualified jobs is likely to be the single major benefit of offshore outsourcing. The SIS industry is characterized by the intensive use of highly qualified human resources. According to McKinsey (2005a, p. 161), 88% of the workers employed by the SIS industry worldwide has completed or uncompleted university education. The activity requires technical qualifications to operate and to absorb frequent technological changes, thus demanding capabilities to learn continuously. The specific qualifications required from workers are generally associated with the technological platforms used. In outsourcing services suppliers need to be skilled in the different technology adopted by clients. For this reason they tend to create outsourcing centers for different types of operations. SIS companies are organizing themselves in operational modules located in different countries. IBM, for example, is developing a model that it calls 'globally integrated operations', in which the company brings together professionals in Centers of Competence - groups of people with specific abilities distributed around the world. Instead of each national business unit having a full labor force, people are virtually summoned to the centers of competence when required.

However, software people are in short supply everywhere. For example, it is estimated that in the whole world there are 4.5 million Java professionals including both analysts and programmers and a shortfall of two million professionals that cannot be met⁴. In all cases examined here, the shortage of qualified people is seen as the main obstacle for further development. To participate in international networks, it is not enough to know programming and systems analysis, proficiency in English and other languages is also required. This includes not just linguistic abilities *per se*, but also the ability to understand specific cultural codes of relationship and communication. Professionals have to adopt clients' quality standards,

⁴ *Valor Económico* dated 3 August 2006, p. B3.

respect deadlines and inspire confidence in their partners abroad. These cultural abilities are considered to be even rarer than technical abilities.

Policy implications of the proposed taxonomy

The proposed taxonomy of SIS clusters shows that software firms have different needs according to product/services strategies, target markets and scope of operations. The types of resources demanded are differently balanced according to each category. We found that, in some cases, regional policies failed because the availability of human and other resources did not match the needs of the type of business they were targeting to attract.

Outsourcing Platforms support labor-intensive operations that require a large and continuous supply of university trained people. For this reason, outsourcing operations are usually located in large cities that count with several local educational institutions. Despite being a small town, Hortolandia is a success outsourcing platform because it is inserted in Brazil's most developed industrial area where thousands of new technicians can be hired every year. In addition to the availability of qualified people, the region offer excellent transport and communication infra-structure, a relatively low living costs and a good life quality. In Cordoba, most of these conditions are also available, since the city is both an industrial and educational centre. Salvador, in contrast, is located in a less developed region with little tradition in IT advanced training. The supply of qualified people is short face increasing local demand. Despite being an agreeable place to live and count with generous tax incentives, a development strategy based on large scale outsourcing would barely prosper at the short run.

Technology Clusters rely on more qualitative resources. The successful cases studied directly involved universities with strong tradition in post graduate and advanced research. Government fiscal incentives and subsidies are a necessary but not a sufficient condition to attract R&D activities. The case of Petropolis shows that a technology centre could not succeed counting with government policies only, if it could not find enough highly qualified people and spin-offs of advanced research projects locally. It can be noted, however, that most technology clusters are showcases of government policies

that, in addition to the availability of highly qualified people, depend on direct government subsidies (like the Informatics Law in Brazil) and would not be sustainable in the absence of this kind of support.

User-Producer Networks are typical of industrial cities where clusters of specialized users provide incentives for local designed solutions. The cases of Rosario and Blumenau show that good institutional arrangements, such as active business associations and good local public administration can not only give rise to SIS business but also leverage their industrial structure and accumulate capabilities to push new sectors. Some industrial sectors generate demand for specialized knowledge which are not always provided by multinationals and constitute market niches for local firms counting with good technological capabilities. However, niches are usually temporary opportunities since the local market growth would attract competition from outsiders. Consequently, in order to survive, local SIS firms must expand their scope of operations to outside the existing cluster.

We conclude by arguing that only regions that are committed with expanding and further improving its education system can aspire to promote local development of software and services industries. In most cases, however, government policies neglect long term investments in higher education because these efforts do not provide short term political gains. Often, education is seen as a secondary issue in industrial policies, a resource that could be provided by private initiatives. In fact, there are several new private ICT educational institutions in Argentina and Brazil operating with idle capacity because most potential students could not afford the fees. Also, private universities seldom perform research activities without government financial help. Educational policies are usually generic and few initiatives are directed specifically to ICT. According to UNESCO (2006), engineering careers attracts only 7.5% of existing university students in Brazil and Argentina, since they are considered more difficult and sometimes less rewarding than other careers. For these reasons, IT policies must include incentives for directing more young talents to technical careers.

Formación de capacidades

The project contributed to further improve our capability to develop post-graduate teaching and research in the field of the economics of ITC and clusters. Also, we learned how to work better in networks. The four institutions are developing new projects in that field some of them in partnership within the network.

In Argentina, two research assistants - **Gabriela Starobinsky** and **Cecilia Simkievich** actively participated in the Project and acquired valuable knowledge for further research activities.

In Brazil **Alessandro Pinheiro**, **Ricardo Furtado Rodrigues**, **Glaudson Bastos** and **Silvio Araujo** and **Felipe Silveira Marques** had the opportunity to develop skills that are being applied in their PhD thesis.

Renata La Rovere is now offering a new post-graduate course at UFRJ on knowledge and innovation that discusses Project results.

Gestión del proyecto

The financial management of the Project was done by Fundação Universitária José Bonifácio, of Federal University of Rio de Janeiro without any major problem. The only problem detected was a misunderstanding related to the payment of the Argentine researchers. In order to pay those researchers we had to sign an institutional contract to justify to the remittance. The problem was solved in time and did not affect the project development in Argentina.

The project faced the challenge of working in three different idioms. All participants could easily understand Spanish and Portuguese, but not write in both idioms. In consequence the reports on Argentina are written in Spanish, while those produced by Brazilians are in Portuguese. We wrote the project summary and this report in English in order to facilitate the reading for a larger public. The final article (to publish by IDRC) will be translated into Spanish. We hope not to cause any trouble for the project evaluators.

Repercusiones

Potential Socio-Political Impact.

In Argentina the results of the project allowed a diagnosis of the evolution and prospects of the two most important software clusters in the country to

be carried out, their principal strengths and weaknesses were also looked at. In this way the results can prove to be useful by both by helping to guide policy strategies and actions both clusters, as well as aiding ventures of a similar nature that are being developed in other parts of the country. Moreover, the project looked in a general form at the Argentinean software and services industry, which allowed an analysis of the competitive advantages and disadvantages of this industry which will also be useful for policy makers and the private sector. The work also contributed to the discussion of the development and prospects of the SSI industry under the auspices of the ITC Perspectives Forum, sponsored by the Argentinean Ministry of Science and Technology, to which CENIT researchers were invited to participate in different discussion groups and made a number of contributions.

Furthermore, the conclusions that result from the work will help to guide policy actions in the two clusters and in the Argentinean SSI industry, focusing them on responding to the issues that appear as obstacles to their strengthening and institutional, economic and techno-productive improvement.

In Brazil the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* - IBGE) has great interest, as well as an investigation group, in the area of the Economics of Knowledge. It is currently facing the challenge of creating indicators, especially in relation to ITC, Innovation and Services. Since IBGE has traditionally exchanged knowledge with the Institute of Economy of UFRJ, the participation of an IBGE staff member (Alessandro de Orlando Maia Pinheiro, who is now on license to do his PhD in UFRJ) in the team has helped improve the indicator creation activities of the former organization which coordinates the National System of Statistical Information. Therefore, the dialogue created with private and public policymakers at the municipal, state and federal levels has contributed to the formulation of a new analytical perspective in relation to the question.

Collaboration and synergies created with other research groups and institutions

In Argentina the SSI industry has been one of the most dynamic sectors in the economy in recent years and forms a crucial part of the possible transition of its economy to an economy of knowledge. Various research projects on this question have been carried out by CENIT. The new project allows new questions crucial to the future development of the sector to be looked at, especially in relation to the role of clusters and the impact, both positive and negative, of new foreign investments that have been made in recent years. In turn CENIT researchers have established ties with the principal actors in the two clusters analyzed, which will be important for future research in the area. In addition, connections were also established with research groups in different Brazilian universities which are also participating in the project.

A network of managers and support institutions for Latin American ITC clusters has been functioning in Brazil since 2005, supported initially by CEPAL through a technical support mission to the Recife cluster. This network has been organizing an international workshop where advanced experiences in region have been presented and development promotion strategies have been debated. It is a space for the discussion of ideas and experiences by researchers and managers of support policies for regional ITC clusters. In 2005 the first meeting was held in Recife (Pernambuco, Brazil), sponsored by CEPAL, the Pernambuco state government and Porto Digital, amongst other institutions. In 2006 the second meeting was held in Salvador (Bahia, Brasil), with the support of the state government of Bahia and the Federal University of Bahia, amongst other institutions. In 2007 this event was held in Brasília (Federal District, Brazil), with the support of the local government and SEBRAE (*Serviço Brasileiro de Apoio à Micro e Pequena Empresa* - Brazilian Support Service for Micro and Small Companies). This year the meeting will be held in Buenos Aires with the support of the municipal government, the Ministry of Science, Technology and Productive Innovation of Argentina (MINCYT), the Buenos Aires IT Center, SEBRAE and CEPAL, amongst others. Two researchers from the project, Marcos Suassuna and Néstor Bercovich, will participate in this workshop as speakers, where they will present their

principal results. In this way the project will help to consolidate and enrich this network. Specifically the conclusions of the two researchers will be diffused and debated by a large number of managers and politicians linked to the ITC clusters in the region.

Furthermore, the participation in the project of two partners of Néstor Bercovich, Marcos Suassuna and Charles Schwanke, also has implications for institutional collaboration. Marcos Suassuna works as a consultant for the Management Authority of Porto Digital (Recife, Brasil). Therefore, the results of the project will help to calibrate the strategies of this body to promote the Recife cluster. Charles Schwanke works as the manager of the Commercial and Industrial Association of Blumenau, an institution that participates in the governance of the IT cluster of that city. Also in this case the lessons of the study will be applied directly to improve local development policies. Charles Schwanke and Néstor have recently been invited by Blusoft (the cluster development authority) to monitor a training program that is being implemented in the Blumenau cluster.

Renata Lèbre La Rovere and two other researchers from the Institute of Economics of UFRJ, whose names will be defined after the confirmation of financing, will participate in a project coordinated by Prof. Chrisanthi Avgerou, from the Department of Information Systems of the London School of Economics, entitled “Software Services/Users Synergistic Innovation in India, Brazil, and China”.

Francisco Lima Teixeira has established two specific partnerships: one to write an article discussing the advantages and disadvantages of TECNOPUC with a research professor from one of the investigated organizations (Edimara M. Luciano from PUCRS). In addition a project was prepared with Prof. Edimara Luciano entitled *The Evaluation of Dynamization Policies of Local Productive Arrangements Based on the Structure-Conduct-Performance Model*, afterwards approved by FAPESB (Fundação de Apoio à Pesquisa do Estado da Bahia - Foundation for the Support of Research in the State of Bahia).

For Antonio Botelho the project has led to an increase in synergy with SOFTEX (*Sociedade de Promoção às Exportações de Software* - Society for the

Promotion of Software Exports), due to the opportunities to exchange experiences during the collection of data on the Brazilian software industry in the second half of 2007 and the first quarter of 2008. SOFTEX is a civil organization that administers the Brazilian Program of Software Exports, considered a priority by the Ministry of Science and Technology and coordinated by CNPq. The participation of Antonio Botelho in PEC B107 also contributed to an institutional approximation with SEBRAE during the second half of 2007, aimed at understanding the SEBRAE cluster integration model and the formal mechanisms of governance adopted by SEBRAE in the 15 Brazilian IT clusters. Finally, Antonio Botelho joined a research project on clusters led by IDE-JETRO in Japan.

Evaluación general

The project was very important to develop a research network involving different research groups in two countries. Comparing IT experiences in Argentina and Brazil was a very interesting experience not only for academics but also to government agencies and entrepreneurs who are presently cross-investing in both countries.

We exchanged information, trained juniors, published articles and books and are contributing to reinforce policy makers' capabilities. The Knowledge Economy project coordination at FLACSO was very helpful and competent and managed to create a good research environment by organizing home pages and seminars. Also we had the opportunity to exchange views with other project participants in Mexico, Costa Rica and Argentina.

Annex 1

Productos Generados

Research results were presented in the IV Workshop Latinoamericano de Clusters de TICs, in Buenos Aires in November 2008. The Workshop program is available in PDF in the project homepage.

Results were also presented in meetings realized in Brazil, Argentina and México and are available at the project homepage

- Article 1: LA ROVERE, R.L.L.; RODRIGUES, R.F. *Outsourcing and diffusion of knowledge in ICT cluster: a case study* -12° International Schumpeter Conference Society - ISS 2008 - Rio de Janeiro (RJ), Brasil. A modified version of this paper was selected to appear as a chapter of a book organized by prof. Andreas Pyka, from the Schumpeter Society.
- Article 2: RODRIGUES, R.F.; LA ROVERE, R.L.L.; *Parcerias e apoio tecnológico para empresas de software: o caso do Centro de Estudos e Sistemas Avançados do Recife (CESAR)* - Ricardo Furtado Rodrigues, Renata Lèbre La Rovere e Gabriela Calafate Brito. IV Congresso Internacional de Desenvolvimento Regional , Santa Cruz do Sul (RS), Brasil, 22 a 24 de outubro de 2008.
- Article 3: RODRIGUES, R.F.; LA ROVERE, R.L.L.; *Desenvolvimento local e a difusão do conhecimento em empresas de Tecnologias da Informação e Comunicação (TIC)*. Encontro de Pesquisadores de Economia Industrial da UNESP, 2008. Araraquara (SP), Brasil.
- Article 4: LA ROVERE, R.L.L.; RODRIGUES, R.F.; SHEHATA, L. *Os parques tecnológicos enquanto instrumentos de apoio ao desenvolvimento local: o caso do Petrópolis-Tecnópolis*. XII Seminario de Gestión Tecnológica - ALTEC 2007, Buenos Aires, Argentina.
- Article 5: LÓPEZ, A.; RAMOS, D. *La industria de software y servicios informáticos argentina. Tendencias, factores de competitividad y clusters*. Documento de Trabajo, Buenos Aires, Agosto 2008.
- Article 6: PINHEIRO, A. M.; RAPINI, M. S.; FELIPE, E. S. *Problematizing the commercial: liberalization-technology access-productivity channel, Brazil post 1990*. Globelics Eletronic Paper, México, 2008

- Article 7: PINHEIRO, A. M.; FELIPE, E. *Problematizando o canal. Liberalização comercial-acesso à tecnologia-produtividade no Brasil pós 1990*. Anais do XIII Encontro Nacional de Economia Política, João Pessoa, 2008
- Article 8: ARAUJO, S.; TEIXEIRA, F.J.L. LUCIANO, E. *Virtudes e Deficiências dos Parques Tecnológicos Brasileiros: O Caso TECNOPUC*. XXV Simpósio de Gestão da Inovação. Brasília, DF, 22 a 25 de outubro de 2008

Agenda de difusión del proyecto

The following articles were submitted to academic journals:

- TIGRE, P. e MARQUES, F. *Inovação e Propriedade Intelectual na Indústria de Software na América Latina*. Accepted for publication in Economia e Sociedade.
- TIGRE, P. e MARQUES, F. Offshore outsourcing in Latin America: the role of global firms. Submitted to *Information Technology for Development* - Wileys.

Articles being presently prepared for submission:

- Andrés López y Daniela Ramos: *Evolución y perspectivas de los dos clusters estudiados a la luz de la experiencia internacional*
- Silvio Araújo e Francisco Teixeira: *Razões e desafios para execução de atividades de P&D Offshoring*.
- Renata Lèbre La Rovere: *Território e aglomerações de empresas no setor de TIC: discussão sobre os efeitos do outsourcing no setor e perspectivas do Brasil*. To be submitted to Revista TIC (Brasil).
- Ricardo Furtado Rodrigues e Renata Lèbre La Rovere: *Relações de comunicação e difusão do conhecimento em empresas de tecnologia da informação e comunicação*. Submitted to XI CONGRESSO IBERCOM 2009 - Associação Ibero-Americana de Comunicação. Travessias comunicacionais: Cultura, Tecnologia e Desenvolvimento Funchal, 16-19 / Abril 2009
- Paulo Tigre and Felipe Marques: *Desafíos y oportunidades de la industria de software en América Latina*. Book on print by Editora Mayol (Colombia).
- Renata Lèbre La Rovere e Ricardo Furtado Rodrigues: *Locational Decisions of ICT global companies: the case of Hortolandia, Brazil*.

Seminars:

- A seminar is being organized by the project leaders to present the results to policy makers, industry managers and academics.

Book:

A book is being prepared presenting the project results. We hope to contribute to improving our understanding about the dynamics of SIS business in developing countries, corporate strategies and public policies.

Annex 2

Primeiro Relatório Técnico-Acadêmico

Clave del Proyecto: PEC B-107

Título del Proyecto: *Desafios e Oportunidades para a Indústria de Software e de Serviços no Brasil e na América Latina*

Sujeto de Apoyo: Fundação Universitária José Bonifácio

Informe n.1, de 31 de agosto de 2007

Período: Março a Julho de 2007

Introdução: Apresentação do Projeto

1. Avances del Proyecto en la Etapa

A seguir, serão descritos os objetivos e metas que já foram atingidos. Os outros objetivos e metas encontram-se em andamento.

Objetivo 1: Estudo do setor de software e de serviços de informática no Brasil:

Meta 1: Diagnóstico de evolução e tendências

Acción 1.2. Elaboração de documento de síntese

O documento de síntese trata das questões metodológicas da pesquisa, e foi elaborado pelos coordenadores do projeto. Estas questões metodológicas foram apresentadas num workshop que reuniu toda a equipe em junho de 2007, e as sugestões da equipe foram incorporadas ao documento. O documento será apresentado no workshop da FLACSO na cidade do México em 12 de setembro.

Meta 2: Análise dos principais sistemas produtivos locais (SPLs) no Brasil

Acción 2.1 Definição dos SPLs a serem estudados

A definição dos SPLs a serem estudados foi um dos resultados do workshop que reuniu toda a equipe em junho de 2007.

Acción 2.2. Definição de questionário e de roteiro de entrevistas às empresas dos SPLs

A definição do questionário e do roteiro de entrevistas teve início no workshop e continuou através de trocas de emails entre os membros da equipe. Até o momento foi definido um roteiro básico com perguntas que serão aplicadas em todos os locais. A equipe está no momento trabalhando nas questões específicas

Meta 3: Análise das empresas de outsourcing

Acción 3.1 Definição das empresas a serem estudadas

A definição das empresas já foi feita; a discussão teve início no workshop e continuou através de trocas de emails da equipe. A lista das empresas encontra-se em anexo.

Acción 3.2. Definição de questionário e de roteiro de entrevistas às empresas de outsourcing

A definição do questionário e do roteiro de entrevistas teve início no workshop e continuou através de trocas de emails entre os membros da equipe. Até o momento definimos um roteiro básico com perguntas que serão aplicadas em todas as empresas. A equipe está no momento trabalhando nas questões específicas

Objetivo 2: Estudo do setor de software e de serviços de informática na Argentina

Meta 2: Análise dos principais sistemas produtivos locais (SPLs) na Argentina

Acción 2.1 Definição dos SPLs a serem estudados

A definição dos SPLs a serem estudados foi um dos resultados do workshop que reuniu toda a equipe em junho de 2007.

Acción 2.2. Definição de questionário e de roteiro de entrevistas às empresas dos SPLs

A definição do questionário e do roteiro de entrevistas teve início no workshop e continuou através de trocas de emails entre os membros da equipe.

Meta 3: Análise das empresas de outsourcing

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A definição das empresas já foi feita; a discussão teve início no workshop e continuou através de trocas de emails da equipe. A lista das empresas encontra-se em anexo.

Acción 3.2. Definição de questionário e de roteiro de entrevistas às empresas de outsourcing na Argentina

A definição do questionário e do roteiro de entrevistas teve início no workshop e continuou através de trocas de emails entre os membros da equipe. Até o momento definimos um roteiro básico com perguntas que serão aplicadas em todas as empresas. A equipe está no momento trabalhando nas questões específicas

2. Logro de Metas Respecto de Metas Comprometidas

O cronograma original previa 24 meses de trabalho ao total (de janeiro de 2007 a dezembro de 2008). Por razões administrativas, a pesquisa teve início de fato em março de 2007 e o término está previsto para novembro de 2008 (20 meses ao invés de 24). O projeto original previa o cumprimento de todas as 24 ações ligadas às metas dos objetivos 1 e 2 em 12 meses. Como foram cumpridas 9 das 24 ações em 4 meses, a equipe espera cumprir todas as metas no prazo previsto.

3. Logro de Objetivos Respecto de Compromiso

Como as metas estão dentro do cronograma, a equipe pretende atingir os objetivos 1 e 2 no prazo previsto

4. Grupo de Trabajo

Nosso grupo de trabalho teve uma substituição em relação à proposta inicial. Daniel Chudnovsky, da UDESA, foi substituído por Daniela Ramos, do CENIT.

O grupo se constitui assim de pesquisadores de várias instituições, a saber:

Pesquisadores:

Paulo Bastos Tigre e Renata Lèbre La Rovere, do Instituto de Economia, Universidade Federal do Rio de Janeiro:

Antonio José Junqueira Botelho, da Pontifícia Universidade Católica do Rio de Janeiro

Andrés Lopez e Daniela Ramos, do CENIT

Consultores:

Francisco Teixeira, da Universidade Federal da Bahia

Néstor Bercovich

O grupo conta ainda diversos alunos de pós-graduação das instituições supra mencionadas, que trabalharão na pesquisa de campo e no apoio à revisão de literatura.

5. Desviaciones y/o modificaciones en la etapa

Foram realizadas duas modificações em relação ao projeto original. A primeira foi na composição da equipe, provocada pelo falecimento de Daniel Chudnovsky. A segunda foi na lista de SPLs pesquisados. No workshop, após várias discussões, optou-se por eliminar o SPL de Petrópolis e acrescentar o de Porto Alegre. Isto porque Porto Alegre é um SPL consolidado, enquanto que o de Petrópolis está em formação.

6. Acciones Derivadas de las Desviaciones

As mudanças ocorridas não provocaram modificações em nosso cronograma, nem nas metas e nos objetivos propostos.

7. Acciones Realizadas con los Sectores Usuários

Não foram ainda realizadas ações junto às empresas

8. Observaciones Relevantes sobre el Presupuesto Autorizado

Foi solicitado um remanejamento dos recursos destinados à pesquisa de campo ao Sr. Dante Avaro. A autorização foi concedida por email no dia 20 de março de 2007. Uma cópia do email encontra-se em anexo.

9. Estado de las Aportaciones Complementarias

Até o momento não houve necessidade de aportes de recursos complementares.

10. Productos Obtenidos en la Etapa

10.1 Ata do workshop realizado nos dias 20 e 21 de junho

10.2 Documento metodológico de síntese da discussão conceitual sobre sistemas produtivos locais e sobre a indústria de software e de serviços

A ata do workshop encontra-se no anexo 2. O documento metodológico será apresentado por Paulo Bastos Tigre no workshop da FLACSO.

11. Compromisos para la Seguinte Etapa

Finalizar a revisão de literatura e o trabalho de campo, cumprindo assim plenamente os objetivos 1 e 2.

Rio de Janeiro, 31 de agosto de 2007

Renata Lèbre La Rovere

Ata do Segundo Relatório Técnico-Acadêmico

Clave del Proyecto: PEC B-107

Título del Proyecto: *Desafios e Oportunidades para a Indústria de Software e de Serviços no Brasil e na América Latina*

Sujeto de Apoyo: Fundação Universitária José Bonifácio

Informe n.2

Período: Agosto de 2007 a Junho de 2008

Introdução: Apresentação do Projeto

O projeto proposto tem como objetivo estudar as perspectivas da indústria de software e serviços no Brasil e na Argentina, visando promover o desenvolvimento regional e a transmissão de novas tecnologias para indústrias usuárias. Isso inclui o estudo de dois tipos de empresas: empresas de sistemas produtivos locais, contribuindo para a competitividade sistêmica de uma região, e empresas de “enclaves de outsourcing”. Estes dois tipos apresentam formas de atuação empresarial e impactos sobre o desenvolvimento regional e nacional bastante distintos.

Este projeto pretende analisar a capacidade das empresas localizadas em sistemas produtivos locais e das empresas que fazem outsourcing, no setor de TICs, de explorar novas oportunidades de negócios geradas pela Economia do Conhecimento e ampliar seus mercados. A partir desta análise será possível propor elementos que contribuam para a definição de políticas de apoio às empresas de software e de serviços de informática estudadas no Brasil e na Argentina.

1. Avances del Proyecto en la Etapa

A seguir, serão descritos os objetivos e metas que já foram atingidos. Os outros objetivos e metas encontram-se em andamento.

Objetivo 1: Estudo do setor de software e de serviços de informática no Brasil:

Meta 1: Diagnóstico de evolução e tendências

O diagnóstico foi feito a partir de revisão de literatura e uma versão preliminar já foi finalizada.

Meta 2: Análise dos principais sistemas produtivos locais (SPLs) no Brasil

Acción 2.1. Definição dos principais sistemas produtivos locais no Brasil

No workshop de junho de 2007, a equipe tinha definido os principais sistemas produtivos locais a serem estudados no Brasil. Decidimos acrescentar à lista de sistemas produtivos estudados o SPL de Hortolândia, por ser um caso recente e bem-sucedido de outsourcing no Brasil, e re-introduziu o de Petrópolis, por ser um caso também recente porém mal-sucedido de desenvolvimento de pólos de software.

Acción 2.2. Definição de questionário e de roteiro de entrevistas às empresas dos SPLs

A definição do questionário e do roteiro de entrevistas teve início no workshop de junho de 2007 e continuou através de trocas de emails entre os membros da equipe. Em dezembro de 2007 o roteiro de entrevistas e questionário foi finalizado, e a equipe iniciou o trabalho de campo.

Acción 2.3 Aplicação de questionário e de roteiro de entrevistas

Os questionários e entrevistas foram realizados pelos membros da equipe nos seguintes SPLs: Porto Alegre, Salvador, Recife, Blumenau e Hortolândia. Nos casos de Petrópolis e Rio de Janeiro, foram feitas entrevistas com especialistas na região.

Acción 2.4 Consolidação dos resultados

Feita entre março e maio de 2008. Os resultados consolidados foram discutidos no segundo workshop da equipe em maio de 2008, visando à elaboração do documento de síntese final. A ata do workshop segue no anexo

I. Os índices dos documentos que subsidiaram as discussões do workshop estão listados no anexo II.

Meta 3: Análise das empresas de outsourcing

Acción 3.1 Definição das empresas a serem estudadas

A definição das empresas já foi feita; a discussão teve início no workshop de junho de 2007 e continuou através de trocas de emails da equipe.

Acción 3.2. Definição de questionário e de roteiro de entrevistas às empresas de outsourcing.

A definição do questionário e do roteiro de entrevistas teve início no workshop de junho de 2007 e continuou através de trocas de emails entre os membros da equipe.

Acción 3.3 Aplicação de questionário e de roteiro de entrevistas Feita entre dezembro de 2007 e março de 2008.

Acción 3.4 Consolidação dos resultados

Feita entre março e maio de 2008. Os resultados consolidados foram discutidos no segundo workshop da equipe em maio de 2008, visando à elaboração do documento de síntese final.

Objetivo 2: Estudo do setor de software e de serviços de informática na Argentina

Meta 2: Análise dos principais sistemas produtivos locais (SPLs) na Argentina

Acción 2.1 Definição dos SPLs a serem estudados.

A definição dos SPLs a serem estudados foi um dos resultados do workshop que reuniu toda a equipe em junho de 2007.

Acción 2.2. Definição de questionário e de roteiro de entrevistas às empresas dos SPLs

A definição do questionário e do roteiro de entrevistas teve início no workshop de junho de 2007 e continuou através de trocas de emails entre os membros da equipe. Em dezembro de 2007 o roteiro de entrevistas e questionário foi finalizado, e a equipe iniciou o trabalho de campo.

Acción 2.3 Aplicação de questionário e de roteiro de entrevistas

Os questionários e entrevistas foram realizados pelos membros da equipe nos seguintes SPLs: Córdoba e Rosario

Acción 2.4 Consolidação dos resultados

Feita entre março e abril de 2008. Os resultados consolidados foram discutidos no segundo workshop da equipe em maio de 2008, visando à elaboração do documento de síntese final.

Meta 3: Análise das empresas de outsourcing

Acción 3.1 Definição das empresas a serem estudadas

A definição das empresas já foi feita; a discussão teve início no workshop de junho de 2007 e continuou através de trocas de emails da equipe.

Acción 3.2. Definição de questionário e de roteiro de entrevistas às empresas de outsourcing na Argentina

A definição do questionário e do roteiro de entrevistas teve início no workshop de junho de 2007 e continuou através de trocas de emails entre os membros da equipe.

Acción 3.3 Aplicação de questionário e de roteiro de entrevistas

Feita entre dezembro de 2007 e março de 2008.

Acción 3.4 Consolidação dos resultados

Feita entre março e abril de 2008. Os resultados consolidados foram discutidos no segundo workshop da equipe em maio de 2008, visando à elaboração do documento de síntese final.

Objetivo 4: Proposição de Políticas de Apoio na Argentina**Meta 1: Análise de políticas horizontais e verticais já existentes**

Acción 1.1: Revisão de literatura

Feita entre agosto e setembro de 2007

Acción 1.2: Definição de roteiro de entrevistas a instituições de apoio

Feita em setembro de 2007

Acción 1.3 Aplicação de entrevistas a instituições de apoio

Feita em outubro de 2007

Meta 2: Identificação de medidas para fortalecer políticas de apoio existentes

Acción 2.1 : Análise dos resultados das empresas

Feita em janeiro de 2008

Acción 2.2: Análise das entrevistas às instituições

Feita em novembro de 2007

Acción 2.3 Elaboração de documento de síntese de propostas

Feito em fevereiro de 2008

Meta 3: Proposição de novas políticas

Acción 3.1 Análise dos resultados das empresas

Feita em janeiro de 2008

Acción 3.2 Análise das entrevistas às instituições

Feita em novembro de 2007

Acción 3.3 Documento de síntese com propostas

Feito em fevereiro de 2008

2. Logro de Metas Respecto de Metas Comprometidas

O cronograma original previa 24 meses de trabalho ao total (de janeiro de 2007 a dezembro de 2008). Por razões administrativas, a pesquisa teve início de fato em março de 2007 e o término está previsto para novembro de 2008 (20 meses ao invés de 24). O projeto original previa o cumprimento de todas as 24 ações ligadas às metas dos objetivos 1 e 2 em 12 meses. Estas ações foram cumpridas entre março de 2007 e maio de 2008. A coordenação avalia que o atraso de dois meses não trouxe prejuízos ao andamento do projeto.

3. Logro de Objetivos Respecto de Compromiso

A equipe atingiu os objetivos 1, 2 e 4 e espera cumprir os objetivos 3 e 5 nos próximos meses.

4. Grupo de Trabajo

Nosso grupo de trabalho teve neste período a participação mais ativa de estudantes de pós-graduação de diversas instituições

O grupo se constitui assim de pesquisadores e estudantes de várias instituições, a saber:

Pesquisadores:

Paulo Bastos Tigre e Renata Lèbre La Rovere, do Instituto de Economia, Universidade Federal do Rio de Janeiro:

Antonio José Junqueira Botelho, da Pontifícia Universidade Católica do Rio de Janeiro

Andrés Lopez e Daniela Ramos, do CENIT

Consultores:

Francisco Teixeira, da Universidade Federal da Bahia

Néstor Bercovich

Estudantes de Pós-Graduação

Alessandro B. Orlando Maia Pinheiro - IE/UFRJ

Glaudson Mosqueira Bastos - PUC-RJ

Ricardo Furtado Rodrigues - IE/UFRJ

Silvio Vanderlei Araújo Sousa - UFBA

Trajano Ayrton de Souza Lima Jr. - UFBA

5. Desviaciones y/o modificaciones en la etapa

Foram realizadas duas modificações em relação ao projeto original.

A primeira foi em relação aos documentos de síntese de pesquisa de campo. O projeto original previa dois documentos de síntese de pesquisa, um discutindo os SPLs e o outro discutindo as estratégias das empresas que fazem outsourcing. Após a discussão dos workshops, ficou evidente que faria mais sentido consolidar estes documentos num único documento de síntese. Além disso, o projeto original previa dois documentos de síntese sobre políticas de apoio, um avaliando as políticas existentes e outro propondo novas políticas. Discussões dos coordenadores com a equipe responsável por estes documentos levaram ao entendimento de que bastava um documento de síntese sobre políticas para cada país, sendo que a discussão das políticas foi integrada à caracterização da indústria de software nos países.

A segunda foi em relação ao conjunto de SPLs estudados no Brasil. Após ter decidido remover Petrópolis da lista de casos, este SPL foi re-introduzido por se tratar de um contraponto interessante à experiência de Hortolândia (também introduzido após o workshop de 2007). O projeto ficou assim com 9 estudos de caso.

6. Acciones Derivadas de las Desviaciones

As mudanças ocorridas não provocaram modificações em nosso cronograma, nem nas metas e nos objetivos propostos.

7. Acciones Realizadas con los Sectores Usuários

Não foram ainda realizadas ações junto às empresas.

8. Observaciones Relevantes sobre el Presupuesto Autorizado

Sem observações.

9. Estado de las Aportaciones Complementarias

Até o momento não houve necessidade de aportes de recursos complementares.

10. Produtos Obtenidos en la Etapa

10.1 Ata do workshop realizado nos dias 12 e 13 de maio

10.2 Documentos preliminares de relatório da pesquisa de campo

11. Compromisos para la Seguinte Etapa

Cumprir as etapas 3 e 5 do projeto e disponibilizar os relatórios finais na página do projeto na internet.

Rio de Janeiro, 17 de julho de 2008

Paulo Bastos Tigre e Renata Lèbre La Rovere