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Software Firms and Local Development in Bolivia

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Supervisor: Prof. Dr. Utz Dornberger

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ABSTRACT

This research takes a qualitative approach to understand the current impact/effects that Bolivian software companies, a relatively nascent sector, have on local development. The motivation behind the study is that the software industry can constitute an important ingredient for national development.

Based on the Vazquez-Barquero (1988) definition of local development as *a process of economic growth and structural change that leads to a better living standard of the local community/population*, this study will focus on employment and income generation to signal positive economic growth and increased innovation, better human capital management and support from private/governmental institutions to signal an increase in productivity and structural change.

To obtain information on the industry 27 companies and 4 key sector representatives were interviewed. An online survey was administered as well to 16 knowledge workers to cross-check information. The main findings include that software firms do promote economic growth, improved human resources practices and entrepreneurship. However, the lack of organizational capacity among local actors (little social capital) and the non-effective support of private and governmental institutions are obstacles to the systemic competitiveness of the industry; limit its growth and its positive impact in the local economy.

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Cochabamba, Bolivia, July 2013

Claudia Ricaldez

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Abbreviations

BPO	Business process outsourcing
CADEXCO	Cámara de Exportadores-Chamber of Exporters
CBTI	Cámara Boliviana de Tecnologías de la Información- Bolivian Chamber of Information Technology
CEPAL/ECLAC	Economic Commission for Latin America and the Caribbean
CUTI	Cámara Uruguaya de Tecnologías de Información- Uruguayan Chamber of Information Technology
ICT	Information and communication technologies
iOS	iPhone Operating Systems
SBI	Sistema Boliviano de Innovación- Bolivian System of Innovation
SME	Small and medium sized enterprises
SSI	Software and services industry
PROSOFT	<i>Programa de Promoción y Mejoramiento de la Industria de Software en Bolivia- Program for the promotion and improvement of the Software industry in Bolivia.</i>

Chapter 1 Introduction

1.1 Background

The software industry in Bolivia is currently in full development. The Bolivian Chamber of Information Technology (CBTI) developed a study that pointed out the existence of at least 500 companies engaged in software production. In addition, each year approximately 4000 new professionals graduate from careers such as systems engineering, informatics and telecommunications from private and state universities (Juarez Zeballos 2011).

Economically, the software market in Bolivia is relatively small but interesting since businesses from all sizes need to systematize their business processes, production and customer services to be efficient and competitive. In addition, outsourcing offers a broader perspective and new market possibilities world-wide. Several software small and medium sized (SMEs) enterprises are already exporting their services to clients abroad.

As Lafuente Lopez (2007) states, in Cochabamba alone, there is more than a dozen of small and large software enterprises that develop information systems for countries such as the U.S. and others in Europe, which have found high quality and competent software providers in Bolivia. This clearly points to the potential of Bolivia becoming a successful software exporter like neighbouring countries.

However, due to the general lack of awareness by official authorities not much is known about the Bolivian software industry stand (Where is it now? Where is it headed to?). Copying an interviewee, “the software industry in Bolivia is a mystery”.

1.2 Purpose and motivation

Traditionally, Bolivia’s economy has been dominated by the mining, hydrocarbons and agricultural industries. Just in 2006 the government, recognizing the importance of technology for growth, created a new ministry (Viceministerio de Ciencia y Tecnología) in charge of promoting ‘science and technology’ and linking the public sector with the private one (productive sector).

According to endogenous growth theorists such as Romer (1986) and Lucas (1988), technological change is an endogenous outcome of public and private investment in human capital and knowledge-intensive industries. The production of new technologies is crucial for economic development so are increasing returns to scale.

In 2009, Jalasoft SRL, a company based in Cochabamba dedicated to outsourcing of software development and quality engineering, figured among the 12th largest exporters in Bolivia (Ranking Economía y Negocios 2011). Having a software firm listed among the largest exporters, points to the potential of the industry as an important ingredient in national development. In a review of executives’ opinions¹ about software SMEs and their impact on the economy, several pointed out to effects on job generation, transformation of education, promotion of local innovation and more access to new technologies.

¹ Executives include: Alvaro Celis Microsoft representative in Latin America, Dr. Reynaldo Vargas, CEO of Piramide Informatik, Javier Salazar, president of the CBTI, Jorge Lopez, CEO of Simec Soft and Arnold Hagens, Marketing and Product Manager of Jalasoft.

Unfortunately, at the moment in Bolivia the role that software SMEs play in precisely promoting the local economy and spillover effects, such as growth, innovation, better trained labor forces is still unknown. The successes and shortcomings of software SMEs have not been fully documented and have not resulted in policies favouring this sector. The lack of support to this industry is apparent through no formal recognition of software firms in neither the Bolivian taxation agency (Impuestos Nacionales) nor the commercial registration system (Fundempresa).

This qualitative and quantitative research strives to obtain an overview and advance knowledge of the Bolivian software industry, its effects on local development and its competitiveness as a sector.

1.3 Research questions

This research will like to answer the following questions:

- Do software SMEs that export contribute to generating local development in the Bolivian cities of Cochabamba, Santa Cruz and La Paz?
- How competitive is the Bolivian software industry?

1.4 Objectives

Taking into account the previously stated research questions, this study has the following objectives:

1.4.1 General Objectives

Obtain an overview of the Bolivian software industry competitiveness and determine the effect that software SMEs that export have on economic growth and structural change in the cities of Cochabamba, Santa Cruz and La Paz.

1.4.2 Specific Aims

- Study employment and income generation brought about by software SMEs.
- Analyze how software SMEs train their human resources and promote innovation to increase their productive capacity.
- Analyze the institutional environment in which software SMEs function as well as the organizational capability of local actors.
- Assess the competitiveness of the Bolivian software industry.

1.5 Variables of Study

1.5.1 Employment and Income Generation

Both variables belong to the quantitative realm. They were selected as an increase in both, clearly points to economic growth. The connection between employment and stable income is assumed to lead to a better living standard, mainly because the knowledge worker is able to find employment and also work in his/her field.

In this study employment generation is represented by how much labor software companies demand and will need in a 3 year period. Income generation is observed in terms of average wages for IT Professionals both at entry level and after 5 years of work experience. IT professional wages are then compared to the average wage of other professionals in Bolivia.

1.5.2 Innovation and Human Capital

Both variables are qualitative and they were selected because both innovation and qualified workers can significantly increase the productivity of a system. Van Marrewijk and Timmers (2003) state that the quality processes in a software firm depend more and more on the capacity to generate and apply knowledge to productive processes, and this is only possible through qualified employees.

For this research, the focus is on creation of an innovative milieu and effectiveness of competencies training at software firms.

1.5.3 Private/Governmental Support

A qualitative variable selected to inquiry whether there is a favorable local environment for the industry and also how all stakeholders are interacting with each other. Fuá (1994) defines entrepreneurial, organizational capability, environmental resources and functioning of institutions as decisive factors for development. For purposes of this study, the private/governmental support variable is represented by the existence or not of organized groups in charge of promoting the industry.

Below a summary of the quantitative/qualitative variables and their measurement units is presented.

Table 1 Economic Growth Dimension

VARIABLES	INDICATORS	MEASUREMENT UNITS
EMPLOYMENT GENERATION	The quantity of employees in software SMEs increased from time of foundation to present and will continue to increase in 3 years.	-Number of employees at time of foundation. -Number of employees at present. -Projected number of employees in three years.
INCOME GENERATION	Knowledge workers in the selected software SMEs earn more than the average professional in terms of income per capita over a course of 5 years.	-Average entry level income of knowledge workers. -Average senior level income of knowledge workers.

:

Table 2 Structural Change Dimension

VARIABLES	INDICATORS	MEASUREMENT UNITS
INNOVATION	The quantity of employees in software SMEs increased from time of foundation to present and will continue to increase in 3 years. The majority of knowledge workers acknowledged a lack of a clear strategy to promote innovation and hence an innovative milieu at software SMEs.	-Number of employees that believe that they work in an innovative work environment.
HUMAN CAPITAL	The majority of knowledge workers at software SMEs agree that competencies training provided by employers is an effective professional post-training.	-Number of companies with structured entry level training. -Number of companies with continuous training. -Number of employees that benefited from competencies training.
PRIVATE/GOVERNMENTAL INSTITUTIONAL SUPPORT	The majority of employers and knowledge workers at software SMEs acknowledged a lack of organized groups (private/governmental) that support the software industry.	-Willingness to enter into organized knowledge exchange events among companies. -Membership in clusters.

1.6 Delimitations

In the cities of Cochabamba, Santa Cruz and La Paz 27 companies² were interviewed or surveyed. The types of software companies interviewed followed a specific criterion such as being in the area of mainly software development, web development, mobile application development, quality testing and other line of activities that are knowledge intensive and require highly skilled staff.

² Five companies interviewed were excluded from this study because two of them were implementing solutions with foreign partners but not developing and the rest were working only locally but had plans to start operations abroad in 2013. Their input was employed for the recommendation section.

Participating companies were also small and medium sized³ enterprises, with headquarters in Bolivia and an international clientele.

Given the various definitions of development, this study is based on the Vázquez-Barquero (1988) definition of local development as a process of economic growth and structural change that leads to a better living standard of the local community/population.

There exists a broad range of variables that can be analysed for economic growth and structural change. However, this study focuses on employment and income generation to signal positive economic growth and increased innovation, better human capital management and support from private/governmental institutions to signal an increase in productivity and structural change.

Chapter 2 Research Method

This chapter describes the scenario in which research took place, as well as the research approach and collection techniques selected to answer the research questions.

³ The definition of what constitutes a small and medium size enterprise varies, Bolivian standards state that small size enterprises are companies with 20 employees, while according to the OECD standards companies with 100 employees are small. In the EU medium size companies are composed of 250 employees. In this study we adopt the standards used by AMITI (the Mexican Association for the IT industry), where companies with 15-100 employees can be categorized as 'small' and companies with 101-250 employees are considered "medium".

2.1 Research Scenario

Figure 1 Research Scenario Map



Bolivia's projected population for 2012 is of 10'822.546 (INE 2010, 139) and together the states of La Paz, Santa Cruz and Cochabamba embody more than 70% of the overall population in the country.

These states are also an interesting representation of the country as they are very heterogeneous and reflect the variety of the Bolivian geography and culture. Starting north-west at an altitude of 3,640 mts above sea level is andean La Paz, in the middle of the country at an altitude of 2,558 mts is sub-tropical Cochabamba and east 416 mts above sea level lies tropical Santa Cruz de la Sierra (INE 2010, 36).

In terms of competitiveness, these three cities were ranked as the best cities to do businesses in Bolivia. Santa Cruz has a score⁴ of 6.43, La Paz of 5.98, and Cochabamba of 5.64 (Siles Espada, Zeballos Juarez, and Escobar 2010).

According to 2010 statistics from the National Institute of Statistics (INE) on average, La Paz contributes with 24% of the national GDP, Cochabamba with 16% and Santa Cruz with 27%.

⁴ The score looks at political, economic, social and technological conditions. The minimum is 1 signaling the worst possible conditions to set up a business and 10 the maximum score.

State-wise, manufacturing constitutes an important economic activity for all three states. In La Paz public administration services, real estate and other business support activities are also key to their economy (37% of its total GDP). In Cochabamba, transportation as well as public administration services represent 29% of its GDP and in Santa Cruz 22% of its GDP comes from agricultural activities and 14% from real estate and other support business activities.

Based on responses to the local factor questions in the questionnaire for software firms, it was possible to identify the main advantages and disadvantages of each location as to the software industry pertains:

Table 3 Factors of competitiveness by locations

STATE	ADVANTAGES	DISADVANTAGES
SANTA CRUZ	<p>-Santa Cruz is the fastest growing city in Bolivia and is close to several key large enterprises in the fields of hydrocarbons and agriculture. In 2010, the newspaper “Economía y Negocios” published a ranking of the main Bolivian enterprises by economic activity and it is evident that enterprises based in Santa Cruz dominate almost across all sectors.</p> <p>-Cruceños are characterized by their willingness to invest and their promptness to do so.</p>	<p>-Higher living costs than other cities.</p> <p>-Difficult relationship with government as Santa Cruz was among the separatist states in past upheavals. This can hamper the business environment in this region.</p>
LA PAZ	<p>-Seat of the Bolivian government and embassies.</p> <p>-Financial center (9 out of the top 10 financial institutions are based in La Paz).</p>	<p>-Higher living costs than other cities.</p> <p>-Bureaucratic business transactions.</p>
COCHABAMBA	<p>- Presence of the largest software company in Bolivia (Jalasoft), which has spurred several spin offs by former employees in the city and promoted local clustering of software development companies.</p> <p>- Lower living costs as well as ease of transportation compared to La Paz and Santa Cruz.</p>	<p>-Less dynamic business environment compared to Santa Cruz and La Paz.</p>

It is important to understand that some advantages can shape the specialization of software firms in the country. For example, companies in La Paz and Santa Cruz with access to larger customers might prefer to specialize in systems integration, that is implementing solutions rather than developing them (there is less risk and more return) and companies in Cochabamba might look into providing software development services to companies abroad to make up for a smaller market.

Something also essential to highlight is that in Bolivia, micro and small-enterprises⁵, many times informal enterprises, dominate the market. High costs and the complexity involved in opening and running an enterprise have indirectly promoted the existence of a large informal sector in the economy equivalent to 70% of the national GDP (Borda and Ramirez 2006, 23). Costs to open a business in Bolivia are three times higher than those in other countries of the Latin American region, so are the number of procedures (Borda and Ramirez 2006, 41).

While being strategically located in the middle of South America, Bolivia has the significant disadvantage of being a landlocked country which imposes many structural challenges to access world markets and dependence on transit neighbours, such as dependence on neighbors' infrastructure and dependence on sound cross-border political relations (Faye et al. 2004, 31).

Given the characteristics of the software industry such as being human capital intensive, requiring low start-up investment, being environmentally friendly and its high growth, could this industry offer viable path to development in Bolivia?

2.2 Research Method

This thesis employs the qualitative research approach since it seeks to describe, interpret and understand the phenomenon of the software industry in Bolivia. The qualitative approach is used when the interpretation of phenomena cannot be correctly expressed only by statistics or mathematics. To confirm the validity of results, it uses the principles of credibility, validity and transferability. This mainly implies using multiple sources and methods to study a problem (Cerdeña Gutierrez 1993, 48). In this approach smaller but focused samples are more often needed than large samples.

Given the lack of local bibliography on the subject and the difficulty in obtaining the information due to confidentiality concerns, the best methodological techniques to gather data were mainly observation and structured interviews (sometimes equated to developing the survey verbally). Occasionally, software companies' representatives preferred to work with the interview questions online.

An online survey was as well used on some occasions, identical to the semi-structured interview. While the main advantage of surveys lie in their effectiveness to obtain information from the population at a large scale (Cerdeña Gutierrez 1993, 298), in this study it was employed just on occasions where key representatives were out of town, had a complicated schedule and preferred to work on the survey according to their own time. The survey was available online, so it was very convenient to access from work or home. Thus, applying the survey on a large scale was not the intention.

⁵ According to the IDB report of 2002 micro-enterprises contribute to 25% of the national GDP but employ roughly 83% of the total population available to work and large enterprises contribute with 65% of GDP and employ only 8,7% of the workforce.

In addition, to interviews and surveys, an analysis of empirical studies in emerging countries (second hand sources) was conducted along with a survey to knowledge workers to cross-check information and confirm validity of results.

2.2.1 The Interviews

Interviews were conducted by the author to first a) key representatives of software SMEs in the states of Cochabamba, Santa Cruz and La Paz b) presidents of both the CBTI and ProSoft (support organizations of the software industry) and c) a representative from the Vice ministry of Science and Technology and the director of the Systems Engineering department at the Catholic University in La Paz.

The interviews were conducted to 32 firms first during December-February 2012 and again on July and August 2012, out of which 5 were excluded from the sample, reducing the total to 27. The interviews lasted on average 45 minutes.

2.2.2 The Online Survey

The online-survey (identical to the interview) was distributed to some key representatives that did not have time to schedule an interview. Also, a survey to 16 knowledge workers was administered. Knowledge workers ranged from recently hire ups to senior developers/IT professionals and project leads. For a sample of the survey content please refer to **Appendix 2**.

Chapter 3 The Software Industry in Latin America

This chapter presents an overview of the software industry in Latin America, its attractiveness for offshoring, the role of different key countries in the region and their stake in the global software and services industry. An overview of the Bolivian software is included as well.

3.1 The Software Industry in Neighbouring Countries

Software is a knowledge intensive industry, and traditionally, only developed nations had significant roles in these industries. The emergence of Ireland, India and Israel as players in international software caused stir and interest in the business and academic communities (Junqueira Botelho, Stefanuto, and Veloso 2003, 5). Following this trend, the Latin American software and services industry (SSI) is emerging as a strong IT provider and market (Romero Krause, 313).

Datamonitor estimates that by the year 2013, the value of the software market will be of \$457 Billion and increase of 50.5% since 2008⁶. As figure 2 illustrates, Latin America's share of the world-wide total IT Services market is of only 3%, compared with the US and Canada of 40% or EMEA of 41%. However, this sector is growing at a faster pace than many other regions; for example, 19% growth compared to 5% in the USA/Canada.

The attractiveness of the region centers around its (a) evolving economy (b) prepared workforce (c) convenient time zones (d) laws and regulations that benefit the IT sector⁷ (e) educational infrastructure that guarantees supply of new resources and (f) low cost.

⁶ [DataMonitor: Global Software Industry Guide – 2008](#) (Abstract)

⁷ This varies from country to country in Latin America. For example, Chile is known for its strong government support and favorable regulations/incentives, while Brazil has strong tax barrier of 60% for service imports (Romero Krause 2011, 320)

When talking about the software and services industry in Latin America, there are 7 countries that stand out: Argentina, Brazil, Chile, Mexico, Colombia, Uruguay and Costa Rica. Most research is directed towards these countries due to their volume of activity⁸. Table 4 (below) presents the main national software and services companies in Latin America⁹.

Table 4 Main National Software and Services Companies in Latin America, Year 2005. Source: Bastos Tigre and Silveira Marques (Cepal) (277); Ranking Economía y Negocios (2009).

Country	Company	Net Revenue (millions of USD)	No. of Employees	LEI [♣]	Main Activities
Argentina	Anectis	28	-	-	Software sales of third party solutions
Argentina	Grupo las A	24 [♦]	600	25.0	Profesional services
Argentina	DATCO	19 [♦]	280*	14.7	Profesional services
Brazil	CPM	255	2600	10.2	Systems Integration, contracting
Brazil	Politec	196	6500	33.2	Systems Integration, contracting
Brazil	Microsiga	162	1779	11.0	Software-product (ERP)
Chile	Sonda	350	4500	12.9	Integration, development and consulting
Chile	Coasin	60	950	15.8	Consulting, development, software-product
Chile	Adexus	50	400	8.0	Consulting, development, sales
Mexico	Sofftek	140	4000	28.6	Professional services, contracting
Mexico	Hildebrando	94	>1,300	>13.8	Profesional services
Mexico	Aspel	7	200	28.6	Software-product (administrative)
Uruguay	Grupo Canam	20	446	22.3	Profesional services
Uruguay	ARTech	>15	100	<6.7	Software-product (tool)
Uruguay	Infocorp	6	197	32.8	Solutions for Microsoft Platforms
Bolivia	Jalasoft	1.8 [●]	300	166.7	Software development & quality testing

♦ 2004 Data

● 2009 Data

♣ Local Employment Intensity Indicator
(Employment per Million)

The magnitude of the industry in Latin America can be observed through the earnings and employment that these main representatives generate. In Table 4, the company with the highest revenue and thus the main software and services provider in Latin America is Sonda from Chile. Sonda alone in 2005 invoiced \$350 million, \$54 million from Brazilian origin and \$8 million from Mexican and Ecuadorian origin. In Chile, Sonda is ahead of Microsoft and Tata¹⁰ in sales (Bastos Tigre and Silveira Marques 2009, chap. 8, 278).

⁸ Out of the 3% contributed to the world software industry by Latin America, Brazil contributes with 50%, Mexico 17%, Argentina 11%, Colombia and Venezuela each 5% and Chile 3% (Dornberger, Un Nabi, Martin Inocente, 3); (Wista 2001).

⁹ The author included the Bolivian company Jalasoft based on export data. Jalasoft is the largest software company in the country and it only exports; therefore, the net revenue estimate should be fairly accurate.

¹⁰ Tata Consultancy Services (TCS), part of the Tata Group, is a world-class Indian IT service outsourcer whose customer portfolio includes major international corporations.

In terms of employment, Politec from Brazil is the largest employer in the region (6,500 employees). Per the Local Employment Intensity Indicator¹¹ (LEI) Politec employs 33 employees per million (USD) of sales. In addition, it is the sixth largest services enterprise in Brazil just short of IBM, HP/EDS, Unysis and Accenture (Bastos Tigre and Silveira Marques 2009, chap. 8, 278).

Jalasoft from Bolivia is the company that produced the least revenue, but its LEI ratio is the highest. Jalasoft employs 167 workers per million of sales. Some possible explanations include that one of the its main activities is outsourcing of quality engineering services, for which skills required are less specific than those necessary for development projects and wages in Bolivia are lower than in the region (refer to section 3.3.1 strengths of the Bolivian software industry).

When it comes to the software industry, despite the variety in the economies and population of Latin America, it is possible to group countries according to market size and orientation. We have (a) large dynamic markets with large domestic markets, this would be the case of Brazil and Mexico (b) middle sized markets, both domestic and export oriented such as Chile and Argentina and (c) small markets mainly export oriented as in the case of Uruguay and Costa Rica.

Taking Brazil, Argentina and Uruguay, as a representative sample of the classification mentioned above, it is possible to observe the significance of the software industry in terms of each country's GDP and understand how they specialized and selected a specific market orientation, granted the type of resources (population size, language skills, education levels, etc.) available to them.

Table 5 Invoicing and Exports of the Software and Services Industry in selected countries, Year 2004. Source: Bastos Tigre and Silveira Marques, "América Latina en la industria global de software y servicios" (252).

FACTS OF SOFTWARE INDUSTRY	BRAZIL	ARGENTINA	URUGUAY
Total sales (in millions of dollars)	8 213	1 173	226
Exports (in millions of dollars)	314	191,6	88,7
% of GDP (Total sales/PIB)	1,36 %	0,77 %	1,70 %
% of sales abroad (Exports/Total sales)	3,8 %	16,3 %	39,3 %

In Table 5, it is striking that the largest sales volume is from Brazil with 8,213 million dollars in 2004, but Uruguay's software industry contribution to GDP is higher (1.70%) than that of Brazil (1.36%). Also its percentage of sales abroad is much higher 39,3% compared to 3,8% of Brazil. It only makes sense, that Brazil opts for an inward market orientation since it has one of the largest populations in the world (aprox. 200 million) and specializes in labor intensive services such as call centers, application management services¹² (Romero Krause, 320) or in developing solutions for key sectors in the Brazilian economy such as banking and telecommunications. According to Banco Hoje, the Brazilian banking system is the largest single investor in IT in Brazil, accounting for 30% of total expenditures (Junqueira Botelho, Stefanuto, and Veloso 2003, 33).

¹¹ The Local Employment Intensity Indicator (ITL in Spanish), is an indicator created by CEPAL to evaluate the quantity of jobs than a company creates in the country per million of USD in sales.

¹² IT Services such as Application Management Services comprises the effective support and maintenance of applications (Romero Krause 2011, 314).

On the other hand, a small country like Uruguay with a population of aprox. 3,4 million inhabitants, a literacy rate of 98% and good academic level in universities (López Benítez 2006, 24) has done well in tapping into its qualified labor force and specializing in value added software activities. A report from the Economic and Trade Office of the Spanish Embassy in Montevideo (López Benítez 2006) states “Uruguayan enterprises do not produce dedicated software, they are technology creators. They try to create new solutions that acquire a certain level of standardization according to the success of the product. The key characteristic of the industry is that it places itself at a high level of the value chain”.

The export orientation strategy of Uruguay, similar to that of Israel, Ireland and India served well the prosperity of its industry. At the end of the 90s Uruguay “found out” that it was the first software exporter in Latin America. The news moved the press and the political strata, who did not expect that a technological sector without any promotion nor official support could have such an outstanding performance (Vidart 2009, 9). Table 6 (below) shows the progression from almost no-existent exports in the late 80s (\$250,000) to \$80 million in 2004.

Table 6 IT Industry Exports. Source: Yearly Survey by Uruguayan Chamber of Information Technologies (CUTI), 2004.

YEARS	EXPORTS IN THOUSANDS OF USD
1989	250
1993	4500
1998	60000
1999	76800
2000	79400
2001	83560
2002	80083
2003	74525
2004	80360

In 2007, Multinational Corporations created thousands of new jobs in Colombia, Argentina, Chile, Costa Rica, Brazil, and Mexico (Romero Krause, 319).

Table 7¹³ presents the attractiveness assessment performed by Siemens IT Solutions & Services upon deciding where to establish their Global Production Center (GPC) in the region. The countries assessed were Argentina, Brazil, Chile, Mexico, Colombia and Costa Rica and the main factors taken into consideration included: cost, availability of skilled labor, language capabilities, political and economic stability, government support and cultural affinity.

¹³ Table 7 does not include all of the countries that were part of the assessment; it includes only Argentina (medium-sized country), Brazil (large country) and Costa Rica (small country).

Table 7 The Latin America Country Attractiveness Assessment. Source: Romero Kraus 2011, 318.

CRITERIA	BRAZIL	ARGENTINA	COSTA RICA
Cost attractiveness			
Availability of skilled labor			
Language capabilities			
Political and economic stability			
Government support			
Cultural affinity			
Total attractiveness			

Legend  **“Most attractive”**

As it can be observed, each country has its “pros” and “cons”. For example, in Argentina availability of graduates and skilled workers from the relevant fields, lower wages level, government's willingness to invest in the ICT infrastructure development, made the country an attractive location (Dornberger, Un Nabi, and Martin Inocente 2010, 3). However, Argentina's relatively new political and economic stability compared to the other countries were a concern at the time of the evaluation. Regardless of having less fluent English and Spanish speakers, Brazil still marked high in the assessment mainly because its availability of skilled labor with prior experience in the call center and ITO industries (Romero Krause, 318). At the end of process in 2007 Siemens set up its new Mercosur GPC for Application Management Services in Buenos Aires and Sao Paulo, just the fourth in the world along with others in Russia, India and Germany.

In sum, globalization, economic liberalization, technological advancements and the shift from production to service-related businesses in Western economies (Kedia and Mukherjee 2009, 252), has granted the Latin American software industry new opportunities in the global market.

3.2 The Software Industry in Bolivia

In this section, different important aspects of the Bolivian software industry are provided such as market size, local actors and the type of regulations in place. Also a brief SWOT analysis of the industry is carried out as well as a systemic competitiveness analysis to understand the current competitiveness level of the software industry in Bolivia.

3.2.1 Current Market Size

The current size of the software industry in Bolivia is difficult to estimate and was one of the challenges in this research. The Bolivian Chamber of Information Technologies (CBTI) pointed out the existence of at least 500 registered companies that develop software (Juarez Zeballos 2011). Fundampresa, the Commercial

Registry entity, stated that a total of 367 companies registered in 2011 in the cities of La Paz (179), Santa Cruz (107) and Cochabamba (89).

The internal software market in Bolivia is relatively small but interesting since most companies (large, medium and small) need to systematize their business processes, production and customer service to be efficient and competitive. For example, small commercial centers, educational institutions and even, the printing press have had to incorporate computer systems to be able to report to the National Tax institutions and to print invoices (Informe 5. Opinion, 2007).

The average expenditure on IT per country is 7.5%. However, in Latin American countries this average is less than 2%. The software industry in Latin America has a stake of 2.9% in the total expenditure in IT in the world, Brazil having the largest share (Santos Hernández 2004, 7). As shown in Table 8 Brazil, Mexico and Argentina comprise 76% of spending in the region.

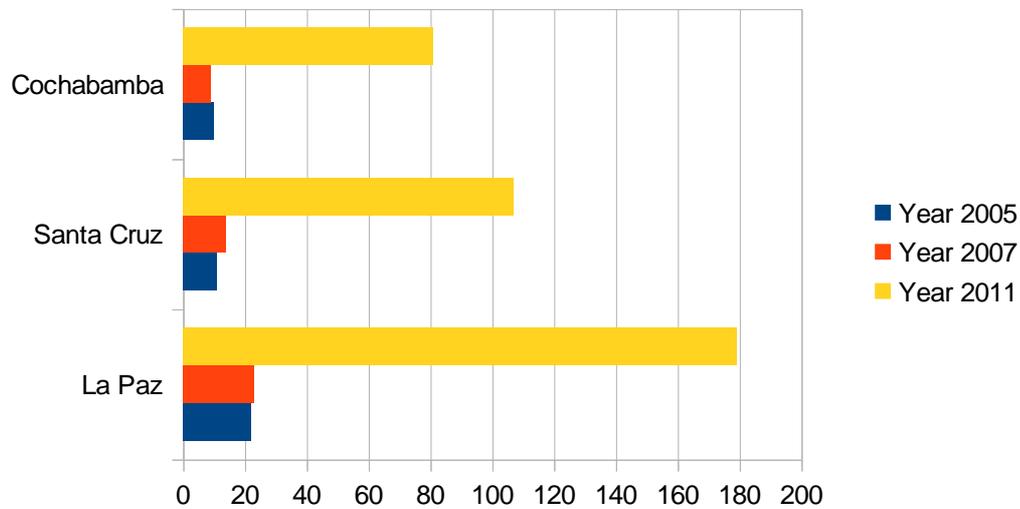
Table 8 Contribution of Latin American Countries to Total Expenditure on IT in the Region. Source: Santos Vismar (2004) "La industria del software. Estudio a nivel global y América Latina".

COUNTRY	HARDWARE	SOFTWARE	SERVICES	INTERNAL EXPENSES	TOTAL
Brasil	49.00%	52.00%	51.00%	40.00%	45.00%
México	18.00%	17.00%	18.00%	26.00%	21.00%
Argentina	10.00%	11.00%	10.00%	7.00%	10.00%
Colombia	4.00%	5.00%	4.00%	9.00%	5.00%
Venezuela	4.00%	5.00%	6.00%	9.00%	5.00%
Chile	3.00%	3.00%	4.00%	5.00%	4.00%
Remaining countries	12.00%	7.00%	6.00%	4.00%	9.00%

Bolivia contributes to IT spending in the region with less than 9%. Thus, outsourcing (as in the case of Uruguay) offers a broader perspective for the software industry and new market possibilities world-wide. Already, several entrepreneurs have incurred in this market. In Cochabamba, there are more than a dozen small and large software companies that create systems for countries such as the U.S. and several others in Europe (Lafuente Lopez 2007).

Data from Fundempresa (figure 2) shows a steep hike of companies registered in the IT activities realm in the past five years:

Figure 2 Enterprise Database of Registered Companies in the IT Sector, Years 2005-2011. Source: Fundempresa tailored report 2012.



Per figure 2 above, it is possible to observe that in La Paz there are 7.8 more companies that registered in 2011 in this sector, in Santa Cruz 9.1 more times and in Cochabamba 9.7 more times- the highest growth at national level (Fundempresa tailored report 2012).

3.2.2 Local Actors

There are several local actors in the Bolivian software industry. First, the software companies, then the knowledge workers, governmental institutions, other support institutions, educational institutions, groups of interest and services providers. In this section a brief explanation of the actors that were part of the research will be provided, except for Internet providers.

The Software Firms:

As stated in section 1.6, the interviewed firms followed a specific criterion and their main activities were:

-Software development: General broad category for designing a software program and application development.

-Web development: Developing a website for the internet or intranet. Includes web design, web content development, client liaison, client-side/server-side scripting, web servers, network security configuration, and **e-commerce** development.

-Web application development: Developing web based applications; that is an application that is accessed by users over a network such as the internet or intranet.

-Mobile application development: Developing application software for low-powered hand-held devices such as personal digital assistants (PDAs), enterprise digital assistants or mobile phones.

-Quality Assurance service providers: The process of testing the quality of a software program/application before release. Quality assurance involves tests of various aspects such as design, content, user interface and more importantly functionality. Quality Assurance was a service offered as well by a couple of software developers.

-Graphic design: Highly related to web development, it is mainly included in this research since several web developers also do graphic design.

Knowledge workers: Human capital is one of the most important assets of a knowledge based firm and knowledge workers constitute the backbone of these enterprises. Knowledge workers or IT Professionals in this study for the most part completed their studies in Systems Engineering or Informatics and occupy different positions: project leader, business analyst, development programmer, quality assurance specialist or tech support specialists. By seniority they are ranked as either entry level or senior IT professionals.

The Vice ministry of Science and Technology: In 2006 the government, recognizing the importance of technology for growth, created a new ministry (Viceministerio de Ciencia y Tecnología) in charge of promoting 'science and technology' and linking the public sector with the private/productive sector. The Vice ministry of Science and Technology designed the Bolivian Innovation System (SBI) which is an instrument to conduct the Bolivian National Development Plan. The SBI has different national platforms such as the Industry and Manufacturing platform, the Climate change platform and there is one specific in charge of ICT (Plataforma Nacional TIC).

CBTI: The Cámara Boliviana de Tecnologías de la Información (Bolivian Chamber of Information Technology) was founded in 2005 with the mission to promote the software industry in Bolivia and align all local actors in the IT sector. The CBTI has an agenda 'plan maestro' ready to be carried out, among one of their main goals is the insertion of software firms in the Bolivian economy; that is helping to establish the right structure for local development. The CBTI is also a member of ALETI (The Federation of Information technology enterprises in Latin America, the Caribbean and Spain). ALETI is one of the most powerful organizations as to what ICTs pertain and it partakes of a Latin America strategy for the development of the software industry or digital technologies.

PROSOFT Bolivia: PROSOFT is an organization that resulted from an agreement between the Catholic University in La Paz, the National Chamber of Commerce, Business Trade Alliance (a private business) and Artexacta (a software company). PROSOFT has the ambitious goal of making Bolivia export in 20 years one thousand million dollars of software, that can be roughly translated into 2,000 software companies with 40,000 employees selling at least half a million USD.

Internet Service Providers: The main service providers in the country are Entel, COMTECO, COTAS, Tigo, Viva and AXS. They offer ADSL connections, Wi-Max connections and also dedicated connections.

3.2.3 Regulations, Norms, and Policies

This section analyzes the institutional framework available for the software industry. The existence or lack of existence of policies, norms, and regulations are an important reflection of the type of support available for entrepreneurs in this field.

Traditionally the ICT sector in Bolivia has been under the coordination/regulation first of the *Agencia de Desarrollo de la Sociedad de Información en Bolivia (Adsib)*¹⁴ and now by the Vice Ministry of Science and Technology. In 2005, the Adsib, accomplished an important milestone, the formulation of the ICT strategy in Bolivia called the "Estrategia Boliviana de Tecnologías de la Información y Comunicación para el Desarrollo (ETIC)"¹⁵. The formulation of ETIC was the result of one of the best participatory practices. The process lasted

¹⁴ The Agency for development of the information society in Bolivia.

¹⁵ Bolivian ICT Strategy for Development (ETIC).

14 months, had contributions from 3,176 participants from more than 700 organizations and also participation of representatives from different sectors (Peres, Hilbert, and Hinojosa 2009, chap. 8, 315). However, until 2008 ETIC remained in the formulation stage without being executed. After ETIC came the National Plan of Digital Inclusion for the period of 2007-2010 and at present Bolivia has a telecommunications, information technology and communications law (law 164) that establishes the ground for access and development of technologies.

As far two of the most important institutions for businesses concern, the national tax entity (Impuestos Nacionales) and the commercial registry for businesses (Fundempresa), software firms do not demand a specific regulation/registration process. For this reason, most software development companies file as service providers or consultants and adapt to existing regulation for this sector. Bolivia does not have a law for exporting services; therefore, companies do not know how to sell abroad or how to apply taxes for tax credits. An interviewee that works with customers abroad admitted that his company never filed taxes on income received because they work with pre-paid cards.

In terms of registration, Fundempresa does not have a special category for software firms. Software activities are bulked with other sectors. For example, “software creation activities” belong to the “K section” along with real estate, business and rent activities and “software sales activities” belong to the “G section” along with wholesale sales activities.

As to legal means of protecting intellectual property, the national service of intellectual property (SENAPI), is the main governmental agency in charge of protecting software through copyrights. Its system is outdated and does not reflect well the activities of the software industry. For example, an interviewee narrated the story of how he obtained a copyright for his mobile app, some of the questions included in the application were whether the product would be shipped via airmail or land, also SENAPI requested a copy of the application in a CD, which does not make sense for a mobile app.

The lack of regulations on the sector and the failure to upgrade the national tax and commercial registration systems and the national service of intellectual property as to reflect the existence of this new sector, make it extremely challenging to keep track of the software industry and promote its growth.

3.3 SWOT Analysis of the Bolivian Software Industry

3.3.1 Strengths

First and foremost, a mixture of low wages and living costs grant Bolivia an advantage over other Latin American countries.

Second, Bolivia is located in the heart of South America with an optimal time zone to work with North American and European customers, as well as with its region. In a Businessweek article, the author explains how outsourcing to Latin America still pales in comparison with India, but this balance could shift as international companies cannot afford to do all their outsourcing with India, there is a big time difference with the U.S. and it is closer to trouble spots in the Middle East (Smith 2006).

Third, the availability of IT professionals, and educational institutions. Statistics point to 4000 graduates per year in technical careers such as Information Systems Engineering, Informatics and Telecommunications (Ranking Economía y Negocios. 2011d).

The last important factor is that software entrepreneurs are specializing in value added activities and in rendering high quality services. Most interviewed employers reported working with international customers for years on, focusing on customer retention rather than expansion through improved quality service.

The Case of Swissbytes: Sanchocho or Majadito¹⁶?

In 2007 two Swiss partners founded Swissbytes. The company has its headquarters in Santa Cruz and a branch in Zurich; it employs 30 engineers and specializes in business process consulting and tailored software for Switzerland.

The partners selected South America because of cultural affinity and convenient time zone (there is a time difference of 5 - 6 hours). In Switzerland one of the partners already had the chance to experience this scenario: in the morning he organized/prepared the projects, he followed up on the progress of the offshore team and then had feedback meetings in the afternoons. Now, he is experiencing the inverse scenario from Santa Cruz, he states that it is the ideal combination. When deciding where to set operations they searched for emerging markets that were not as popular as Brazil. As with any offshore business price played an important role: low labor and living costs. Swissbytes considered two interesting countries: Colombia and Bolivia.

Regardless of its better infrastructure and availability of higher skilled labor force, Colombia was not selected due to its complicated financial system and negative money laundering image. Within Bolivia, Swissbytes selected Santa Cruz because of its high growth and important industries.

3.3.2 Weaknesses

ICT Infrastructure

According to the World Economic Forum report of 2009-2010, Bolivia is ranked 131 (or a score of 2,68) out of 133 countries in information technology and communications (ICT) (Schwab 2010, 15). The study attempted to measure the impact that ICT has on the process of economic development. It is to note that it's probable that countries with a strong GDP/capita growth invest heavily in ICT and at the same time, countries that invest heavily in ICT will obtain better results in terms of growth (Cimoli and Correa 2009, 64). Heading the Forum's Ranking is Sweden with a score of 5,65 and a GDP/capita of \$56,927 compared to Bolivia of \$2,315¹⁷.

The current government of the Plurinational State of Bolivia is taking measures to improve the current ICT infrastructure in the country and the digital literacy rates; however, these efforts are still very modest. For the period of 2010-2015, of the total planned investment of \$32,837 million in telecommunications and technology, only 0.9% or \$306 million is assigned to ICT; compare this figure to Brazil's spending of 8.3% of its GDP in 2001 (Junqueira Botelho, Stefanuto, and Veloso 2003, 10).

Internet Costs

Internet services in Bolivia remain one of the worst and most expensive in Latin America, expressed all interviewed CEOs. Below Table 6 shows a comparison with other countries in the region for 1 Mb connection plans.

¹⁶ Sanchocho is a traditional dish from Colombia and Majadito from Bolivia.

¹⁷ International Monetary Fund: [World Economic Outlook Database, April 2012](#).

Table 9 Internet Cost in Bolivia in Comparison with other Latin American Countries. Source: Ranking Economía y Negocios "El costo del ADSL en Bolivia y Sudamérica".

INTERNET COSTS

Internet Provider:	Country	Costs in BOL	Costs in USD
Empresa Foberte- 1 Mb	Argentina	168	25
Empresa Embratel- 1Mb	Brazil	125	18
Empresa Claro- 1 Mb	Chile	185	27
Empresa Telmex- 1 Mb	Mexico	251	37
Empresa ETB-2 Mb	Colombia	412	60
Empresa Intercable- 1 Mb	Venezuela	213	31
Empresa Entel- 1 Mb (ADSL)	Bolivia	494	72
Empresa Entel-1 Mb (Wi-max)	Bolivia	1000	146
Empresa Tigo-1Mb (Wi-max)	Bolivia	980	143
Empresa Viva- 1Mb (Wi-max)	Bolivia	1480	216
Empresa AXS- 1 Mb (ADSL)	Bolivia	768	112
Empresa AXS-1,2 Mb (Wi-Max)	Bolivia	1750	255

As it can be observed, the Wi-Max plan from the company AXS (1,2 Mb) is up to 10 times more expensive than the 1Mb plan from Fibertel in Argentina.

Financing

For many software SMEs their headstart in terms of knowledge, an intangible asset, is often their only competitive advantage. However, representing intangible assets and understanding their worth is not possible in traditional financial statements. Executives stated that the major restriction for the development of the software industry was limited access to capital, as lending institutions grant loans only on the basis of collateral (Ranking Economía y Negocios. 2011a). Recognizing this important hindrance factor for the industry, the program for development of the software industry in Mexico (PROSOFT), established investment lines, financing and incubators since 2003 (Calderón et al. 2010, 182). In Europe acknowledging the barriers for financing and management of small and medium sized knowledge based companies, the German ministry of Economics and Labor is implementing an Intellectual Capital Statement (Wissenbilanz)¹⁸. The Intellectual Capital Statement reports on Human Capital, Structural Capital and Relational Capital and can be used to supplement traditional financial statements to facilitate the decision making process of banks and investors, increasing the chances of financing (Alwert, Dornemann, and Kivikas 2004, 9).

In Bolivia, granted that several software SMEs are skeptical about disclosing information on their intellectual capital, government support for financing will help alleviate capital needs.

Lack of global skills

¹⁸ The Wissenbilanz has to yet be standardized across Germany and Europe but already 100 Intellectual Capital statements have been prepared.

In a study of major hardware versus software producers, findings show that countries such as India, Israel and Ireland had clear advantages in factors that are suited to software development, and not surprisingly these countries have done extremely well in software production (Lal 2003). These factors are (a) good general engineering education system (b) English language competence and (c) entrepreneurial know-how.

In an article “Technology speaks English”, several software executives state that Bolivian professionals in general have a low English level and this constitutes an important barrier when dealing with overseas clients (Ranking 2011). An interviewee expressed that university graduates are not prepared to work in a globalized world.

Lack of Market visibility & quality

A limiting factor in obtaining new customers, or a factor that delays the process of acquiring more customers is the fact that it is financially difficult to access international certifications that at first serve as a guarantee to customers overseas. For example, the Capability Maturity Model (CMM)¹⁹ certification costs approximately \$26,000, an amount that is prohibitive for several software SMEs in Bolivia. On the other hand, established software exporters with high market visibility such as India, possess certifications. By 2005, over 400 Indian software firms had acquired CMM certifications, with 82 companies certified at level 5, higher than any other country in the world (Ojo et al. 2008, 6).

Shortage of IT Professionals

The Bolivian software industry is growing and requires more IT professionals. However, the quantity of graduates in this field is not sufficient for the requirements of development companies (Informe Especial, Opinion). An interviewee recounted that one of his Canadian customers was ready to buy a building and set up his operations in Cochabamba, but the project required at least 300 engineers in a short period of time. The shortage of IT professionals is a constraint that decreases the feasibility of large scale projects. Just in 2000, Brazil graduated close to 18,000 IT professionals, China produced 41,000 and India 71,000 (Junqueira Botelho, Stefanuto, and Veloso 2003, 11).

Lack of a unified voice

75% of interviewees expressed that there are no institutions that support the software industry. Roughly 17% were acquainted with the activities of the local chambers such as the state chambers or the exporters chamber (CADEXCO). Three were members of Cocha-Valley, a recently formed group to promote the industry in Cochabamba. But in general the impacts of all these organizations/groups/chambers were mild. It is evident that the software industry in Bolivia lacks a unified voice.

3.3.3 Opportunities

The “boom” of the software industry in Bolivia has been enthusiastically covered in several newspaper articles highlighting the achievements of local companies:

¹⁹ CMM is a structured process for software development associated with the Software Engineering Institute at Carnegie Mellon University. It consists of five 'maturity' levels. Companies or units assessed at level four and five are capable of controlling, managing and improving software development practices (Arora, 2002; Athreye, 2002, 261).

“In Cochabamba there are companies like Jalasoft, Piramide Informatik, Software Andina, Inventiva and others that develop software for exportation, using the same state of the art technologies as in other countries” (Lafuente Lopez 2007).

In these articles, there is an emphasis in the fundamental change that Bolivian businesses are experiencing by adopting software systems for everyday operations (Opinion 2007). Also how there is excellent human capital in the country to develop software and export (Ranking 2011c) and how software exporting can become a key industry and project Bolivia at an international level, generating value added income (Lafuente Lopez 2007).

The opportunities are indeed manifold, as stated earlier, the software market is vast and Latin America's share is of only 3%. Therefore, there is ample room for growth. However, competition from large international players is difficult to overcome in the global market and requires persistence, appropriate management and finding the right opportunities.

The current financial crisis can present itself as a challenge or an opportunity for countries like Bolivia. In 2001 the strong devaluation of the Argentine Peso was one of the main reasons for the settlement of the current vibrant multinational corporations (MNCs) influx. Devalued local currency, lower wages and availability of the skilled ICT professionals and graduates attracted the software MNCs in Argentina *vis a vis* in Córdoba (Dornberger, Un Nabi, and Martin Inocente 2010, 5). In the post-crisis period, businesses with international operations (the Fortune 500 and the Global 500) are in urgent need of cutting costs and optimizing resources (Calderón et al. 2010, 175). The crisis is an excellent opportunity for the Latin American region.

Success Story: The Case of Jalasoft²⁰

“Right now we are a VW beetle, we run slowly, we need to become a Porsche to compete with large international corporations”

-Jorge Lopez, CEO and founder-

Jalasoft started operations in 2001 with 7 employees. The founder/CEO, a Bolivian engineer that worked in Silicon Valley with Adobe and with NetIQ convinced the latter company to outsource quality testing to Cochabamba, Bolivia. He also set up the first development team within the company that would be in charge of an interesting new project: developing a network monitoring solution for Microsoft Operations Manager, a non-existent add-on in a niche market. Xian Network Manager's first version was ready in 2003 but the commercial version was officially released in 2005 and continues in the market today. The “Xian” Sales/Marketing team of 8 members placed the solution among the top third party connectors for Microsoft. Table 10 below shows a sample of the Xian customers that range in size and sectors:

²⁰ Author worked in Jalasoft for 5 years and is well acquainted with the company's history. Any information on Jalasoft can be found in its website: www.jalasoft.com.

Table 10 Xian Network Manager Customers, Year 2009. Source: List compiled by author and published in OH Magazine "Tecnología hecha en Bolivia", Los Tiempos 2009.

COMPANY NAME	AREA OF BUSINESS	COUNTRY
Banco de Crédito	Banking and Finance	Bolivia
Boekel de Neere	Legal and Entrepreneurial Advisory	The Netherlands
BBVA	Banking and Pension plans administration	United States
Canadian Space Agency	Agency of exploration and space missions	Canada
Mamonides Hospital	Health	United States
Siemens	Electronic engineering, health, energy and communications	U.K. Office

Today, the "Xian" team is just one of the many teams working simultaneously in the company. Projects range from quality engineering to software development for large companies in the U.S. and Europe. Jalasoft now has 420 employees, a new facilities building that will eventually harbor up to 3,000 engineers and a foundation for IT training.

3.3.4 Threats

Competition from neighboring countries

Competition from other Latin American countries remains high, since some of them have already been in the software market decades in advance. While Bolivian firms struggle to establish an image as software services providers, other countries already have several instruments for the promotion of the industry. For example, TIZONE in Uruguay, an organization financed by the state and under the direction of CUTI (The IT Uruguayan Chamber) works exclusive at promoting the advantages of a community of software firms. Its main goal is to provide each firm with solid marketing skills for potential clients or business partners under the umbrella of a cluster (López Benítez 2006, 8).

Export orientation of the industry

The export orientation of the software industry provides both opportunities and threats. If policies do not promote the integration of software firms into the Bolivian economy, then most of the positive effects of the industry remain at a micro-level.

Presence of Multinational Corporations (MNCs)

The lack of policies in the sector could contribute to the negative impact of MNCs for the development of this nascent industry. For example, in the case of Cordoba, Argentine the settlement of MNCs contrary to expected, caused migration of skilled employees, increased the wage level at small firms and created a shortage of skilled employees in the market (Dornberger, Un Nabi, and Martin Inocente 2010, 11). The presence of MNCs in Bolivia is reduced but its effects already have an impact for the industry such is the case of the MNC Thomson Reuters that has become the main competitor for skilled labor resources with local companies.

3.4 Systemic Competitiveness

An effort to stimulate economic growth of a local economy is bound to involve large scale systemic change (Meyer-Stamer 2008, 1). The concept of systemic competitiveness devised at the German Development Institute, is a framework that analyses the factors that stimulate or hinder industrial development (Altenburg, Hillebrand, and Meyer-Stamer 1998, preface).

The concept goes beyond a traditional analysis at the micro and macro levels but also focuses on two additional analytical levels: the meso and meta levels and their corresponding interactions. The meso sphere looks at selective interventions by meso-institutions such as chambers to support companies' efforts to shape a competitive advantage. The meta sphere is concerned with an important determinant of development that is often overlooked: basic orientations in a given society/societal values (Meyer-Stamer 2008, 2).

To assess the systemic competitiveness of the Bolivian software industry the following key factors were taken into consideration:

- At the meta level the Plan Nacional de Desarrollo (the Bolivian National Development plan) and Plan de Sistema Boliviano de Innovación (Bolivian System for Innovation) were reviewed. Interviews provided a reasonable depth into software firms and other local actor's capabilities to cooperate and trust.
- At the macro level a review of local and national policies that impact the sector was conducted, such as the latest law of telecommunications and financial policies.
- At the meso level the role of chambers and other support groups to promote the sector and create a favourable business environment was analysed.
- At the micro level software firms internal efforts to remain competitive were evaluated as well as the type of alliances (formal or informal) and collective learning that takes place among them.

Appendix 4 presents some of the factors that hinder or favour systemic competitiveness in the Bolivian software sector and Appendix 5 groups factors that hinder systemic competitiveness (obstacles) and shows how factors at different levels interact and impact development. For example, lack of a unified voice among support institutions results in low visibility and little progress on policy making specific to the sector. What stands out is the negative impact that "little social capital" at the meta-level has at the micro and meso-levels, evidenced through little cooperation among software firms and limited collective learning.

Chapter 4 Development and the Software Industry

This chapter goes over the definition employed in this research for local development as well as different views (pros & cons) on the relationship between the software industry and local development.

4.1 Approach on Local Development

There exists ample literature on economic development and its concepts, as Vazquez-Barquero (2006) states the concept of economic development evolves and changes as countries, regions and cities face and solve new problems.

Development has been traditionally associated with economic growth; for example, according to the Harrod-Domar model of the 1930s, an increase in the savings/investment ratio, resulted in higher productivity, growth and thus development. The Harrod-Domar model can be seen as the early justification for foreign aid incursions, realizing that developing countries would not be able to have higher savings; the solution was to inject capital in developing countries to produce a specific GDP growth.

This vision is not all together wrong. In fact, it is difficult to state that a certain economic development theory is wrong; mainly economists from different schools have contributed with valuable concepts. In general economic development seeks to address poverty reduction, employment generation that favors economic progress along with social progress. It's not only about a GDP growth/higher productivity but also about improvement of social relations and living standards (Gómez 2004).

Local development emerged in the face of increased competition and globalization, forcing local actors to change their productive systems in order to survive. Local development can be defined as *a process of economic growth and structural change that leads to a better living standard of the local community/population*. Local development enriches itself with an analysis of three dimensions: an economic dimension, a socio-cultural one, and a political-administrative dimension.

In the *economic* dimension local entrepreneurs use their capabilities to organize local productive factors with sufficient levels of productivity as to be competitive in the markets. In the *socio-cultural* dimension, values and institutions serve as the base for the process of development and finally, in the *political-administrative* dimension, the territorial policies allow for the creation of a favorable local economic environment, by protecting it from external forces and promoting local development (Vázquez-Barquero 1988).

The "local" approach to development reinforces the idea, that any suggested strategy to foster the productive system of an economy, has to take into account the social, institutional and cultural fabrics of the locality. Furthermore, outcomes will be determined partly based on the "development potential" present in each region and the organizational capacity of local actors. Economists Friedmann and Weaver (1979) go a step further in pointing out that the economic progress of a territory is only possible when firms and actors within the territory interact, organize themselves and invest with the view of developing the local economy and society.

In the present context of financial crisis, innovation is a key element to transform the productive system of countries, strengthen and make them more competitive at international levels (Vázquez-Barquero 2009, 6).

However, the diffusion of innovation can only take place by qualified human resources. It is through employees that knowledge is incorporated in the production of goods and services and in the fulfillment of development strategies (Van Marrewijk and Timmers 2003). For this reason innovation and human capital are vital ingredients of structural change and local development.

4.2 The Software Industry and Local Development

The impact of the ICT industry and of the software industry in particular on economic growth is largely unknown, and the possible positive effects remain debatable. Several economists believe that the positive effects on the economy are necessarily related to how much investment there is allocated to this sector and the type of innovation system structures available. This section highlights the positive and negative impacts of the software industry in an economy and the caveats associated with some common misconceptions of the industry.

4.2.1 ICT Spending and GDP Growth

In a study part of the ECLAC series on the *“Information Society in Latin America and the Caribbean”*, the contribution of ICT capital to GDP growth is analysed in different world regions grouped as follows: G7 countries, Asia in development, Non-members of the G7 countries, Latin America, Oriental Europe, Sub-Saharan Africa and the Middle East. For the periods analysed 1985-1995; 1995-2000 and 2000-2004, based on growth accounting, the contribution of ICT capital to GDP growth for the Latin American region was inferior to the world average and was very low compared to the G7 member countries average (Cimoli and Correa 2009, 66–67). This points to the existence of a positive impact from ICT on growth; however, this impact is higher in developed nations. Thus, countries with a strong GDP per capita can invest heavily in ICT which will result in better growth.

In terms of the ICT impact on productivity, there is a positive relationship between the technological effort of a country²¹ and productivity. Thus countries that spend a higher amount of their GDP in ICT will tend to have higher productivity ratios. However, technological failure or success will depend ultimately on the characteristics of each countries' national innovation systems; that is the characteristics of institutions, educational organizations, research centres, policy making agencies and the interactions amongst them (Cimoli and Correa 2009, 72).

For policy makers this implies that the effective contribution of the ICT sector to growth in developing countries is not just a matter of increasing investment in ICT. Here lies the reluctance of some experts on assuming a positive relationship between this sector and economic growth and structural change (productivity).

4.2.2 Linkages of Software Firms with Local Economy

India is well known as a major software exporter in the international economy. Surprisingly, as of 2000 this sector contributed with 1% of India's GNP and accounted for over 7% of the growth of its GNP (Arora and Athreye 2002, 254). Thus, contrary to popular believe, the software industry is not the leading sector in India's economic growth. The main reason for this scenario, as concluded by Arora and Athreye (2002), is due to the industries poor linkages with the rest of the economy. This poor linkage is probably the consequence of the 'service' rather than 'product' nature of the industry and its 'external' rather than 'inward' orientation.

Similarly in Bolivia, given the export-orientation of software development firms, their insertion in the local economy is mild- except in terms of employment generation. Most interviewees were not aware of the growth of new enterprises that provided services to their companies and they only interacted with the necessary entities such as the national tax entity (Impuestos Nacionales), banks and internet service providers. Only about 8% of the software companies interviewed had linkages with local universities.

²¹ The technological effort of a country is measured by the % of GDP spent in ICT.

4.2.3 Competition on the Basis of Cost Advantages

Value creation in offshoring largely depends on whether the benefits generated from disintegration and the superior capabilities of specialized foreign market firms, offset or exceed transaction costs (Kedia and Mukherjee 2009, 256).

Firms looking to offshore can have a range of motivations such as remaining competitive in a highly dynamic business environment, focusing just on core competencies, innovating through partnerships with firms abroad or being able to provide support services 24/7/365. However, cost reduction remains one of the strongest motivating factors for offshoring business functions (Kedia and Mukherjee 2009, 255).

Competing on the basis of just cost advantages such as low wages, can have a series of implications in developing countries bidding their services to foreign clients (a) specialization in industry segments lower in the value chain and (b) adverse working conditions for employees.

In India Majumdar, Vora, and Nag (2010) found that the top 20 firms, which account for 76% of sales, engaged in business process outsourcing (BPO) activities (tasks that require less skills), generating substantial revenue per employee (exploitation strategy²²), while the bottom 200 firms that controlled just 0.16% of the market, were the ones involved in high technology activities (exploration strategy).

Much is discussed about the potential benefits of the software industry and outsourcing but less is mentioned about labor conditions and employee welfare under the scheme of costs competition. Per Taylor (2003) in the high risk IT environment, 80-90% of all software and 30-45% of all systems projects fail. However, to gain credibility and retain customers, software firms in charge of outsourcing projects must meet strict deadlines and budgets. Managers negotiating with customers overseas might promise delivering a project in an unreasonable amount of time adversely affecting their teams. According to Arora and Athreye (2002) in interviews with US Managers, the ability of Indian firms to mobilize large teams of developers at short notice was of key importance to them. This capacity to “always” deliver became one of India's competitive advantages. Blogs like “IT Survivors- Staying Alive in a Software Job²³” denounce working conditions at software companies and encourage colleagues to speak out. Furthermore, authors like D’Costa (2011) state that the Indian IT industry continues to reproduce economic and social inequality.

Based on the anonymous survey sent to knowledge workers, 63% believed that what made their respective locations attractive to foreign customers was low labor costs and 25% stated that there is too much exploitation in some software firms where employees do not complain out of fear of losing their jobs.

An additional disadvantage of competing on costs is that in the long run cost-related labor arbitrage fades (Kedia and Mukherjee 2009, 255). GE's London-based head of Global IT outsourcing, states that if India starts to charge the same unit cost as Mexico, Mexico will look better and better for outsourcing projects (Smith 2006).

Despite these negative aspects, the software industry offers new opportunities for social and economic development in Latin America (Bastos Tigre and Silveira Marques 2009, 249). It can promote growth if policy-

²² Exploitation requires firms to improve and capitalize on current capabilities and resources to take advantage of returns (exploitation provides firms with large cash flows), while exploration requires time and experimentation to try to develop new innovations and skills (Rothaermel & Deeds, 2004).

²³ <http://www.pythonthreads.com/articles/python/it-survivors---staying-alive-in-a-software-job.html>

makers and entrepreneurs make strategic decisions to foster competitiveness in firms and not only rely on cost advantages. The software industry can (a) enhance productivity in a knowledge economy, (b) contribute to structural change and (c) have spillover effects on different sectors.

4.2.4 Productivity in a Knowledge Economy

Software has now become a core competency and general purpose technology that is critical to the global competitiveness of most industries and to the effective deployment of government services in every country, regardless of its level of economic development (Tessler, Barr, and Hanna 2003, 3).

Just a decade ago most businesses, organizations and institutions in Bolivia were managing their information manually (Informe 5, Opinion, 2007). As with any developing country, a major constraint is budget and poor strategic vision to adopt new technologies. Software is needed for optimal decision-making, to save time, manage information correctly, reduce risks of errors and overall increase productivity. There are several enterprises that no longer consider that having an information system is an expense, instead it's an investment to increase their competitiveness.

However, for software to truly have a relationship with productivity, it has to as well be produced locally and not only be imported. A balance in the use of software imports and of "indigenous" software throughout a local economy constitutes the main vehicle for competitiveness renewal and productivity growth (Tessler, Barr, and Hanna 2003).

Taking into account that the Bolivian market is dominated by micro and small enterprises and informality is high, chances for the creation of a strong, competitive indigenous software industry are small. In interviews, several CEOs admitted that the main problem of working with local customers is the low value placed on software produced locally and the informality in payments.

Another impediment to the development of an indigenous software industry is the lack of sophisticated demand. In the case of the domestic industry in Brazil known internationally for its state of the art software for the banking and telecommunications sectors, much of its success is due to these leading sectors themselves. These leading sectors are sophisticated clients and strong developers of software systems (Junqueira Botelho, Stefanuto, and Veloso 2003, 34). As observed by Ricardo Marusic, Director of SAP in Bolivia, local software companies can contribute greatly to the region by developing systems and solutions targeted to the leading sectors of its economy such as mining, hydrocarbons and the industrial agricultural products industry (Ranking Economía y Negocios. 2011).

4.2.5 Contribution to Structural Change

The significance of the software industry in particular and of information and communications technologies (ICTs) in general lies in their contribution to structural change in developing countries (Calderón et al. 2010, 171).

Economic development is highly related with structural change. An economy in growth is an economy that becomes more complex in terms of new productive sectors and companies that make more intensive use of knowledge. Parallel to this growth, new institutions, new capabilities, human resources and ways of learning take place at the interior of society (Katz 2007, 74).

In the case of India, Arora and Athreye (2002) realized that the software industry is not the leading sector of economic growth. However, they noted that it contributed greatly in the change of the mindset towards education, entrepreneurship and the value of human capital in the economy.

Because a firm's competitiveness depends on knowledge and innovation, training of knowledge workers has become a priority. Among the interviewed companies, approximately 67% have continuous education programs to keep their workers up to speed in technology trends and to improve their skills. All

CEOs/partners assigned critical importance to training for business operations. This culture of knowledge sharing (only within the organization) and of enhancing workers capabilities is probably best display by software firms versus companies from different sectors.

In terms of entrepreneurship, a review of the origin of firms made evident that approximately 50% of software firms were spin offs of lead companies and the period when most spin offs and start ups took place was between 2005 and 2010. This data matches well with Fundempresa's records that show an increase of registered companies in the periods of 2007-2011. Overall, it is possible to assert that the software industry has promoted entrepreneurship and specifically among groups of young professionals. As one interviewee stated 'he likes the ecosystem' that is building up in the region for software firms.

4.2.6 Spillover Effects

International experience shows that the ICT industry, like the manufacturing industry, is subject to Kaldorian economies of scale²⁴. It has spillover effects on all sectors of the economy, spurs productivity and helps to diversify the supply of exports, making it a driver of economic growth in lower income countries (Calderón et al. 2010, 171).

There are different types of spillover effects that stem from the software industry; however, the focus of this study will be on knowledge spillovers. Knowledge spillovers result mainly from imitation/demonstration or contagion effects. Imitation effects can occur through direct contact between the software exporters and other regional software firms or overseas customers with superior technology (Blomstroem, Kokko, and Zejan 1992). Adopting new technology is often times risky since companies do not know what they are in for (costs vs. benefits). While being a pioneer has great advantages, it is often more suitable to gain information on the feasibility of a new technology first from a lead company or a customer, before taking the plunge. Big Push theory initially introduced by Rosenstein-Rodan (1943) and then adopted by Albert Hirschman (1953) illustrates well how a firm's decision whether to industrialize or not depends on the expectation of what other firms will do. Even if the economy could produce more by using modern methods, this does not mean it will. It must be profitable for each individual entrepreneur in the modern sector to produce, taking into account the necessity of paying the premium wage and also the decisions of all entrepreneurs (Krugman, 55).

Imitation effects are closely linked with other spillover channels such labor mobility, linkages with customers and competition (Goerg and Greenaway 2004). All these channels help acquire knowledge for imitation. For example, in labor mobility- when employees switch jobs between firms in the same sector/city or start their own business- it is common that they will carry over knowledge on products, processes and skills learned in their previous job (Bratt, 19). Some lead firms, recognizing the risk of losing their competitive advantage through labor mobility, request that their employees sign non-disclosure agreements (NDAs) compromising to not employ any of the methods/techniques that are exclusive of their company²⁵.

The second channel for productivity spillovers is competition. The competition for market share can produce virtuous cycles of innovation, competition and productivity (Bratt, 17). Even though software exporters in Bolivia are not competing with each other for market shares, they are competing globally against thousands of software producers. This can result in motivation to work harder, more efficient use of existing technologies/resources, better management practices and adoption of new technologies (Bratt, 17).

²⁴ Kaldorian economies of scale mainly states that there is a correlation between output and productivity. An initial growth of output induces productivity gains that allow for reduction of unit labor costs, fall in prices, increasing the competitiveness of a country. These gains in turn allow for further output expansion through increasing exports which reinstate the cycle.

²⁵ Jalasoft in Cochabamba requests that all employees sign NDAs that are valid for five years upon leaving employer.

Spillovers do not only occur between companies in the same industry but they also occur with foreign customers (Bratt, 15). Sharing knowledge via technical assistance and training is usually to the advantage of foreign customers, since the result is a higher quality product. Several interviewed companies expressed having a close relationship with their foreign customers.

In the Bolivian software industry most knowledge spillovers happen in the form of labor mobility, competition and backward linkages with customers overseas.

Chapter 5 Empirical Findings

In the previous chapter a reflection on the positive and negative impacts of the software industry on local development were analysed. In this chapter the results of the interviews will be presented, first a background of the interviewed firms and knowledge workers that took part of the online survey, then a review of how software firms contribute to economic growth or structural change.

5.1 Overview of Software SMEs

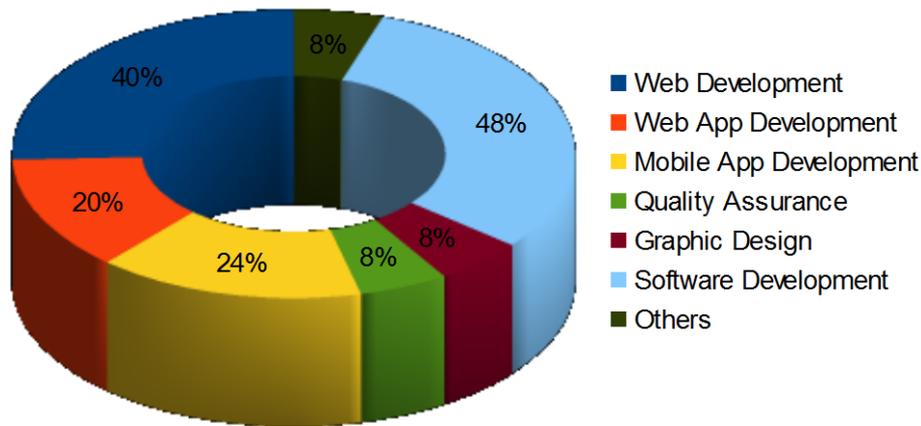
The target group for this study were software SMEs in the cities of Cochabamba, Santa Cruz and La Paz. Most companies provide a range of IT services for local clientele but mainly for overseas customers. For a detailed description of participating companies please refer to Appendix 3.

All interviewees held upper management positions and the interview questions were mainly geared towards first analysing the business environment in which firms run their operations, the impact that enterprises can have at the level of employment, income generation, as well as investment in technology and training of staff. For interview questions please refer to Appendix 1.

5.1.1 Line of Activities

Most interviewed companies have one core area of specialization but they also have complementary activities. For example, a company working on web development will as well offer graphic design or mobile app development. Below figure 3 illustrates the line of business of these enterprises:

Figure 3 Software SMEs line of Activities. Source: Own Compilation



As it can be observed, the main activities for participating companies are software development (48%), followed by web development (40%) and mobile app development (24%). All these activities being more knowledge intensive and requiring well trained staff.

5.1.2 Export Destinations

The business operations of participating software SMEs take place in 4 continents with a predominance of Spanish and English speaking countries. Below a list (table 11) that depicts the percentages of local versus international sales:

Table 11 Export Destinations

N°	COMPANY NAME	% OF LOCAL SALES	% OF SALES ABROAD
1	(N.T.)	0%	100%
2	(LT.)	0%	100%
3	(AST.)	0%	100%
4	(T.)	0%	100%
5	(S.)	0%	100%
6	(P.M.)	0%	100%
7	(N.S.S.)	0%	100%
8	(AP.)	5%	95%
9	(O.B.)	5%	95%
10	(P.I.)	5%	95%
11	(W.S.)	5%	95%
12	(SW.)	5%	95%
13	(G.)	5%	95%
14	(A.)	10%	90%
15	(CL.)	10%	90%
16	(CO.)	10%	90%

17	(IFT.)	20%	80%
18	(SRS.)	20%	80%
19	(AA.)	20%	80%
20	(E.S.)	30%	70%
21	(TY.)	40%	60%
22	(BFT.)	50%-60%	50%-30%
23	(I.L.)	50%-60%	50%-30%
24	(AX.)	80%	20%
25	(O.P.)	80%	20%
26	(U.S.)	85%	15%
27	(FX.)	95%	5%

From observation of the list above, it is discernible that 20 out of 27 interviewed companies depend highly on international clients, deriving between 70% to 100% of their sales from them. 7 companies only outsource, most of them in the area of software/web development and mobile app development.

Companies sell between 50%-95% locally as is the case of Axon and Informatica Latina have been around since the 90s, allowing them to establish a strong local presence.

Overall 85% of software SMEs work intensively with foreign customers. The predominant destination market, as expected, given the time zone advantage is North America with 17 companies working in this region. Within North America, the U.S. remains the largest customer. A possible explanation for this scenario is that migration of Bolivians to this country was relatively high prior to the year 2000, making this market more accessible compared to the Canadian. Residents help through knowledge of the business dynamics in a country, communications and networks. Companies such as Webstudio, Lysoft, Assuresoft and Pinch multimedia have branches in different states of the U.S.

5.2 Overview of Knowledge Workers

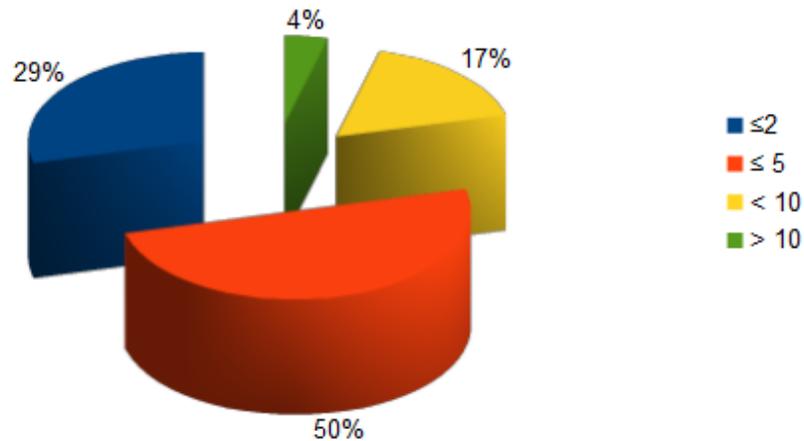
Human capital is one of the most important assets of a knowledge based firm. Human capital is 'owned' by employees who can take their knowledge home with them or on to their next employer (Alwert, Dornemann, and Kivikas 2004, 43). The purpose of sending knowledge workers a survey was to cross check information provided by interviewees. In general one can describe knowledge workers as having completed their degrees in systems engineering or informatics and occupying different positions. The principal occupations were of quality assurance engineering and project leading of either development or quality assurance teams. The sample also included both entry level staff as well as seniors.

5.3 Economic Growth Analysis

5.3.1 Employment Generation

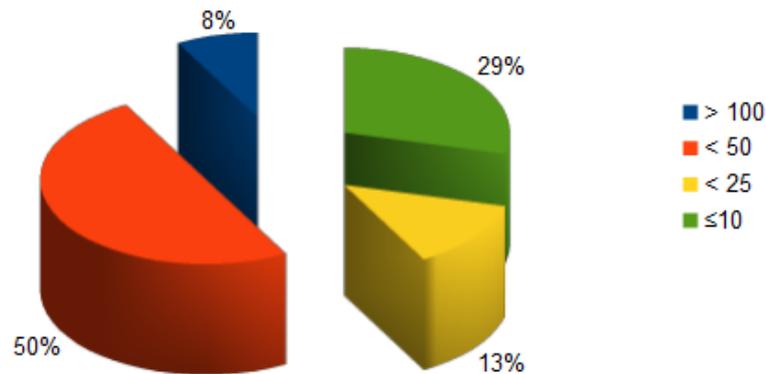
According to figure 4, 50% of software SMEs interviewed started working with teams of 5 or less members and 29% started with just the founder or teams of two.

Figure 4 Software SMEs Number of Employees at Foundation. Source: Own Elaboration

With how many employees did your company start to function?

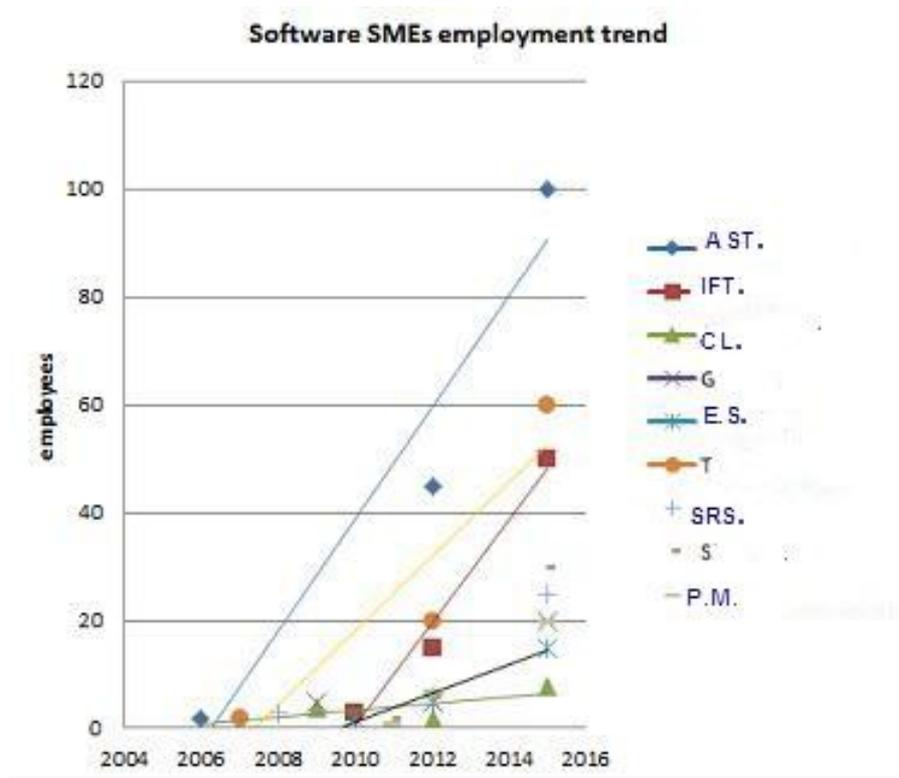
Per figure 5 (below), at present 50% of software firms have teams that range from 25 to fewer than 50 employees and 29% have teams of 10 or fewer employees.

Figure 5 Current Number of Employees at Software Firms. Source: Own Elaboration.

How many employees does your company have at the moment?

However, what is most interesting to note is the “upward” trend in employment generation. Figure 6 illustrates how employment has evolved since time of foundation to the present and includes a 3 year projection for 9 randomly selected companies.

Figure 6 Upward Employment Trend at Software Firms. Source: Own Elaboration.



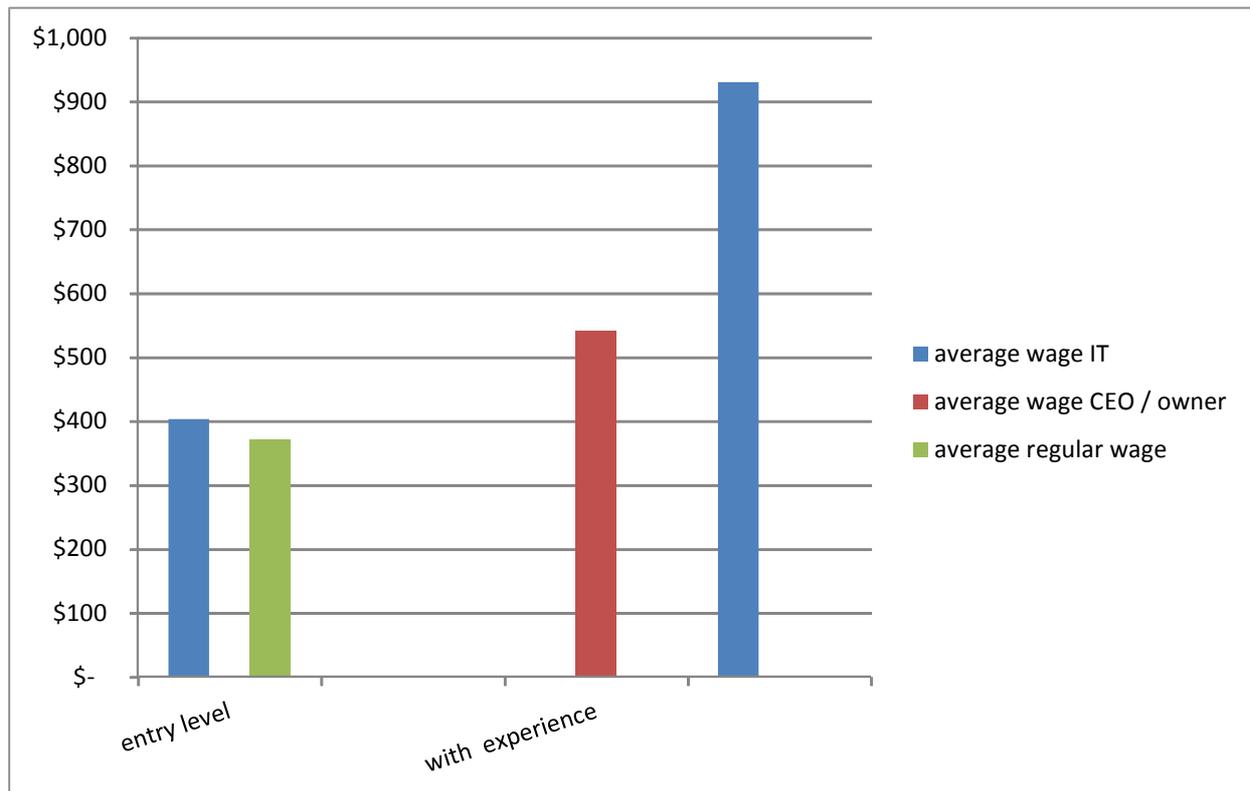
It is possible to observe that employment has an upward slope, in some cases steep as with **AST.** that projects to have a staff of 100 employees by 2015. Only **CL.** experienced a decline in the number of employees since time of foundation due to a decrease in projects. In general, the majority of interviewees plan to hire in the coming years.

5.3.2 Income Generation

For income generation, it was important to cross check the information provided by employers with that of knowledge workers. Results show that the 44% of respondents state that the average wage for new employees ranges from \$300-\$500/month, 30% state it is of \$500 or more per month and 17% state that entry level workers were making less than \$300/month. Cross-checking with knowledge workers responses, 38% of them agreed with the range of \$300-\$500 and 37% with \$500 and above.

In regards to an average wage for senior level workers, those that have been on the job for 5 years, there are more discrepancies in the answers: 26% respondents stated that a senior IT professional makes more than \$1,200/month, 22% believe the range should be between \$800-\$1,000 and 17% between \$500-\$800. On the part of knowledge workers 7 did not reply and the ones that did were torn between \$1,000-\$1,200 and more than \$1,200. A low response ratio on this question could be the result of confidentiality agreements. Also important to note is that at the senior level, wages have a higher relationship with individual performance and the negotiation skills of employees.

A comparison of the average IT professional salaries with those of professionals in other areas, demonstrate that earnings in this industry are higher.

Figure 7 Monthly Salaries Comparison of IT Professionals vs. Other Professionals. Source: Own Elaboration.

From figure 7 two important aspects emerge, the first one is an overall higher wage for IT professionals (\$403) compared to other types of professionals (\$370). Only at the entry level position, IT professionals earn less than company owners and CEOs (\$540). Second, with progression of time, a seasoned knowledge worker earns almost twice (\$930) than an owner/CEO. Current higher wages in the industry are probably due to a higher labor demand than supply.

5.4 Structural Change Analysis

5.4.1 Innovation

(Ahlstrom 2010) states that innovation is not only important at the firm level but also crucial to society. Businesses that bring innovation into the market stay competitive and grow. In turn they generate regional economic growth, employment and an increase in the overall living standards.

According to knowledge workers, 31% believe that the lack of a clear innovation strategy is the main deterrent for an innovative milieu at work, followed by the absence of initiatives to promote innovation and confidentiality agreements

Contrary to this result, 45% of interviewed CEOs state having incentives to promote innovation at work. There is a clear divergence between the two groups of respondents; a possible reason is that innovation strategies/policies are not being clearly transmitted to employees. Or simply that the innovation strategy in place is not the appropriate one for a specific set of workers.

5.4.2 Human Capital

The human capital variable looks ‘indirectly’ at the type of investment and effort that software firms are making to train their staff. Van Marrewijk and Timmers (2003) believe that to keep up with market and technology change, employees – the human capital – need to develop as well. New knowledge and skills have to be learned and competencies trained. The study looks at the offer from software employers for professional training and the effectiveness of the same.

During the interviews, several companies complained that the preparation received at universities was deficient and that there was a need to train employees between 1-3 months before they could be productive for the firm. Results show that a high percentage (67%) of software firms offer “structured” entry level training. Nevertheless, when interviewees talked about structured entry level training often times they meant assigning the new employee a team and having him/her learn on the job. Only one company had a 1 month program with hands on labs and specific training steps.

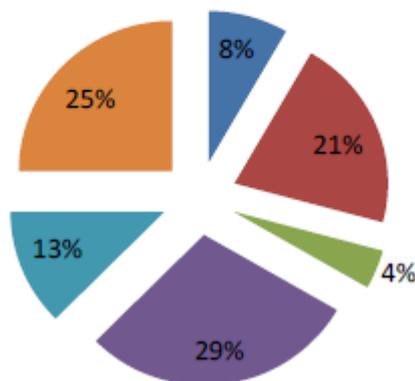
In regards to continuous training, most interviewees felt that it was key for their operations, for this reason several offered in-house programs of knowledge exchange. Despite the importance of continuous training, only 67% of firms were able to offer it. The main impediment for 20% was the lack of resources. Also it is to note that at least half (50%) of the interviewed companies are training employees in areas that customers deem necessary, usually as a result of a new project. In 33% of the cases, management decides the focus of the training sessions.

As to financial resources allocated to training, figure 8 (below) shows that 29% of software firms spend at least \$5,000/year in training its staff. 21% of firms spend between \$10,000-\$25,000/year and less than 8% spend more than \$25,000/year. Besides costs, another scarce resource for these companies is time.

Figure 8 Software Firms Yearly Investment in Training. Source: Own Elaboration.

Aproximately how much is invested yearly in entry level and continuous training?

■ 25000 - 50,000 \$us ■ 10000 - \$US 25,000 ■ 5000 -10,000 ■ ≤5000 USD ■ 0 ■ N/A



In regards to the efficiency of training, 75% of company respondents state that they conduct an evaluation after training sessions. Some consider (58%) that analyzing project performance/results is the best method of evaluating the effectiveness of training. Only one company was ISO 9001:2008 certificated and was required to perform evaluations of in-house or with external training.

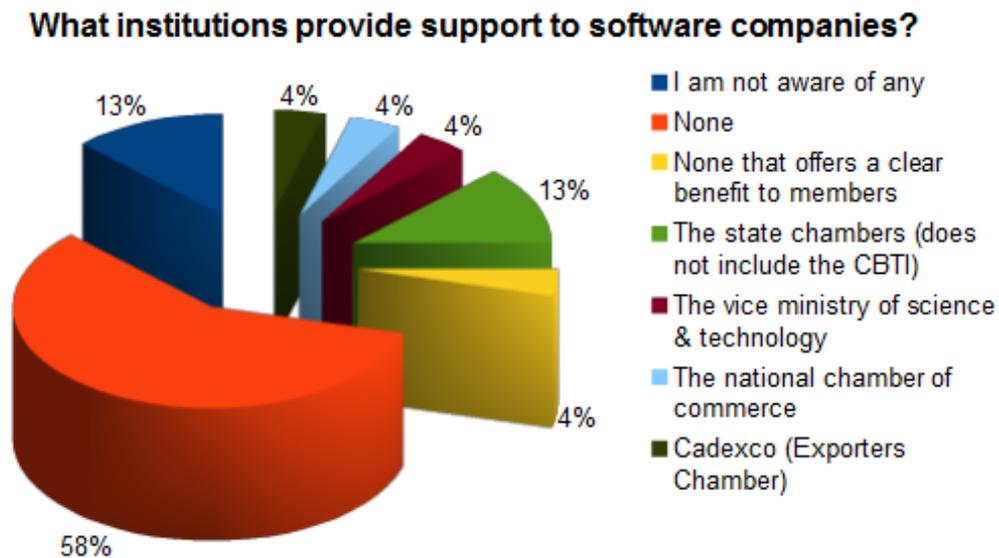
As to knowledge workers and their capabilities enhancement, a great majority (75%) feel strongly that their skills have increased as a result of their work experience at software firms, increasing also their chances of future employment prospects. The 13% that did not observe a positive impact mainly stated that it was due to very specific tasks related to one product; therefore, making this knowledge difficult to transfer to other areas. However, most employees regarded their job as a chance to hone their university skills, learn about

new technologies, learn about team work, management of groups and projects as well as how to work with customers abroad.

5.4.3 Private/Governmental Support

(Scott, Garafoli, and Vázquez Barquero 2007) state that economic development, takes strength in those territories with evolved, complex and flexible institutional systems. Analysing the type of institutional backbone available for the software industry in Bolivia is key. Figure 9 below shows results of answers regarding institutional support.

Figure 9 Institutional Support for Software Firms. Source: Own Elaboration.



From the figure above, it is possible to discern that the majority (58%) of CEOs never received assistance from any type of institution, 13% were not aware of any assistance or promotion programs and only 13% mentioned that local chambers provided some support (excluding the CBTI from their answers). Overall, the lack of institutional support for the sector or the lack of effectiveness of programs available at the moment, were confirmed by at least 75% of interviewees.

If institutions do not have an impact in local development strategies, then as Fuá (1994) states, the organizational capacity of the local actors themselves is decisive. To analyze organizational capacity a question related to organizing knowledge exchange events among software firms in the region was asked. A knowledge exchange event was selected since knowledge is the most important asset for knowledge based firms. The ability to create new knowledge, share existing knowledge, and apply organizational knowledge to new situations becomes critical for competitiveness (Lesser 2000, 9).

While most interviewees (54%) believe in the possibility of having an organized event for the exchange of knowledge among software firms. 33% are doubtful. Interviewees admit that exchanges are helpful and even necessary but carrying out an initiative of this sort is not feasible, given the Bolivian business culture. Companies are afraid to share their hard earned know-how for free, risk losing their competitive advantage or even clients.

Another way to analyze the organizational capability of local actors was asking software CEOs about membership in learning or innovation clusters. Given the scenario previously discussed on knowledge sharing,

it is not surprising that most software firms (75%) are not part of a cluster in their region. Most cite the lack of a strong program or promotion of the benefits of clusters as the main reason not to join. In addition, some interviewees feel that they cannot relate to other companies in the region and that the groups that exist are not a good match for their company culture. In sum, the limited fellowship and sympathy among software firms in the region is evident.

Chapter 6 Summary of Findings and Interpretation of Results

In this section the results to the main questions of economic growth and structural change are summarized, trying to interpret if software SMEs that export contribute to generating local development in their regions.

Table 12 Variable, indicators and results

VARIABLES	INDICATORS	RESULTS
EMPLOYMENT GENERATION	The quantity of employees in software SMEs increased from time of foundation to present and will continue to increase in 3 years.	a) Based on interview results, 96% of companies plan to hire in the next 3 years and at the moment 63% have job vacancies b) On average software SMEs started with 4 employees at time of foundation. By 2012 on average firms have 34 employees and in 2015 projects point to 51 employees (on average). It is possible to deduct that Software SMEs increase the number of employees by a factor of 8.5 from time of foundation to present c) The average hiring rate of interviewed companies is of 1.5 employees/year based on 2015 projections.
INCOME GENERATION	Knowledge workers in the selected software firms earn more than the average professional in terms of income per capita over a course of 5 years.	a) Based on interview results and surveys to knowledge workers, an average wage for entry level and senior IT professionals was obtained. It is noted that knowledge workers earn a higher initial monthly wage (mim. \$403) than other types of professionals (\$370). A seasoned IT professional makes mim. \$930 on average, which is almost twice the wage of an owner/CEO (\$540).
	The software industry does generate positive employment and income generation. Given that the	LEADS TO ECONOMIC GROWTH

RESULT ON ECONOMIC GROWTH	wages of IT professionals are higher than those of regular professionals and there is a high demand for their services, it is assumed that both variables have a positive impact on living standard as well as on economic growth.	
INNOVATION	The majority of knowledge workers acknowledged a lack of a clear strategy to promote innovation and hence and innovative milieu at software SMEs	31% of knowledge workers confirmed that the lack of a clear innovation strategy was a hindrance to an innovative work environment. 19% of workers also stated that there were no initiatives to promote innovation and 19% mentioned that confidentiality agreements are an impediment to knowledge flows and thus innovation.
RESULT ON STRUCTURAL CHANGE	While 45% of software firms have a mixture of acknowledgment and economic benefits to promote innovation in software development or a specific process, there is a clear disconnect with what employees perceive as an incentive.	<i>DOES NOT LEAD TO STRUCTURAL CHANGE</i>
HUMAN CAPITAL	The majority of knowledge workers at software SMEs agree that competencies training provided by employers is an effective professional post-training.	75% of knowledge workers at software firms admit that training at their companies has increased their skills and added value to their CV, making them more marketable. Overall, entry level and continuous training in software firms has a positive effect on employees' competencies.
RESULT ON STRUCTURAL CHANGE	Software firms have understood well that human capital is a key asset for their organization. Their competitive advantage lies in what their employees know. However, due to limited resources of funding and also time, not all firms are able to provide the necessary training. Nevertheless the companies that do set up in-house training programs constitute an example to other sectors in the	LEADS TO STRUCTURAL CHANGE

	economy.	
PRIVATE/GOVERNMENTAL INSTITUTIONAL SUPPORT	The majority of employers and IT professionals acknowledge a lack of organized groups (private/governmental) that support the software industry.	<p>54% of employers stated that an organized exchange of knowledge among other software companies in the region is possible, 33% mentioned that 'maybe this is possible'. On the other hand 56% of employees at software SMEs stated that an exchange is possible. Resulting in an overall possibility of knowledge exchange. However, when it came to actual membership in learning or innovation clusters 75% of companies were not part of this initiative.</p> <p>When asked about institutions that offer support to software SMEs 58% of employers answered that 'none' offer support and 13% were not aware of any programs that promote the industry.</p>
RESULT ON STRUCTURAL CHANGE	There is willingness to join organizations and exchange knowledge, but no initiatives really taking place due to lack of trust and sympathy with other companies in the region, even, if they are not direct competitors.	<i>DOES NOT LEAD TO STRUCTURAL CHANGE</i>

Chapter 7 Conclusion and Recommendations

7.1 Conclusion

Based on interviews and surveys administered to local actors of the sector, all seems to point to the potential that the software industry has to promote local development. There is economic growth present through positive employment generation rates. Also IT professionals' wages are above the national wages of other professionals in the country and due to their continuous training, most have enhanced their skills and are

more marketable. In regards to wages, due to the excess demand versus the current supply, they are to remain high for the sector, at least in the short-run.

The major hindrance factors for the software industry remain the low organizational capacity of local actors that are not able to create solid support networks. Also the environment in which software SMEs function, starting from a deficient ICT infrastructure, a lack of governmental/institutional support, outdated regulations for the sector to little innovation, do not lead to structural change and an increase in the productive capacity. From a systemic competitiveness perspective, obstacles at the meta and meso level do not allow for the industrial development of the software sector.

7.2 Recommendations

Bolivia has a great potential to become an important software exporter in the region, it has a qualified labor force, low costs and a strategic location in South America. It is no surprise that in developing countries many industry successes started with the commitment of a rather small group of individuals. In the fascinating story of the software industry in Uruguay, it is very evident that this industry prospered because of the hard work, tenacity, willingness to take on opportunities and a collaboration network of academics at the Universidad de la República (UR). Below a list of recommendations to leverage the software industry is presented:

Increase visibility of the software industry: The software industry in Bolivia is invisible to the government and this is reflected at various levels. There are no policies that promote the industry, no legal framework nor financial support. Competitiveness of the sector could be improved by assisting software companies obtain capital for expansion, reducing taxes on imports of equipment for operations or reducing/exempting software companies of the international transaction tax charged on wire transfers. Increasing the visibility of the sector should be in the agenda of all support institutions.

Regional strategy vs. National strategy:

The promotion of the software industry should not only be left to the *eje-troncal*²⁶ cities in Bolivia- which already enjoy more prosperous economies than the rest of the country. Instead any strategy involving the software industry should be implemented nationwide to also benefit lagging regions.

Exporting and building an indigenous industry:

As Tessler, Barr, and Hanna (2003) state national strategies must balance software export potential with internal growth or both will be impaired. Developing software for key sectors in the Bolivian economy will surely increase the competitiveness and productivity overall.

²⁶ Eje troncal refers to the cities of La Paz, Santa Cruz and Cochabamba.

Building trust and cooperation networks among software firms:

The process of building trust and cooperation is not simple and requires time. For this reason, attempting to implement knowledge exchange events might not work well in this stage. First the benefits of alliances should be promoted. Then, it should be emphasized that most companies are not competing locally but instead globally.

Increasing effectiveness of support institutions:

Most support institutions are formed by software entrepreneurs that already have their hands full with their business operations. Forming public-private alliances might ensure funding to have full-time staff dedicated to promoting the industry.

Building bridges between universities and software sector:

Good relations between universities and software firms is a win-win scenario. Software firms are in constant need of human resources and universities' reputations increase when they can place their newly graduates in internships and jobs. Agreements between universities and software enterprises can include: a) recruiting of students for internships b) employment recruiting of newly graduates c) thesis research projects at software firms d) new technologies research and e) financing of software development start ups.

Support of research activities through university spin offs and business incubators:

In Uruguay, the development of the software industry was the natural consequence of a transfer from the academia to the industry that lasted 15 years (Vidart 2009). In Bolivia, incentives for scientific activities and R&D are very limited (0.51% of GDP and 0.26% of GDP correspondingly). University spin offs would allow students to research and work. Business incubators, ideally back by some government funding, could help innovative start-ups mitigate risks.

Reinforcing law 164:

Poor ITC infrastructure and high service costs affect adversely 69% of software companies that participated in this research. Finding mechanisms to reinforce the latest telecommunications law is important, as this law guarantees quality, continuous service and price affordability of services to all citizens. Support institutions should demand regulation of internet providers.

Promoting innovative work environments:

From all CEOs interviewed only two had interesting innovation strategies that went beyond a financial reward or work acknowledgement. Since innovations require time and effort, employers could provide workers with appropriate infrastructure and permission to work on projects a couple of hours a week. Also offering

ownership rights for products/innovative ideas developed at work could serve as a great incentive for both employers and employees.

Chapter 8 Appendices

8.1 Appendix 1: Interview Questions for Software SMEs

INTRODUCTION INFORMATION

Thank you for your time and for your valuable information! We will take approximately 45 minutes to complete three sections of 46 questions. The main objective of this survey is to gather information on how small and medium size enterprises (Bolivian or partially Bolivian) help to generate local economic development.

Note: If you consider that some information provided could generate a situation of risk, please make sure to indicate so or do not answer.

HOW TO COMPLETE THIS SURVEY

The majority of questions are open-ended, for which reason we ask you to please respond as in depth as possible. If you would not like to give exact numbers in annual profit for example, an approximate will do. There are a couple of multiple choice questions where you will only need to select one option.

GENERAL INTERVIEWEE AND COMPANY INFORMATION

1. Date on which company was founded: _____
2. Area of business: _____
3. Name and title of interviewee: _____
4. Interviewee works at the company since: _____
5. Products that the company offers: _____
6. Services that the company offers: _____
7. Countries that the company works with: _____

LOCAL EFFECTS

The section on local effects, first analyzes the business environment in La Paz/Santa Cruz or Cochabamba. Then, it evaluates the impact that enterprises can have at a level of employment & income generation, as well as export earnings and investment in technology and training of staff.

LOCAL FACTORS

8. In which city do you run your operations and if you have any branches where are they located?
9. What are the main reasons to choose La Paz/Santa Cruz/Cochabamba as your base of operations? What difficulties are there?
10. In your opinion, La Paz/Santa Cruz/Cochabamba has a good communications infrastructure? What factors contribute to this?
11. Where do you obtain your qualified workforce?
12. Do you have any vacancies at the moment that you cannot fill? How many?

13. What factors help the business climate in your region? And which ones hinder it?

14. Do you believe that thanks to the boom of the software industry in your region, new companies that provide services to this industry have established themselves? Could you provide us with an example?

15. What institutions provide support to software companies? What services are missing?

EMPLOYMENT AND INCOME GENERATION

16. How many employees does your company have at the moment?

< 50 50-100 >100

17. With how many employees did your company start to function?

18. How many employees per year are hired and how many are let go per year?

19. How many employees do you think you will need in the next 3 years?

20. What is the average wage of new employees?

<\$300 \$300-\$500 >\$500

21. What is the average wage of employees with more than 5 years of experience?

<\$500 \$500-\$800 \$800-\$1000 \$1000-\$1200 >\$1200

22. Is there a lot of personnel turnover? If the answer is affirmative, please state reasons.

23. Is there much competition among software companies or other type of companies to attract personnel?

EXPORT EARNINGS

24. What is your annual profit (income-expenses)?

< \$50,000 < \$100,000 <\$300,000 \$300,000-\$500,000 >\$500,000

25. From the total yearly sales what percentage are sales abroad? What are the destination countries? Please indicate objective foreign market.

26. From the yearly sales total what percentage are sales in the local market? Please indicate objective local market.

27. In the last 6-7 years how have sales abroad developed? For example, they have increased by 20%, 30% or 50%?

28. In the last 6-7 years how have regional sales developed? For example, they have increased by 20%, 30% or 50%?

29. In the next 5 years what objective market are you looking to enter?

EDUCATION/TRAINING

30. What is the education level of the majority of your employees?
31. Do you possess any structured training programs for new employees?
32. What continuous education programs do you have? What impacts do they have on your company?
33. If there are no continuous education programs, do you see the need to implement them?
34. How much do you invest yearly in training of new employees and in continuous education training?
35. How are training needs identified? Where does this need come from?
36. Is there an evaluation of training efficiency? If the answer is positive, please describe your evaluation method.

INNOVATION AND TECHNOLOGY

TECHNOLOGY

37. Has your company made investments in technology (hardware, software and others) to access international markets? Please state type of investments.
38. How do you learn from other companies in the region? Have you ever performed a benchmarking analysis of other software companies?
39. Has your company experienced knowledge spillovers from other companies in your region?
40. Do you think that an official and organized exchange of knowledge is possible among software enterprises in the region? Would this help companies? And how would you set up this exchange?

INNOVATION

41. How are employees encouraged to innovate in the development of software or a specific process? Are there any promotion plans or incentives?
42. What innovation strategies were most successful?
43. Does your company take part of any innovation/learning clusters with other local companies or national companies? Is this beneficial or is it necessary to improve?

IF YOU WERE....

44. If you were the Vice-Minister of Science and Technology, what would be your recommendations to make the software industry competitive?
45. If you were an investor why would you invest in La Paz, Santa Cruz or Cochabamba, or what would these cities need to do for you to invest?

46. Is there anything else that you would like to mention or that you deem important about the software industry and local development in Bolivia?

THANK YOU FOR YOUR TIME AND FOR COMPLETING THIS QUESTIONNAIRE!

8.2 Appendix 2: Knowledge Workers Survey

INTRODUCTION INFORMATION

Dear friends and colleagues you are invited to participate of a survey for my thesis project at the University of Leipzig, Germany. The survey will take approximately 20 minutes to complete. The main objective is to gather information about how knowledge workers of software companies perceive the software industry and the possible links with local development.

Note on Answers: Results will be strictly used for this project and the identity of participants will be kept CONFIDENTIAL.

HOW TO COMPLETE THIS SURVEY

The majority of questions are multiple-choice where you need to select only one option. There are a couple of open-ended question where we ask you answer in depth.

GENERAL INTERVIEWEE AND COMPANY INFORMATION

1. In your company what are you in charge of? Since when? And how did you end up in your current job?
2. In general terms, could you describe the area in which your company works and the countries that it works with?

LOCAL EFFECTS

The section on local effects, first analyzes the business environment in La Paz/Santa Cruz or Cochabamba. Then, it evaluates the impact that enterprises can have at a level of employment & income generation, as well as export earnings and investment in technology and training of staff.

3. Do you think that La Paz/Santa Cruz/Cochabamba has a good IT infrastructure for companies like yours?

- No, it does not
- Yes, it does but it is limited
- Yes, it does and it is good
- Yes, it does and it is excellent

4. In your opinion, which factor benefits the “most” the business environment for software or technology based companies in your region?

- Good IT infrastructure

- Good public transportation
 - Qualified personnel
 - Low labor costs in qualified personnel
 - Low living costs
5. In your opinion, which factor damages the “most” the business environment for software or technology based companies in your region?
- Bad IT infrastructure
 - A negative political image
 - High taxes
 - Lack of trust between firms and employees
 - Lack of work ethic
6. Do you believe that thanks to the boom of software industry in your region, new business that provide services to these firms have established themselves?
- Yes there are new enterprises that provide us services (spin offs)
 - I have not noticed that there are new enterprises thanks to software companies
 - No, software enterprises do not help to generate new companies

EMPLOYMENT AND INCOME GENERATION

7. How many employees does your firm have at the moment?
- <50 50-100 >100
8. Do you know with how many employees did your firm started to work with?
- Yes, with less than 10
 - Yes, with more than 10
 - I do not know
9. From what you have been able to observe, what is the average income of new employees?
- <\$300
 - \$300-\$500
 - > \$500

Other (please specify) _____

10. From what you have been able to observe, what is the average income of employees with more than 5 years of experience?

< \$500

\$500-\$800

\$800-\$1000

\$1000-\$1200

> \$1200

Other (please specify) _____

11. Do you believe there is competition among software companies or other type of companies to recruit personnel?

Yes, there is little competition

Yes, there is a lot of competition

Yes, there is competition but only for specialists

There is no competition for personnel

EXPORTS EARNINGS (YOU ARE NOW HALF-WAY DONE WITH THE SURVEY!)

12. (Optional) what do you estimate is the yearly profit of your company (income- expenses)?

<\$50,000

< \$100,000

< \$300,000

\$300,000-\$500,000

> \$500,000

EDUCATION/TRAINING

13. What is the education level of most of your colleagues?

Systems Engineers/Informatics just out of college (without thesis)

Systems Engineers/Informatics with a Bachelor of Science (with thesis)

With a master's degree in Systems Engineering or similar major

Other (please specify) _____

14. Do you believe that your company invests enough to train its personnel?

My company invests little in training of staff

My company invests only in training new staff

My company invests a lot in its personnel, both at entry level and continuously

My company does not invest enough because it does not deem it necessary

My company does not invest enough in training because no one has time

15. Are there any structured training programs for new employees at your firm?

YES

NO

16. Do you have continuous education training programs at your company? And what impacts do they have on the staff?

Yes we do, but they are NOT effective for staff

Yes we do, and they facilitate much of our work and also help us build our skills

There is the possibility of continuous training but it's not easy to receive neither approval nor time for this.

We do not have continuous education training programs

17. How are training needs identified? Does staff have the possibility to request specific training?

During the course of work, and we can request training

According to what customers' need

It's a decision established by our supervisors/management

Other (please specify) _____

18. Do you feel that your work has helped you to acquire new skills, adding value to your CV (resume)? Can you give us an example?

INNOVATION AND TECHNOLOGY

This section seeks to analyze the impact of software companies on technology and innovation.

TECHNOLOGY

19. Do you think that your company invests enough in technology to stay competitive? If affirmative or negative, what do you base your answer on?

20. Do you think that your company works with the state of art technology? What is it missing?

- Investment
- Qualified staff
- Vision

21. Do you believe that an official/organized exchange of knowledge is possible among software companies in the region?

- YES
- NO

INNOVATION

22. In your company how is innovation in software development or a specific process encouraged among employees?

- Mainly through economic incentives (such as a wage increase, bonuses, etc.)
- Only through acknowledgment
- A mixture of acknowledgment and economic incentive
- A job promotion
- Other (please specify) _____

23. What innovation strategies were most successful?

24. Would you that there exists an innovative environment in your company?

- YES
- NO

25. In your company what hinders an innovative environment the most?

26. What innovation strategies were most successful?

27. Would you say that there exists an innovative environment in your company?

28. In your company what hinders an innovative environment the most?

- Confidentiality agreements
- Mistrust among colleagues
- Few recreational areas for informal networking/bonding
- Lack of initiatives to promote innovation
- Management does not listen enough to employees' suggestions
- A clear innovation strategy does not exist

29. Is your company part of an innovation/learning cluster along with other companies in the region or country?

- YES
- NO
- I do not know

IF YOU WERE....

30. If you were the Vice-Minister of Science and Technology, what would be your recommendations to make the software industry competitive?

31. Is there anything else that you would like to mention or that you deem important about the software industry in Bolivia?

8.3 Appendix 3: Participating Companies Description

Legend: **Cbba-** Cochabamba; **SC-** Santa Cruz; **LP-** La Paz

NAME	ORIGEN	Founding YEAR	Interviewee Position	DESCRIPTION OF SERVICES/PRODUCTS
AP.	Cbba	2008	Partner	AP. is one of the fastest growing companies interviewed, with several partners and branches already in Chile, Costa Rica and the US. AP. is a new social and market based yellow pages and business directory site. It works mainly with the Americas.

A.	Cbba	2008	Founder & CEO	A. is a fusion of the architecture and civil engineering fields. Resulting from the CEO's initiative to outsource different services just like software developers. A. outsources 3D visualization & design techniques and works with customers based in the U.S., Canada, England and Australia.
.I.L.	Cbba	1997	Founder & CEO	I.L. has been in the market for over a decade and surely has changed its line of business but currently specializes in web development. It has customers locally but also in the US, Mexico and Switzerland and plans to expand into France.
LT.	Cbba	2002	Founder & CEO	LT. is a software company that develops custom solutions for clients mainly in the US, Argentina and England. It specializes in web and mobile technologies, as well as quality assurance. LT. has a branch office in Oklahoma and plans to extend its line of business to the area of social media in South America.
N. T.	Cbba	2010	Founder & CEO	N.T. started mainly to cater to the needs of one major customer. Now it specializes in software and applications development with an emphasis on iOS devices. N.T. 's main office is in Cochabamba while their sales branch is in London, UK. It has plans to enter the Middle East Market.
O. B.	Cbba	2008	Founder & CEO	O.B. is a sister company to A. and specializes in Graphic Design and web development. It is a young company but already has enough projects to keep its team busy. O.B. works exclusively with the US and Canada and hopes to expand to Brazil.
P. I.	Cbba	1992	Partner	P.I. is a strategic alliance between German and Bolivian partners. P.I. has offices in Cochabamba and Hamburg. It specializes in software development in various areas such as finance and health systems. P.I. works in Bolivia, Switzerland and Germany. There are no plans to extend to other regions.
TY.	Cbba	2008	Project Manager	TY. is an international company, owner of NuevaTel, one of the largest mobile solutions providers in Bolivia. TY. has a specific department that specializes in software development for the telecommunications industry. It works locally but also with the U.S., the Dominican Republic, Haiti, Papua New Guinea, Salomon Islands and New Zealand.
W. S.	Cbba	2003	Partner	W.S. is a software company that specializes in the design and development of solutions for web environments such as websites, mobile applications and web applications. W.S. 's main office is in Oklahoma, U.S. with branches in Cochabamba and Colombia. It works with the U.S., Canada, England, Spain and Australia and would like to work with Brazil.
SRS.	Cbba	2008	Founder & CEO	SRS. specializes in web development and graphic design. SRS. works with various countries such as Argentina, the U.S., England, Australia and Turkey. It is mainly looking to expand operations in Argentina and the U.S.
CL.	Cbba	2009	Founder & CTO	CL. specializes in web development and applications in Java and C++. CL. is based in Cochabamba and has a branch in La Paz. It works almost entirely with the U.S. and hopes to expand operations to Miami and California, as well as in the

				national market.
IFT.	Cbba	2010	CEO	IFT. is based in Cochabamba and provides software development and quality testing outsourcing. It works with Bolivia, Canada, the U.S., Spain. IFT. has plans to enter the Brazilian and Australian markets.
T.	Cbba	2012	Founder & CEO	T. resulted from the division of a former company which was founded in 2006. So while the company is young, its management has experience in the field. T. offers software development and plans to open a branch in Peru. It works with the U.S., Australia, Spain and Belgium and hopes to work with the Silicon Valley.
AST.	Cbba	2006	Founder & President	AST. also stems from a former company. It works in the area of software development outsourcing with the U.S. and Canada mainly. It has a branch in Santa Cruz, in California and Florida. In terms of future plans, it wants to continue working in the countries that it already does.
S.	Cbba	2012	CEO	S. 's main area of work is software development in Drupal. Its current customers are in Peru and Colombia. Growth plans include entering the North American and European markets.
G.	Cbba	2009	Partner & General Manager	G. is a team composed of five partners. It offers web/web application and mobile application development. At the moment it works with Australia and France. In terms of growth, it is opening a branch in Cochabamba that will focus on web development with .NET technology.
N. S. S.	SC	2010	CEO	N. S. S. is a visionary company that works exclusively with the U.S. Nova's principal area of work is software development. It specializes in desktop, web and mobile applications development, as well as building e-commerce websites.
AX.	SC	1994	General Manager	Ax. has been in the market for 18 years and has branches in La Paz and Cochabamba. Ax. develops its own software: Netbank (for banks), ERP Sai (for businesses) and AML Espía (security software). Currently its team works in almost all states of Bolivia and in Peru.
SW.	SC	2007	Owner & CEO	SW. was founded in Santa Cruz by two Swiss partners. Its main activities are the integral development of software and business processes consulting. It works mainly with Switzerland, Germany, Denmark and just this year with Bolivia. SW. has a sales/customer service branch in Zurich.
P. M.	SC	2011	Founder & CEO	P. M. is a passionate multidisciplinary team of 4 with a board of 3 members. It develops mobile applications for iOS platforms. P. M. works exclusively with Apple and has a branch office in Florida, U.S. In terms of growth, it plans to develop for Google too.
O. P.	SC	2011	Founder & CEO	O. P. is a small team that offers web and multimedia design & development, systems development, social media management and recently started offering mobile app development. It has most of its customers in its thriving city,

				but also works with Spain and in plans to enter the US market.
FX.	LP	2006	Partner	FX. is an innovating private consultancy that is composed of 4 main lines of business: Software development and Geographical Information Systems (GIS), Earth Sciences, Environment and natural resources and Geology & Mining. FX. works locally and with Chile and Peru. They have a branch in Arequipa, Peru.
BFT.	LP	2004	Founder & CEO	BFT. is a systems integrator and software developer with years of valuable experience in La Paz. BFT. works in the area of business intelligence with their own solution and has operations in both Bolivia and Mexico.
E. S.	LP	2010	Owner & CEO	E. S. is located in La Paz and its main activities include web development and web application development for all sectors, excluding the finance area. Its works mainly in Bolivia and the U.S. In the near future it hopes to enter the services market in the U.S., expand operations mainly anywhere where Spanish and English is spoken.
AA.	LP	2005	General Manager	AA. works in the areas of software development, has its own solution SilverTrack and offers as well electronic billing and electronic libraries. It has a branch office in Santa Cruz and its operations are in Bolivia, Austria, the U.S. and Nicaragua. AA. is a founding member of ProSoft, an organization in charge of promoting the software industry in Bolivia.
CO.	LP	2002	Partner & CEO	CO. develops its own software and its star product is the "process maker", a program for business process management (BPM) that sells globally. CO. considers itself a trend setter, it was the first company in the BPM realm to offer its program completely online and in 2008 it went open source.
U.S.	LP	2009	Founder & CEO	U.S. offers software development for mobile platforms, technology integration and consulting. It works under a scheme of contracting and online work with freelancers. U.S. has strategic alliances with partners in Miami and Venezuela. In the next five years it plans to enter the Argentinian and Chilean markets.

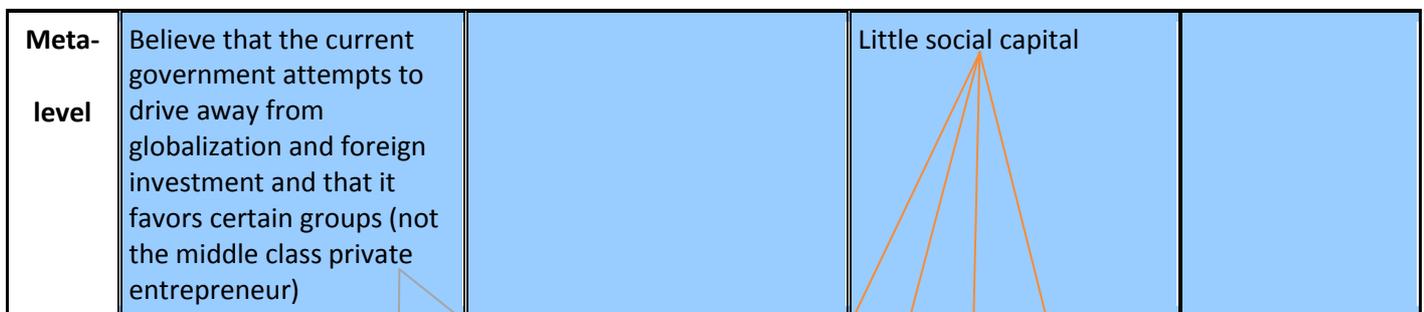
8.4 Appendix 4: Factors that hinder or favor the Bolivian Software Industry's Systemic Competitiveness

ANALYTICAL LEVEL	REFERENCE	FAVORING COMPETITIVENESS	HINDERING COMPETITIVENESS
META	Bolivian National Development Plan (2006-2010)	Under the new political constitution Bolivia is a social, communitarian state. Its democracy model is one that promotes participation of different groups in political, economic and	The current government's development plan claims the shift from a neoliberal model to a sovereign state. For this, among many other measures, the nationalization of natural resources such as hydrocarbons was key. But

		social decisions, empowering its citizens furthermore than previous governments.	nationalization caused insecurity among private entrepreneurs and foreign investors. 22% of interviewees stated that a negative political image hindered the business environment in their regions.
	Bolivian System for Innovation	The Bolivian system for innovation promotes the generation of new and better processes and products. It links scientific/technological centers with the private/productive sector.	Regardless of the intention to link scientific/technological centers with the productive sector, there is little synergy occurring amongst these sectors. This is evident in the disconnect between universities and industry. Interviewees complained that the preparation received in universities does not match their needs. On the other hand, the Director of Systems Engineer at the Catholic University states that it is mainly deficient training programs and equipment that do not allow recent graduates to perform well in their jobs.
	Appendix 1: Questionnaire for Software SMEs		Based on interview questions little social capital is observed among software SMEs. Most firms work as "islands", 75% of interviewed companies do not form part of a learning/innovation cluster. 33% of interviewees doubt that knowledge exchange among firms is possible granted the closed business culture in Bolivia. The Bolivian entrepreneur is "jealous" and does not want to share business information.
MACRO	Competitiveness report by CAINCO (The Chamber of industry, commerce, services and tourism in Santa Cruz)	Bolivia currently enjoys macroeconomic stability and relative politic stability	
	The general law of telecommunications- and ITC (Law 164 decreed on August 8 th , 2011)	Law 164 is based on important principles that could be an excellent lever for the software industry: * Universal access *Price affordability *Service quality per national and international standards	The implementation and enforcement of law 164 is complex. In interviews all software CEOs stated that the communications infrastructure available for their businesses was not adequate. In addition, most complained about high internet costs and unreliable service.

		*Service without interruptions *Privacy	
	Appendix 1: Questionnaire for Software SMEs		Legislation and processes concerning registration of software firms, taxation of software exports and protection of intellectual property is outdated and does not reflect the activity of these firms.
	Interamerican Development Bank report on SMEs in Bolivia, 2006		Costs to open and run a business in Bolivia are high. This is an obstacle for start up businesses and encourages informality.
MESO	Interviews with representatives of the CBTI (the Bolivian Chamber of Information Technology) and Prosoft	Both the CBTI and Prosoft look to promote the software industry in Bolivia. The CBTI is lobbying for legislation specific to the sector (software law) and procures to match members with foreign strategic partners occasionally.	Unfortunately 75% of interviewees state that they never received support or that they were not aware of any programs/institutions that support/promote the sector.
MICRO	Appendix 1: Questionnaire for Software SMEs	Some companies interviewed mentioned that they had informal alliances with other companies that complement their services.	More than half of interviewed companies did not believe that they learn from other companies in the region.
	Appendix 1: Questionnaire for Software SMEs		67% of companies did not perform any benchmarking of services/products. And the remaining companies that performed benchmarking (19%) did so with international companies and not regional ones.

8.5 Appendix 5: Systemic Competitiveness Obstacles in Bolivia



<p>Macro-Level</p>	<p>High costs to open and run businesses promote informality</p> 	<p>No recognition of the software sector:</p> <ul style="list-style-type: none"> *No specific law for the software sector. *No guidelines for software exports. *No specific category to register software firms in commercial registry. *Outdated application requirements for copyrights. 	<p>Poor regulation of internet providers (high costs, poor service)</p>	
<p>Meso-level</p>	<p>Lack of a unified voice among support institutions</p>  	<p>Low impact of support institutions</p> 	<p>Deficient infrastructure for telecommunications, information technology and communications</p> 	<p>Little communication and cooperation between universities and local software firms.</p> 
<p>Micro-level</p>	<p>Limited firm efforts to evaluate competitiveness</p> 	<p>Little knowledge exchange among firms</p> 	<p>Little interaction/cooperation between software firms</p> 	

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