

# THE BOGOTA SOFTWARE CLUSTER



***Microeconomics of Competitiveness (MOC)***

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# 1 Colombia's Competitiveness

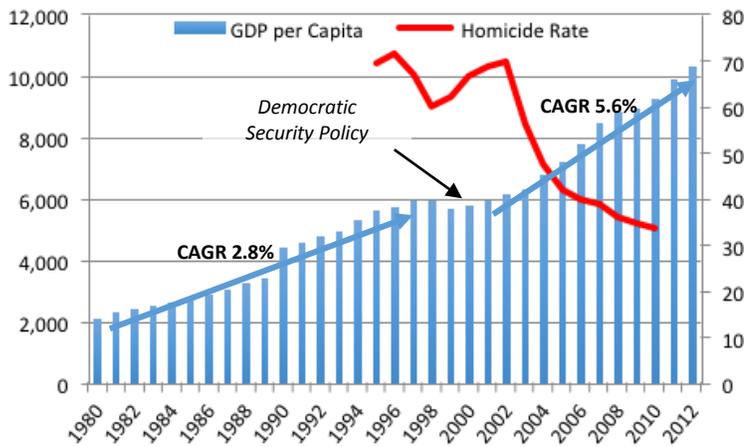
Competitiveness is determined by a variety of factors. Yet, a crucial element that drives competitiveness is productivity, as it depends on the microeconomic capability of an economy and the level of sophistication of local competition at the regional and cluster level. Macroeconomic competitiveness and endowments matter, but never to the same extent as productivity and microeconomic competitiveness. Thus, this paper will only briefly analyze the endowments and the macroeconomic competitiveness of Colombia before deep diving into the software cluster of Bogota analyzing first the context in which it operates, Bogota, before taking a closer look at the cluster itself. Finally recommendations on how to support and further drive the software cluster's development in Bogota shall be presented.

## 1.1 Country Profile & Economic Performance

Colombia is situated at the northern tip of South America and is Latin America's oldest democracy with a long standing tradition of constitutional government. The country counts a relatively young population of 46.9 million people. 58% of Colombia's inhabitants are between 15 and 54 years old providing the country with a positive demographic outlook for the short to mid term. Furthermore, the country is, despite vast jungle areas and high mountains ranges known as the Andes, densely populated in comparison to the OECD (41.7 vs. 34.4 population density per square kilometer). The urbanization rate is high with 75.3% compared to 82% in the United States. This can in part be attributed to the number of major metros in Colombia. Bogota, the country's capital has a population of 8.8 million (18.8% of national population) followed by Medellin with 3.6 million, Cali 2.8 million, Barranquilla 1.9 million, Bucaramanga 1.1 million and Cartagena with 1.0 million inhabitants. *(OECD, 2013 & Ramirez and Porter, 2013)*

Colombia's GDP per capita (PPP) is with US\$10,100 less than one third of the OECD average of US\$35,400 per capita, but the country counts on numerous natural resources also known in terms of economic development as endowments. Given its location Colombia has access to the Pacific Ocean as well as to the Caribbean Sea. It is a highly diverse country geographically speaking as three mountain ranges of the Andes divide the country and provide for a wide variety of year-round climate zones determined by the altitude rather than the geographic location. Colombia forms part of the five most bio-diverse countries in the world. Other natural resources such as oil and gas make Colombia the fourth largest petrochemical exporter globally and self-sufficient in terms of energy consumption. The country also has some vast reserves on high quality coal making it the fifth largest exporter of coal. Besides the mentioned natural resources Colombia also has gold,

**Exhibit 1: GDP per Capita (US\$ PPP)**



Source: Economist Intelligence Unit (EIU) & UN Office on Drugs and Crime

silver, platinum and iron ore mines. Yet, the most surprising fact is that 75% of the world's emeralds come from Colombia. (OECD, 2013 & Ramirez and Porter, 2013)

The country's economic performance has since 2001 been anything but slow, especially when compared to the period of 1980 to 2000 (Exhibit 1). The acceleration started with the implementation of the Democratic Security Policy

initiated by then President Uribe. Colombia has ever since enjoyed an accelerated growth reflected in GDP per Capita (US\$ PPP) CAGR between 2001 and 2012 of 5.6% compared to a CAGR of 2.8% in the years between 1980 and 2000. Furthermore, the homicide rate dropped dramatically improving the safety situation in Colombia significantly. Today Colombia represents the fifth largest economy in Latin America with a GDP in 2012 of US\$365 billion, and probably will be taking soon over Venezuela that had in 2012 a GDP of US\$382 billion. Yet the country has been slow in driving labor productivity as a means to sustain and further accelerate economic growth. Between 1990 and 2011 Colombia's annualized labor productivity has only grown at 1.1%, below Brazil (1.4% growth) or the Latin American average of 1.7% growth. When compared to the OECD bottom 10 average of 2.9% the situation seems even direr. Yet, despite an annualized labor productivity growth rate significantly below the Latin American average and severe safety challenges Colombia has against all odds maintained its constitutional tradition and today is a stable democracy looking for sustainable economic growth. (OECD, 2013 & Economist Intelligence Unit (EIU), 2013)

## 1.2 Colombia's Competitiveness

A country's competitiveness depends to a large degree on improving microeconomic capabilities and the sophistication of local competition while the basics in terms of macroeconomic policies as well as social infrastructure and political institutions have to be in place and operating properly. In a nutshell, context only drives potential for economic growth but the microeconomic competitiveness level is the defining factor in order to achieve sustainable economic growth for prosperity. (Porter, 2008)

### 1.2.1 Macroeconomic Competitiveness

Colombia has since 2001 come a long way but there is room for improvement when evaluating the social infrastructure and political institutions that are in place today. Overall the country is considered, based on the human development index, a country with high human development and has since 2006 been able to gain 4

ranks. The life expectancy is with 75.2 years relatively high compared to the OECD average of 79.7 years. Literacy rate is 93.4% and the country invests more in education than the OECD average. 7.7% of GDP is invested yearly in education in Colombia (OECD 6.2%), but the challenge is the quality. The PISA study revealed that Colombia needs to especially focus on improving the quality of the math and science related education. Compared to the OECD average of 493 in reading, 496 in mathematics and 501 in science Colombia only achieved 381 in mathematics and 402 in science but did better in reading with 413. Driving innovation is also an area that requires attention as on a national level only 0.2% of GDP is invested in research and development while the OECD average is 2.4%. Also the patents registered per million inhabitants are with 3 extremely low compared to the OECD registration level of 455 patents per million inhabitants. *(OECD, 2013)*

Colombia has fared well with the monetary and physical policies of the past decade. Public debt as a percentage of GDP is with 40.9% in 2012 significantly ahead of the OECD average of 91.8% and slightly better than the South American average of 45.3%. And despite the healthy growth the country has experienced in the last decade inflation has since 2010 been somewhat closer to OECD levels than Latin American levels. Colombia registered in 2012 a consumer price index change of 3.2% while Brazil registered 5.4%. Foreign Direct Investments have been flowing at an unprecedented rate reaching with US\$16.3 billion an all-time high in 2012. The World Bank and the International Finance Corporation have also ranked the country the sixth best country globally based on the investor protection provided by a country's regulator environment. For example countries like Chile and Brazil are ranked 32<sup>nd</sup> and 82<sup>nd</sup> respectively. *(EIU, 2013)*

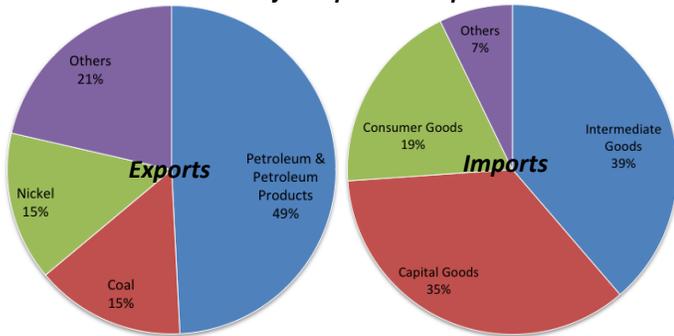
### 1.2.2 Microeconomic Competitiveness

The microeconomic competitiveness is per Porter defined as a combination of the national business environment (also know as diamond), the state of cluster development and the sophistication of company operations and strategy. *(Porter, 2008)*

Colombia's economy is very much a commodity driven and traditionally focused on leveraging existing endowments while to some extent neglecting modern industries. When evaluating imports and exports it becomes apparent that exports are purely commodity driven while imports are to a large degree with consumer goods and intermediate goods combined representing 58% driven by national consumption rather than manufacturing or other activities (Exhibit 2). Thus, it is not surprising that the major industries today are oil & gas, coal, agricultural products, jewelry, metal mining and tourism (Exhibit 3). The Software industry is with an estimated size of US\$75 million a very small but promising industry, as it does not rely on any of Colombia's endowments and is not limited by the more traditional challenges the country has with

transportation infrastructure for goods from the central highlands surrounded by the Andes to the ports at the two seas. (Fedesoft, 2011)

**Exhibit 2: Major Exports & Imports 2011**



Source: Economist Intelligence Unit

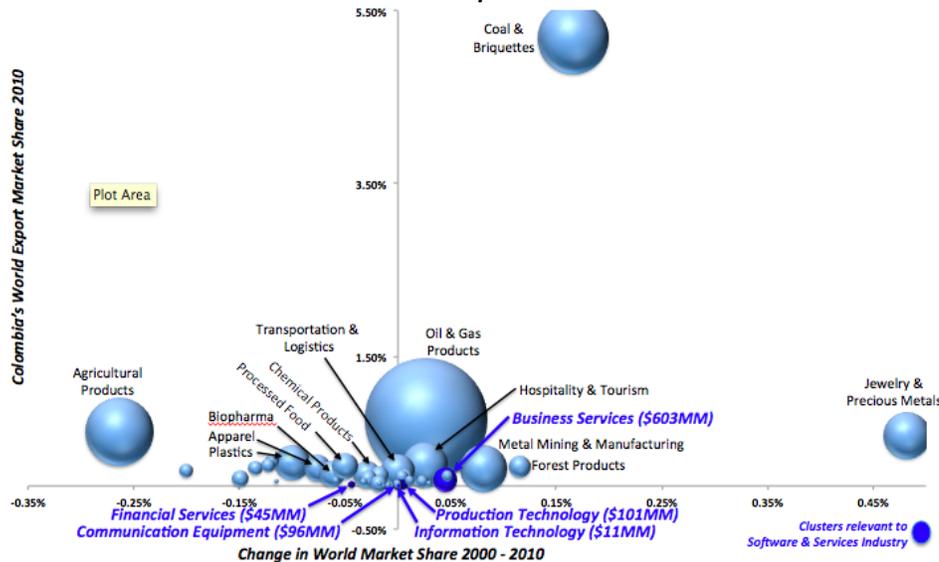
**Exhibit 3: Major Industries & Global Share 2010**

Industry	Size (\$MM)	Mkt. Share
Oil & Gas	\$16,518	0.77%
Coal & Briquettes	\$5,521	5.18%
Agricultural Products	\$5,072	0.62%
Jewelry & Precious Metals	\$2,342	0.58%
Metal Mining & Mnft.	\$2,306	0.20%
Hospitality & Tourism	\$2,168	0.25%
Software & Services	\$55	< 0.01%

Source: Institute for Strategy & Competitiveness

Further evaluating the state of cluster development and its evolution over time (Exhibit 4) reinforces how endowment and natural resource dependent Colombia is. The country’s export cluster portfolio is dominated by natural resource based industries leveraging existing endowments and a low skilled labor force. The only cluster that has actually grown its market share since 2000 starting from a relatively large base of 5.18% global share is Coal and Briquettes. All the other clusters have a relatively small global share below 1% and with the exception of Oil & Gas, Jewelry, Metal Mining, Forest Products, Hospitality and Business Services have actually lost market share in the period from 2000 to 2010 (Institute for Strategy & Competitiveness (ISC), 2012). The fact that there are so many small and poorly developed clusters indicates that the state of cluster development is in its infancy.

**Exhibit 4: Colombia’s Export Cluster 2000 - 2010**



Source: Institute for Strategy & Competitiveness

Colombia’s business environment has significantly improved over the last decade while clearly identified areas for improvements are to be addressed in order to further drive competitiveness. The Institute for Strategy and Competitiveness at Harvard University has ranked Colombia 52<sup>nd</sup> among 71 countries on the quality of it’s business

environment in it's annual Global Competitiveness Index. The quality of the business environment is evaluated based on four elements: (1) factor input conditions, (2) context for firm strategy and rivalry, (3) related and supporting industries, and (4) demand conditions (Exhibit 5). (ISC, 2012)

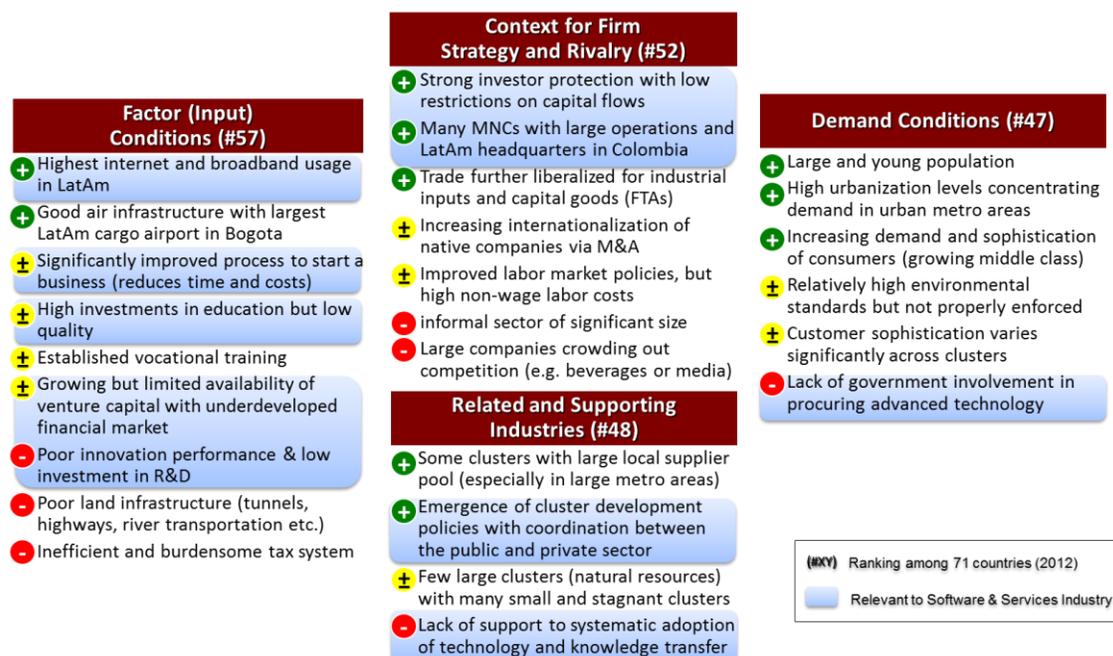
The factor input conditions in Colombia have improved and continue to do so with others being on a neutral stand, meaning that with some focus and investment they could be turned into positive factor conditions. The most prominent two that actually would reinforce each other are to further accelerate and reduce the process required to register and open a business, which in turn would create a more favorable environment for venture capital to identify and make investments into early stage companies across the country. More specifically to the software cluster in Bogota the fact that Colombia has one of the highest Internet and broadband usages in Latin America is favorable.

The context for firm strategy and rivalry is somewhat more favorable than the factor input conditions. The fact that Colombia has such strong investor protection is a significant plus. This has certainly also supported and probably reinforced the fact that many multinational corporations choose to open Latin America wide headquarters in Colombia, more specifically Bogota. Yet, the informal sector is still of significant size and driven by non-favorable labor market policies and high non-wage related labor costs. The phenomenon that large national companies tend to crowd out smaller competitors to establish oligopolies is certainly another challenge that needs to be addressed.

In terms of related and supporting industries some clusters can rely on a large pool of local suppliers, especially in the large metro areas of Bogota, Medellin, Cali, Barranquilla, Bucaramanga and Cartagena. A significant improvement and step in the right direction is also the existence of cluster development policies across many different sectors and stakeholders, most importantly the private sector. Yet unfortunately many of the existing clusters do not have an established support system in place that would allow them to systematically adopt new technology across all suppliers and drive knowledge transfer to strengthen the overall cluster competitiveness.

Last but not least, the demand conditions are the most favorable aspect of the diamond. Colombia has a large and relatively young population that is concentrated in large urban centers. The consumers increasingly become more sophisticated and as such drive the development of a sophisticated demand. Multinational corporations bring their global standards to Colombia and hold their suppliers accountable against those standards forcing them to upgrade and provide more sophisticated products and services. Yet, the government is barely if not at all involved in driving this demand sophistication, especially in the area of technology and software. The lack of government involvement in procuring advanced technology makes it difficult for the cluster to self fund its development.

### Exhibit 5: Colombia's Business Environment (Diamond)



Source: author's own development based on Porter's diamond framework

## 2 Bogota's Competitiveness

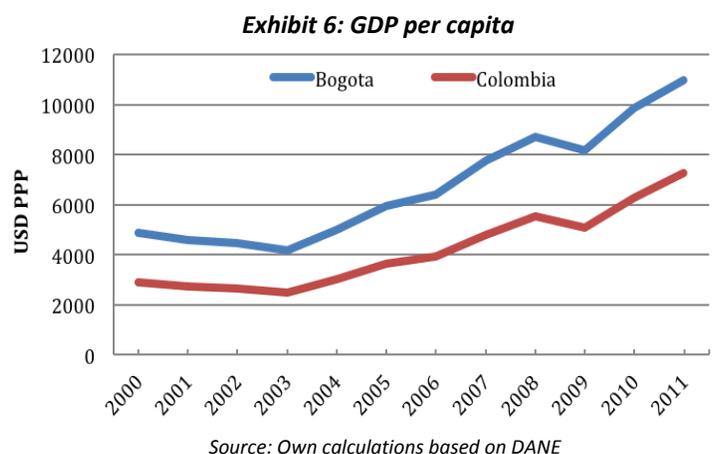
This section analyzes Bogota's competitiveness from two perspectives. Starting with the macro perspective, it takes a look at Bogota's endowments and social infrastructure and political institutions. Thereafter, the business environment will be analyzed in order to understand how the existing business environment drives or hinders the development of regional cluster strategies.

### 2.1 Macro perspective for competitiveness

The city of Bogota's strong endowments have laid the foundation for it to become the economic engine of Colombia. Bogota is located in the middle of Colombia at an altitude of 2,600 meters and thus relatively distant from the ports, however, it highly benefits from being the country's capital. Bogota is the political, social and economic center of Colombia. With a GDP of \$81,8bn Bogota represents 25% of the national GDP and is the strongest regional economy in the country (DANE, 2011). Bogota has experienced a rapid urbanization process. Bogota passed from an urbanization rate of 58% in 1964 (Rueda-García, 2003) to 98% in 2012 (DANE, 2012) and now is one of the most densely populated cities in the world (13.000 inhabitants per sq mile). Due to its dynamism, Bogota attracts people from all regions of Colombia. Bogota has a total population of 7.5 million inhabitants (16% of total Colombian population) and a large and relatively young work force of 3.8 million, which is largely between 14 and 44 years old (DANE, 2013). Bogota also benefits from relevant biodiversity and water resources for hydroelectric energy production.

Regarding the social infrastructure and political institutions, Bogota shows mixed results. Mayor Moreno, who was elected in 2008, ended a long-standing record of good public management. His mandate was defined by several corruption scandals that brought the Colombian Inspector General to suspend Moreno from his duties ahead of time. There were many irregularities related to multibillion contracts for public construction projects in Bogota. Despite these recent events Bogota performed above the national average when it comes to social and economic criteria. In 2011, Bogota's poverty rate was with 13% less than half the national average (Plan de Desarrollo Bogotá Humana, 2012). Primary education enrollment in Bogota was in 2011 higher than national average (93.7% vs. 87%) (World Bank, 2011). Additionally, Bogota had in 2012 the lowest homicides rate (16.7 vs. 31 nationally) (FORENSIS, 2013) of the last 30 years reaching a homicide level below that of the city of Washington D.C. (21.9) and on par to Miami (Cityrating.com, 2010).

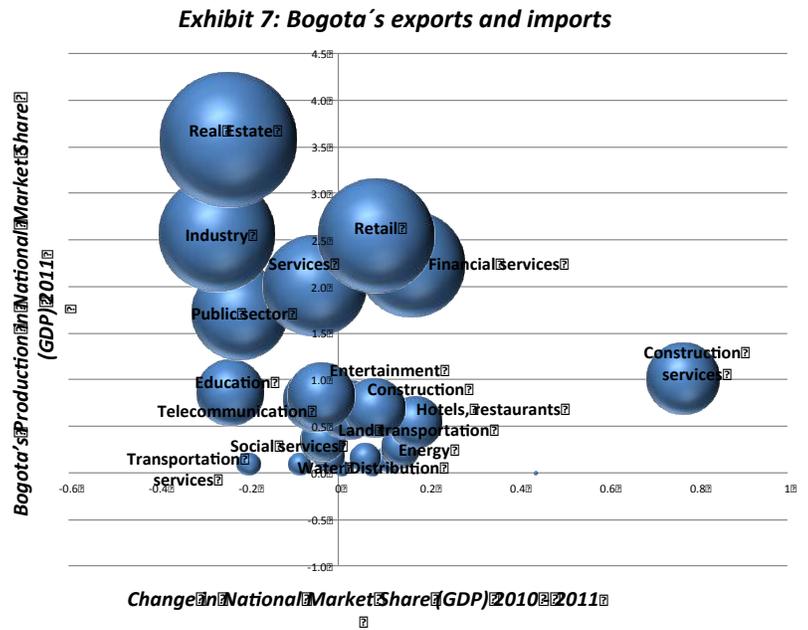
Bogota's GDP per capita growth has outperformed the national average in the last decade. In 2011, Bogota's GDP per capita was 34% higher than Colombia's (10,956 vs. 7,239) (Exhibit 6). Also, unemployment in Bogota has rapidly decreased in the last decade and since 2007 was below the national average. In 2011 Bogota's unemployment rate was 9.6% while Colombia's unemployment rate was 10.8% (DANE, 2012). Nevertheless, Bogota's economy over relies on its local and immediate demand. The large naturally existing demand and the distance to the ports has ill prepared companies to compete internationally and thus many companies have not ventured outside the boundaries of the country. Total imports have increased significantly from 12 billion in 2007 to 25 billion in 2012, while total exports have remained below 4 billion from 2007 to 2012 (Secretaría de Desarrollo Económico, 2012).



## 2.2 Micro perspective for competitiveness

Based on Bogota's existing industries, the Regional Commission for Competitiveness initiated a cluster strategy in 2008. Bogota's economy is dominated by services related activities. Services represent 82% of Bogota's GDP, Construction 6%, Manufacturing 12% and Agriculture and Mining 0.2%. Exhibit 7 evidences Bogota's GDP composition and shows services growing (right quadrant with Construction Services, Financial Services, Retail, Hotels and Restaurants). In 2008 the Regional Commission for Competitiveness launched the 2019 Competitiveness Plan prioritizing the clusters that the region should focus on. This strategy covers three

sectors: the agribusiness sector (including flowers, fruits etc.), the manufacturing sector (including textiles, publishing, plastics, etc.) and lastly the service sectors (including tourism, healthcare, ICT, etc.). Thus ICT has been selected as one of the clusters to be supported as part of Bogota's regional competitiveness strategy. However, from this list of products the only one that competes globally is Flowers, which represent 19% of Bogota's exports of US\$997 million annually (Ministerio de Comercio, Industria y Turismo, 2013). Followed by medical and chemical products that only represent 2.5% and 3.5% respectively and do not reach an export value of US\$200 million each (Ministerio de Comercio, Industria y Turismo, 2013).



In comparison to other Colombian regions, Bogota's cluster strategy benefits from the most favorable business environment in the country evidenced by its strong regional economy. However, based on Porter's four aspects of the business environment analysis (also known as the diamond), opportunities for improvements can be identified (Exhibit 8). Starting with factor conditions, Bogota has good air infrastructure and connectivity due to its renovated El Dorado International airport, which is the largest cargo hub in Latin America. Moreover, Bogota as the capital of Colombia has good administrative infrastructure including the largest national public offices such as the Presidential Office and Ministries. Bogota concentrates the best national universities, yet lack of relevance and quality of the tertiary education is a challenge. Concerning the financial services, Bogota holds a sound financial system but with limited accessed to risk capital through VCs or funding for small and medium sized enterprises. Given that the software cluster in Bogota is comprised of mainly small enterprises this is especially troublesome for the cluster. An other aspect is that on average 30% of labor time in Bogota is wasted in transportation due to high congestion capping productivity levels (ADB-CAF, 2013).

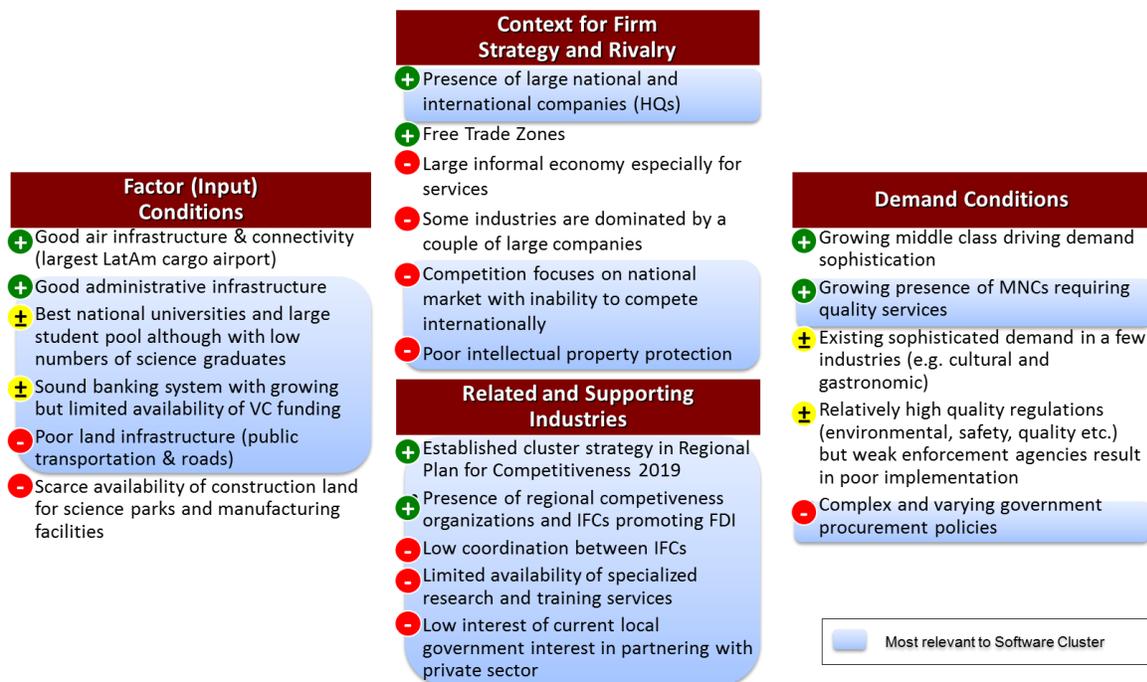
The picture on Context for Firm Strategy and Rivalry is similarly mixed. Many national and multinational companies have chosen to locate their national as well as Latin American headquarters in Bogota providing for a relatively high level of rivalry. Also, the existence of five Free Trade Zones (FTZ) in Bogota and 19 in the surrounding municipalities open the opportunity to companies to benefit from custom duty free materials and equipment for manufacturing activities in the FTZ. However, several factors restrain competition in Bogota.

The informal economy is still large and some industries are dominated by a handful of companies. Regarding the ICT cluster, the poor intellectual property protection stifles innovation and fosters a widespread piracy. This is a crucial aspect as the companies in the software sector are primarily based on intangible assets.

Bogota's Demand Conditions can be considered the most developed of the four aspects of the business environment. The region has an existing sophisticated demand driven by the presence of MNC's and large national companies as well as by the growing middle class. On of the weak spots is the lack of sophisticated demand from the government. Complex procurement regulation continues to limit the government to buy products and services at the highest standards.

Lastly Related and Supporting Industries have been fairing relatively well. Bogota has the advantage of having an organizational structure for competitiveness (Regional Commission for Competitiveness) and numerous Institutions for Collaboration (IFCs) like Invest in Bogota, Bogota Chamber of Commerce, Private Competitiveness Council, ANDI (National Business Association) and ANALDEX (Foreign Trade Association). However, the coordination between IFC's could be improved. For example, it is important to further strengthen the Regional Commission for Competitiveness, which integrates the most important IFC's in the region and the public sector.

**Exhibit 8: Bogota's Business Environment (Diamond)**



Source: author's own development based on Porter's diamond framework

In conclusion Bogota's business environment is one of the most favorable in the country, yet big challenges such as the quality of tertiary education and transportation infrastructure remain. Regarding the tertiary education, Bogota has the best universities of the country but lacks strong ties to the private sector to drive increased R&D and relevant course design. Bogota has the largest university graduate pool in the country but R&D capabilities are underdeveloped, as evidenced by the per capita web of sciences publications from 2000-2011 being lower than Venezuela, Mexico and Argentina (OECD, IBRD and World Bank, 2013)). PhD programs are almost nonexistent when comparing its rate of 0.34 per 100k inhabitants in Colombia with peers like Chile (2.28), Argentina (2.32) and Mexico (2.43) (OECD, IBRD and World Bank, 2013). Therefore, there is a gap between the needs of companies and the graduating students and the workforce in general that needs to be closed. This is a very relevant problem for the software cluster in Bogota, as they rely on highly trained graduates to drive product development. Today 50% of firms report an inadequately educated workforce as a very severe or major obstacle for growth (OCDE, 2013).

Finally, transportation has become one of the most challenging aspects for competitiveness in Bogota. Although this problem only affects the software cluster indirectly it is a big challenge for the whole economy. The numbers of vehicles circulating per kilometer have doubled from 2006 to 2010 resulting in Bogota having one of the lowest roads per vehicle ratios in Latin America. Additionally, today half the roads in the city require repairs worth \$6.8 billion (OCDE, 2013); resulting in an average commute of 72 minutes in 2010 (Alcaldia de Bogota, 2011).

### 3 Global Software Industry

In this section the global and regional business context for Bogota's software cluster shall be described by looking at global trends and market performance. In a second step several countries and regions competing with Bogota's software cluster shall be examined before identifying the main characteristics of the Colombian software industry.

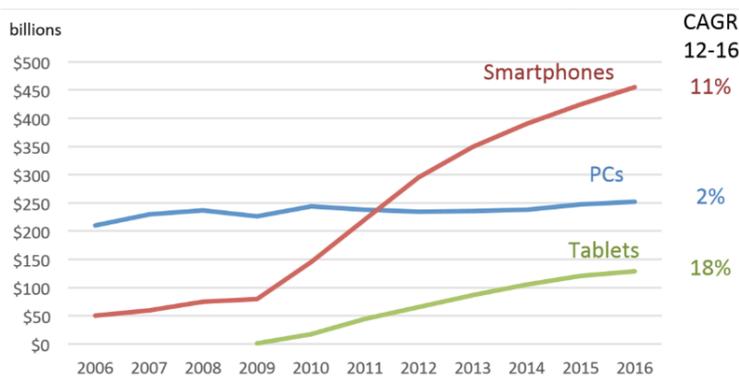
#### 3.1 Global Software Industry Structure & Trends

In the last few years, the ICT industry has been undergoing a radical transformation. Based on an ever-increasing Internet access globally, vast new segments of the world population are joining the global internet community each year, with an expected 5 billion people joining in the next 5 years (Schmidt, Cohen, 2013). Since 2005, Facebook, Twitter and others have shown the power of social networking as a means to engage

ever-growing number of connected users, going beyond connecting friends to allow the emergence and coordination of massive social movements across the globe.

More recently, the Internet landscape is being disrupted by the emergence of two key technologies: Mobile Devices and Cloud. First, the rise of smartphones and tablets as the main medium to access the Internet have changed the way people interact and communicate, producing radically new connectivity connection points that allow society to be permanently “connected”, demanding and consuming mobile apps with immediate response.

**Exhibit 9: Global Spending for PC, Smartphones and Tablet**



Source: IDC Blackbook Q4 2012. Constant currency.

As can be seen in Exhibit 9, smartphones outnumbered PC sales in 2012, and have become the dominant way to access the Internet (IDC Blackbook, Q4 2012). Tablets have disrupted the PC market as well, becoming a substitute for PCs in both casual and professional usage. Their impressive growth rates have only been recently surpassed by the emergence of mobile apps, software applications for mobile devices, which are expected to grow at an impressive 48% CAGR over the next years (IDC Mobile, 2012).

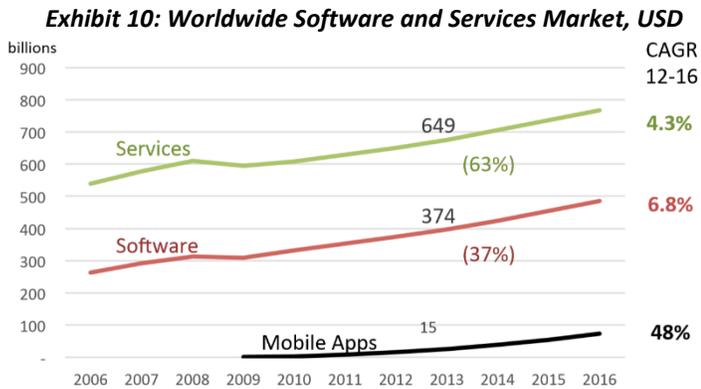
The second trend has to do with cloud-based applications and services. Experts predict they will dominate the software scene in the next few years, replacing many of the traditional off-line and on-premise local solutions at an ever-increasing rate. From IaaS (Infrastructure as a Service), to SaaS (Software as a Service) and others, the Cloud is changing how software is delivered to its users, both consumers and businesses, with important consequences. On one hand, it allows for multi-device integration, showing the same data and information to the user no matter which device (PC, smartphone, or tablet) is being used. On the other hand, Cloud has enabled a disruption in the software business model, converting it in many cases from a one-time up-front payment to a recurring subscription model. One of the key components of all Cloud applications is Cloud-based storage. The growth of cloud-based storage is accelerating rapidly since 2008, and the trend suggests a rapid growth of more than 28% CAGR in the next few years (IDC Cloud Storage, 2012).

The global ICT (information and Communication Technology) industry can be subdivided into:

- Software: packaged applications for consumer, B2B, etc.
- Services: consulting, implementation, systems integration, etc.
- Hardware: PCs, smartphones, tablets, etc.

- Communications: hardware and software used to provide communication services.

The IT (Information Technology) industry includes Software, Services and Hardware. In this project we will focus on the Software and Services categories within ICT. (IDC Software Taxonomy, 2012; IDC Services Taxonomy, 2013 and Forrester Tech Outlook, 2013)



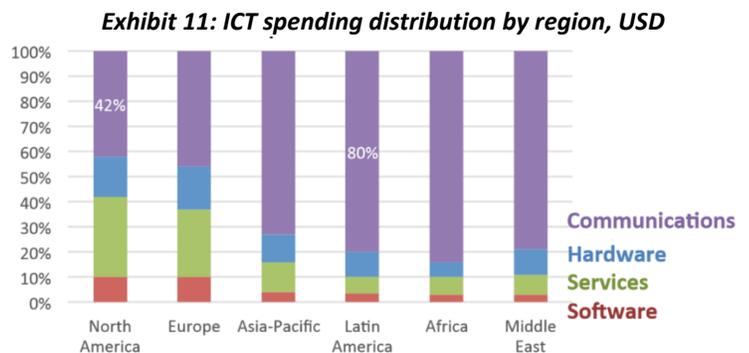
Source: IDC Software Forecast 2012-2016, IDC Services Forecast 2012-2016

The global software ICT industry is a \$3,300 billion per year industry and is growing at 5.3% CAGR, vastly surpassing the growth of worldwide GDP. Software and Services correspond to almost one third of the total ICT industry, amounting to \$1,023 billion per year globally in 2012, corresponding approximately 63% to Services at \$649 billion and 37% to Software at \$374 billion (IDC Software

Forecast, 2012; IDC Services Forecast, 2012). As can be seen in Exhibit 10, both Software and Services are growing at 4.6% and 6.4% rates per year. As has been mentioned, many of the Software and Services being offered will be increasingly in the mobile and cloud-based segments.

### 3.2 Regional Industry Performance

When comparing ICT spending in different regions of the world, the smaller and less developed ICT markets like Latin America still devote almost 80% of their spend in the Communications segment. In contrast, larger, more advanced ICT markets like North America and Europe funnel much less towards Communications and devote almost 40% of their spending in Software and Services (UNCTAD, 2012). The reasons could be varied - from still growing needs in communications infrastructure in developing markets to deficient enforcement of software license rights.



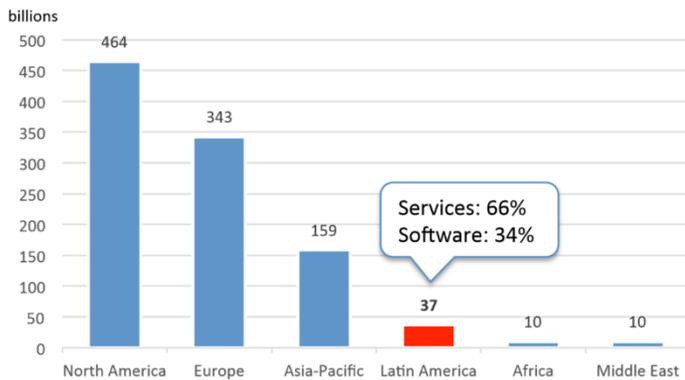
Source: UNCTAD, 2012

However, if market spending leaders can be used as models, it is to be expected from markets like Latin America to start spending much more in Software and Services in the coming years.

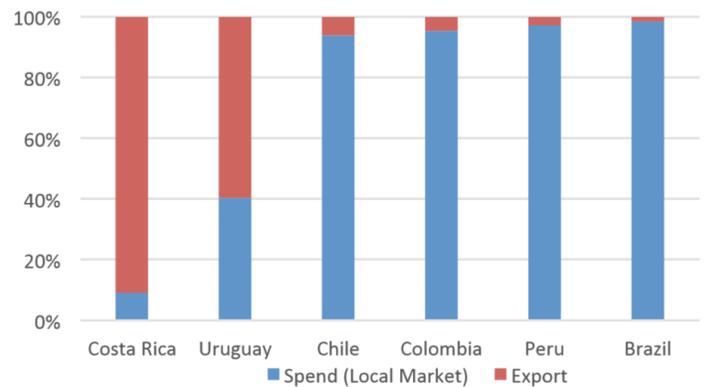
Diving into the Software and Services segments, North America still accounts for the biggest share of the 1,023 billion worldwide market at \$464 billion, followed by Europe and Asia (Exhibit 11). Latin America is still a small

component of Software and Services, with a \$37 billion or 3.6% of the worldwide Software and Services market. It is split in a similar 2:1 ratio for Services and Software, respectively. (UNCTAD, 2012)

**Exhibit 12: Colombian Software and Services Performance, USD**



**Exhibit 13: Software and Services Exports vs. Local Market**



Source: UNCTAD, 2012; IDC Software/Services Forecast 2012-2016; Own analysis

Source: UNCTAD, 2012

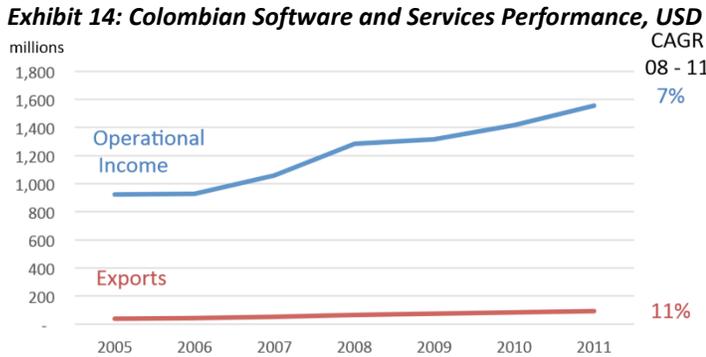
Within the \$37 billion Latin American market, Brazil is clearly the largest player, contributing \$12 billion of the total spend. Colombia was in 2009 the 5<sup>th</sup> largest market with \$1.2 billion. (FEDESOFTE, 2011) However, most Latin American countries are extremely inward-looking: the ratio of exports to local market spend is minimal for most countries, including Brazil, Colombia, Perú and Chile. The most important exceptions are the export leaders of Latin America, Costa Rica with an impressive 9x exports to local market spend (Exhibit 13), and Uruguay, with 1.5x exports to local market. (UNCTAD, 2012)

The software and services clusters in San Jose (Costa Rica) and Montevideo (Uruguay) are thus currently the biggest competition to the Bogota software cluster in terms of exports. Costa Rica is truly a world player in terms software exports as percentage of GDP, being third worldwide with software exports representing 3.6% of GDP, only behind Ireland at 15.5% and Israel at 3.6% of GDP (UNCTAD, 2012). Brazil, with its most concentrated IT cluster in Sao Paulo, is a potential short-term threat, especially if it succeeds in its recent effort to transform its large software sector from inward-looking to become an export leader.

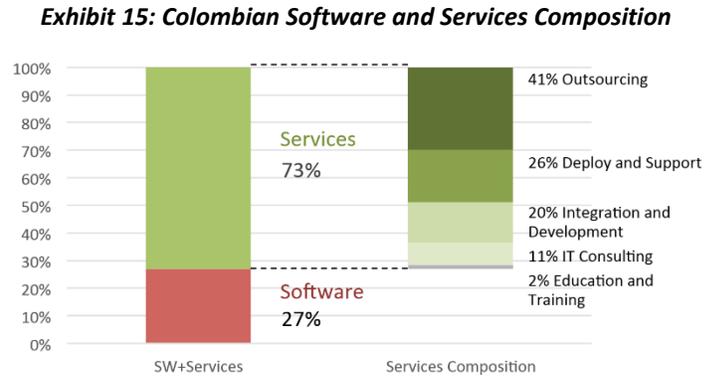
Within Colombia, the main geographic zones with potential to become thriving software clusters besides Bogota are Medellin, the Coffee Triangle and Santander. In particular, Medellin has already undertaking firm steps in terms of fostering innovation and entrepreneurship with the establishment of *Ruta N*, an initiative that uses recently-built, modern physical infrastructure to pioneer in Colombia a combination of shared spaces for start-ups, accelerator, VC funding and cluster coordination mechanisms. Medellin, with *Ruta N*, represents a best practice case in Colombia in terms of fostering a flourishing high-growth start up environment (Echeverri, 2013).

### 3.3 Colombia's Software Industry

Colombia's software industry is characterized primarily by the fact that it is significantly composed of micro-enterprises, focusing on the local market, and having a very weak export performance. More than 93% of Colombia's 6,524 software companies are micro-enterprises, with a reported asset base of less than US\$55,000 (FEDESOT, 2011). As of 2009, the industry is estimated to have generated \$1.2 billion in revenues, with operational income growing at an estimated 7% CAGR and exports slightly faster at 11% CAGR (FEDESOF, 2011). However, the export base is extremely low, at less than 5% of revenues (UNCTAD, 2012).



Source: FEDESOF 2011



Source: PROEXPORT 2013

The Colombian software industry is slightly more biased towards Services, at 73% of total revenues vs. Software with 27%, when compared with the global figures described previously (PROEXPORT, 2013). Employment in the cluster is estimated at 25,000 and growing at a 12% CAGR, reflecting a growth rate of employment proportional to revenue growth (FEDESOF, 2011).

## 4 Bogota Software Cluster

The Bogotá software cluster has a rich history, but has seen its most significant developments in recent years as the government and private sector have created IFCs, regulations and invested in infrastructure to grow the domestic demand for software products and services. Just last year efforts to create a formal structure of the software cluster in Bogotá have provided it with the best chance to overcome the challenges that remain in an industry that has the important task of modernizing the private and public sectors of Bogotá, the trendsetting and most productive city in Colombia. Therefore, efforts to position the cluster domestically must continue to be a significant part of the strategy, without overlooking its export potential. In this chapter we will discuss the cluster's history and evolution, explain the map of the cluster, analyze the value proposition and apply the diamond framework to highlight the key challenges that will be further addressed in the recommendations chapter.

## 4.1 Cluster History and Evolution

We can trace the history of the cluster to IBM's arrival to Colombia in 1937 under the name of "Watson Business Machines Co. of Colombia". But it was not until 1960 that Bavaria and Coltejer, a beer and a textile company respectively, bought and used the first IBM 650 computers that arrived in the country, mainly for administrative and accounting purposes. A few years later in 1966 and 1968 the National University (Colombia's largest public University) and the University of Los Andes (private University founded in 1948) offered systems engineering careers. (Cámara de Comercio de Bogotá, 2012 and Bitajor)

Microsoft arrived in 1993 and public and private efforts led to the creation of the National IT Council with Presidential involvement in 1997. 1999 was important for the software industry as the two existing industry associations merged into FEDESOFTEC. Also in 1999, Congress passed the Law 597, which regulates digital trade and retail, access and use of data messages and digital signatures, and establishes institutions for certification. In 2000 the national government created the "Connectivity Agenda", a policy to promote the mass use of digital technologies, and a year later the Presidential Program for ICT Development (Presidential Decree 127, 2001). There were also developments from the private sector through the creation of Alianza Sinertic, an association of companies in the ICT industry that offers practical training focused on skill development relevant to how to run a business, technical capabilities, human resource management, and advances in research and development (Alianza Sinertic, 2013). To support, promote and incentivize the mass use of applications by micro businesses and SMEs the national government launched the MiPyme Digital strategy in 2005, which currently provides funds through Bancoldex for companies to buy and implement software solutions that will increase their productivity (Ministerio de las Tecnologías de la Información y Comunicaciones). MiPyme Digital also organizes an annual expo in Bogotá to introduce micro, small and medium enterprises to digital technologies and applications.

2006 was an important year for the software cluster due to the approval of Law 1032 against piracy. Effective implementation of regulations has created a favorable environment for software in Colombia, turning it into the country with a piracy rate of 54%, the lowest in Latin America (Revista Dinero, 2011). These measures and the government's interest in the ICT sector prompted further responses from the private sector. ESICenter Sinertic Andino was created in 2007 as a non-for-profit, providing the cluster with the international network of ESICenters, with the objective of strengthening IT companies in Colombia by providing access to best practices and research and development (ESICENTER SinerTIC). 2007 also saw the birth of ParqueSoft Bogotá, a private initiative to provide entrepreneurs with a physical space to incubate their projects, and an organization that serves as a technology integrator between the public and private sectors (ParqueSoft Bogotá).

In 2008 the Colombian government developed the National Policy for Competitiveness and Productivity, the Program of Productivity Transformation (Programa de Transformación Productiva - PTP), the National ICT Plan, and strengthened the MiPymes Digital strategy. These initiatives were complemented in 2009 with Law 1341, which created the national framework for the formulation of public policies that regulate the ICT sector. A year later the government introduced the Vive Digital program into the four-year National Development Plan with the aim of increasing Internet connectivity to 700 out of 1100 municipalities, 50% of micro businesses and SMEs, and 50% of homes (Ministerio de las Tecnologías de la Información y Comunicaciones). As a part of this strategy the government developed apps.co, as a way for the government to create business opportunities for software developers through government driven demand.

In 2012 Bogotá's Chamber of Commerce began developing a comprehensive strategy around the software cluster in the city by taking full advantage of the more than 2500 software companies located there (representing 70% of the national software companies) creating a formalized framework that could work to upgrade the cluster and increase the productivity of those involved in it (ADB-CAF, Universidad de Los Andes). For this task the Chamber of Commerce hired an international consultant and commissioned a competitiveness study of Bogotá funded by the Corporación Andina de Fomento – CAF (Development Bank of Latin America) and executed by Center for Strategy and Competitiveness at Los Andes University. In order to introduce a more dynamic development of the software cluster the Chamber of Commerce has convened companies, providers, public and private organizations, academia and research institutions and entities that demand the products (Cámara de Comercio de Bogotá, 2012).

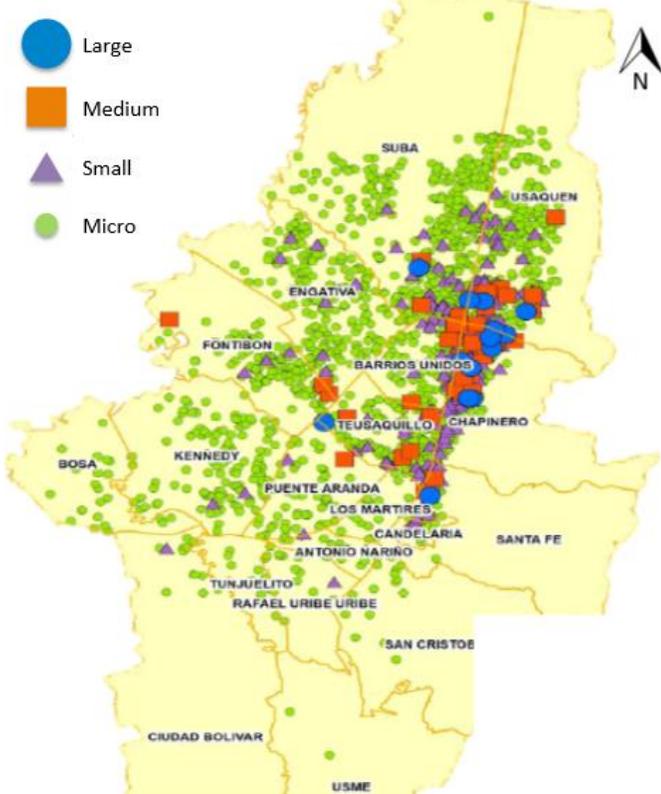
## 4.2 Current State of the Bogota Software Cluster

Bogotá's software cluster concentrates 81% of Colombia's software revenues. (Fedesoft and team calculations, 2013). As it happens at the national level, micro-enterprises are a prevalent characteristic of the Bogota software cluster. From the 2,852 companies registered in Bogota, a staggering 84% are micro-enterprises.<sup>1</sup> The weakness of these fragmented, small companies is illustrated by the fact that this 81% of micro-enterprises capture only 6% of total software revenues. (Bogota Chamber of Commerce, 2013). Only 17 software companies in Bogota are large firms, and they concentrate the vast majority of the revenues. It is important to note that, the 2,852 number corresponds to *registered* companies, but not necessarily operating companies. Recent manual survey efforts point to the actual number being closer to approximately 800 companies actually in operation. (Chamber of Commerce of Bogota and Fedesoft, 2013) The companies are concentrated on the city's North, as can be seen in the diagram below. (Bogota Chamber of Commerce, 2013).

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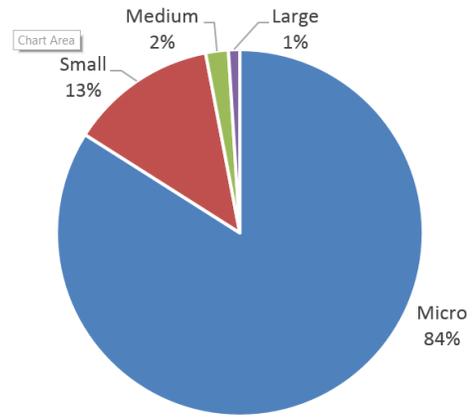
<sup>1</sup> Microenterprises are defined as having less than 10 employees and reported assets of less than \$148,000. Large enterprises are defined as having more than 200 employees and

**Exhibit 16: Geographic location of cluster companies in Bogota**



Source: FEDESOF, 2011

**Exhibit 17: Number of companies by size in Bogota**



Source: PROEXPORT, 2013

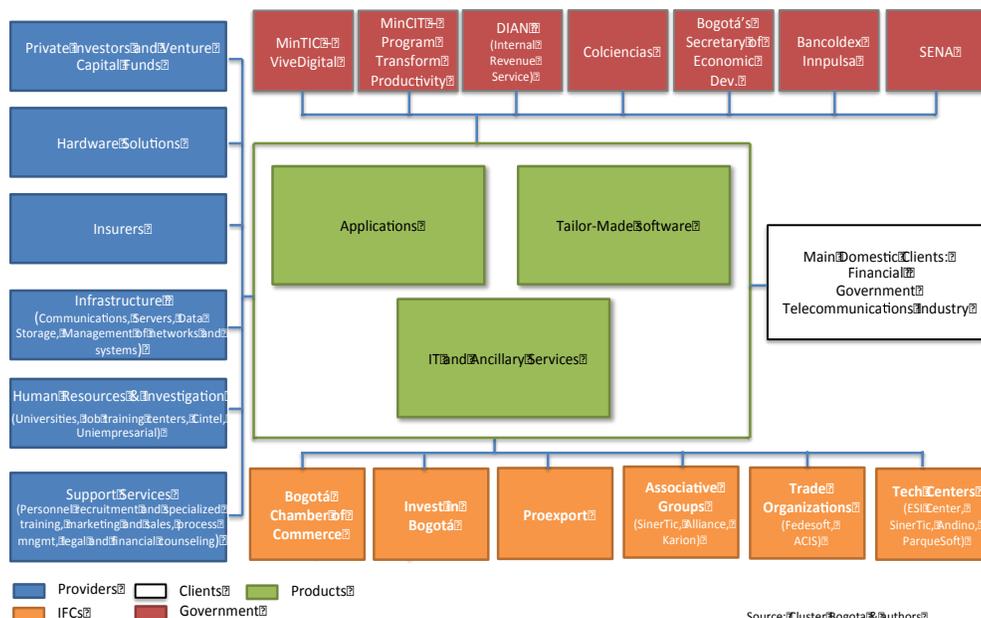
**Exhibit 18: Total revenues by company size in Bogota**



Source: PROEXPORT, 2013

The Bogotá Software Cluster Map (Exhibit 19) shows the three types of companies in the cluster (green): those that build applications for companies, people and for entertainment, those that generate custom-made software for the user, and finally those that provide IT ancillary services (Bogota Chamber of Commerce, 2012).

**Exhibit 19: Bogotá Software Cluster Map**



Source: Cluster Bogotá authors

The blue boxes represent the providers for software companies, such as hardware and infrastructure solutions, insurers, private investors and venture capital funds, support services, and training institutions. Government institutions are highlighted in red. They include two ministries, the internal revenue services of Colombia, the national science and technology institute, the national vocational training entity, the government institution for entrepreneurship and a public bank for business development and exports.

The cluster's IFCs are in orange and include organizations that promote FDI and exports, trade organizations that lobby the government and technology centers where entrepreneurs can incubate their businesses, get training and tap into wider networks to learn about best practices. And in grey the map shows the main clients for the cluster, companies in the financial sector, the government and the telecommunications industry. The importance of the Bogotá software cluster is related to the fact that the city has been the center of government, business, entrepreneurship, home to corporate, non-profit and IFCs' head quarters, and one of the primary drivers of the Colombian economy. The city is important because it is the trendsetter in Colombia as the center of policy and business decision-making. Therefore, Bogotá is where the software cluster can make an impact that will have a significant positive impact beyond Bogota and across the entire country to drive overall productivity, resulting in economic growth and rising standards of living.

In terms of domestic demand Bogotá already generates 27% of Colombia's GDP, with more than 200,000 companies, out of which 98% are micro and SMEs (Universidad Santo Tomás, 2006) and the majority of them represent a medium-low demand for software and related products (ADB-CAF & Universidad de Los Andes, 2013). For Colombia's competitiveness it is critical that micro businesses and SMEs increase their sophistication through the implementation of software solutions, and the Bogotá software cluster can play a significant role because software is a "cross-cutting technology with multiplier effects on other industries" (UNCTAD, 2012) and has the potential of increasing the overall productivity of firms, governments, IFCs and locations. For Bogota's access to international markets and exports the software cluster is also important. Bogotá is about 1000 kilometers from the ports of Cartagena and Barranquilla on the Caribbean Coast and 500 kilometers from the Port of Buenaventura on the Pacific, which given the magnitude of the Andean mountains means high transportation costs. Software does not need to travel by road so this is a product for which Bogota's geographic location holds less export barriers.

### 4.3 Value Proposition

Bogota's software cluster is not specialized in specific products and does not have a value proposition that allows the cluster to compete in the international arena with a clear and differentiated positioning. The Chamber of Commerce of Bogota, together with different actors such as private firms, the Ministry of

Information Technology and Communications, the Ministry of Industry, Trade and Commerce, academia and industry associations, has been working on identifying a possible positioning for the software cluster of Bogota. It has spent considerable effort on identifying the most valuable opportunities in order to build a strong value proposition for the cluster in the future (Chamber of Commerce of Bogota, 2013).

Thus far, the main characteristics that have been highlighted by the working group mainly comprised of public entities as unique factors are: high concentration of firms (70% of Colombia's software firms); leverages central and local government policies; located near the concentration of best educational institutions in the country; access to quality human capital concentration and dynamism of IFC's and government agencies; connectivity and logistics; same time zone as US and Mexico; diversified domestic economy (Chamber of Commerce of Bogota, 2013).

Taking into consideration these factors, the world trends, the possible future demand of the industry, the competition analysis and the strengths and limitations of Bogota's software cluster the working group has proposed the following elements for a the cluster's value proposition (Chamber of Commerce of Bogota, 2013):

- Regional focus: develop leadership in Andean region and Central America
- Product focus: specialize on industry specific business solutions
- Growth Opportunities: mobile applications, cloud based added value services, verticalization of services and regional leader in technological surveillance
- Cluster Consolidation: industrialization of software industry and articulate initiatives from government, academia and private sector
- R&D and marketing: development of specialized R&D and strong commercial training

While we agree with some of the conclusions and suggestions made by different stakeholders, we believe that the software cluster of Bogota needs to take its future in its own hands. Today too many IFCs and government entities consult and decide on what the cluster and the companies in the cluster should focus on. A broad leadership and participation from the companies forming the software cluster is needed to develop a value proposition that truly matters for the cluster and sets it up for success. Government entities should focus on driving a sophisticated government demand and removing roadblocks such as time required to open a company, streamline and improve quality of software procurement policies of government entities and support the creation of a well functioning seed capital market. The cluster's positioning should evolve over time based on demand conditions evaluated by the private sector and not based on what IFCs and

government entities believe to be the best solution. It must be an emergent strategy development process, rather than top down.

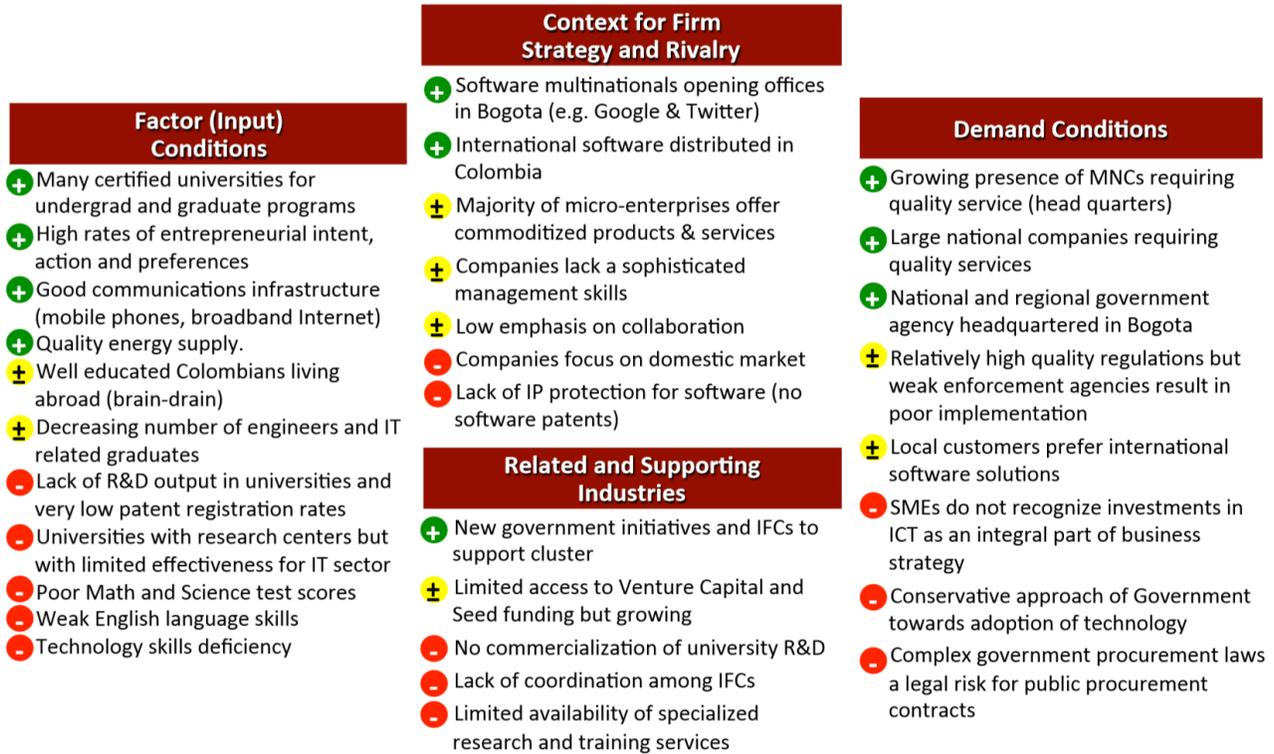
Based on our own analysis taking national and international trends and potential future demand into consideration we have identified three market segments that could potentially be a point of differentiation for the cluster in Bogota:

- Mobile apps for the Spanish speaking world
- Industries with challenges unique to developing countries like Colombia (e.g. financial services solutions that work via mobile network, public utility management software that work based on old infrastructure, security and surveillance systems etc.)
- Complementary services to the BPO industry (e.g. back office support, database and client service management).

#### 4.4 Bogotá Software Cluster: Diamond Analysis

It is crucial to understand the business environment for the software cluster in order to identify both the strengths and weaknesses that influence the development of a strong cluster. Green dots with a plus sign indicate strengths of the business environment that cluster participants must continue to build on. Yellow dots with a plus and a minus sign represent those areas where the government, IFCs and the private sector can work to improve. In some cases these may be short-term wins or low hanging fruits that could have a significant impact on the initiative to formalize a strong cluster. Finally, red dots with a minus sign have been included to emphasize the aspects where most work needs to be done because they weaken the current position of the cluster and can prevent its further development (Exhibit 20).

**Exhibit 20 Bogota Software Cluster's Business Environment (Diamond)**



Source: author's own development based on Porter's diamond framework

Three factor conditions benefit the cluster's competitiveness. First, there are more than 200 universities and colleges in Bogotá with a high quality education, making them a magnet for the best students in the country. Second, undergraduate and graduate students show entrepreneurial intent, action and preferences, and the city offers them with opportunities for internships in numerous firms. Third, there is good quality infrastructure to support software development and use because energy supply is reliable, broadband Internet is available and antennae for smart and mobile phones operate without difficulties.

The factor conditions hindering the competitiveness of the cluster are: First, the fact that R&D output from universities with regards to software has been limited to the publishing of research papers rather than the development of software applications usable by consumers.<sup>2</sup> Second, weak English limits opportunities to tap into global networks of open source software and prevents the internationalization of firms. Thirdly, poor math and science skills become a disadvantage for an industry that relies heavily on human capital for its development, in light of other Latin American competitors like Costa Rica, Brazil and Uruguay that are investing heavily in improving the quality of education for the software industry.

<sup>2</sup> As an example here is a link to the System's Engineering web page of Los Andes University (an institution that we believe has the capacity to not just research but develop innovative software projects): <http://sistemas.uniandes.edu.co/main/publicaciones-academia>

To improve factor conditions the biggest focus should be placed on making sure that universities increase the output of software research and development. Thus generally significant improvements in math and science skills are necessary to compete globally. Learning a second language – preferably English – should be made a nation wide goal for secondary education. Lastly the cluster should focus on communicating and advertising the potential a career in software can have with the goal to motivate students in enrolling in systems engineering and related fields of study.

There are two positive aspects to highlight in CSR: that software multinationals are opening offices in Bogotá, as is the case with Google and Twitter's sales office. This creates role models, brings sophistication and, through training and shared experiences, upgrades the overall level of local developers. Additionally, international software is distributed in Colombia and by doing so local firms must innovate and improve, but can also understand why others are being successful. The negative aspects have to do with the lack of IP protection for software in Colombia, prompting locally developed software to remain outside of the market for investors and insurers. Also, the fact that companies are focused only in the local market limits their capacity to produce breakthrough software that can add value to the cluster.

The context for firm strategy and rivalry can be further enhanced if IP protection was guaranteed through a new legal regulations that allow developers to insure and grow their firms without worrying that their idea might be stolen; and by the expansion of exports to achieve higher revenues while simultaneously dealing and understanding a more sophisticated demand.

It has been very important for the cluster to have the support and interest of the national government, which evidently understands the importance of the IT sector (to the extent that the Ministry of Communications was renamed as Ministry of ICT). Another relevant point is that there are plenty of IFCs, both from the government and non-profits, working to make the firms in the cluster successful. However, there is a tension between some IFC's and government initiatives that work with the industry. As we witnessed during our research and interview process, there is an important challenge to coordinate all the programs they design and the services they provide, as well as an opportunity to enhance the leadership of the private in the process and work with the IFC's as support organizations, rather than leaders of the initiative.

Another unfortunately factor for the cluster, is that there is still no commercialization of the R&D being done by the universities that are part of it. Moreover, IFCs seem to prioritize the development of certain parts of the cluster, instead of creating a platform for the cluster as a whole. This creates missed opportunities to coordinate policies and interventions that might upgrade the cluster in a comprehensive manner. Lastly,

specialized research and training services are limited or are only available to a few companies or students, and are not generally open to the wider public.

Related and supporting industries like universities need to shift from research to development and commercialization of software solutions in order to improve the business environment. An additional challenge is to strengthen the collaboration between IFCs within the cluster, rather than having separate initiatives to lobby the government independently and, finally, it is critical in this respect to enhance the leadership of the private sector in cluster initiatives.

The competitiveness and productivity of the cluster will be driven by the growing presence of multinational and large national companies in Bogotá, that because of their level of sophistication require quality services from the cluster companies. Additionally, the central government is located in the city, and it has the ability of determining standards and best practices for other state and local governments throughout the country. Therefore, if a cluster firm can sell to the national government and its agencies it can most certainly provide solutions for other levels of government in Colombia.

However, there are three important problems that prevent a stronger business environment with regards to demand conditions. The first inconvenience is that more than 95% of all companies in Bogotá are micro enterprises or SMEs, with middle-low sophistication that believe that software is not a strategic investment for their firms. An important driver of demand and client for the cluster is the government, but unfortunately due to changing regulations public servants are very conservative with regards to the adoption of new software. In fact, just because of the careers they come from, public officials are not proficient or knowledgeable in terms of technology, which limits their ability to set trends beyond Colombia. Finally, the complexity of government procurement rules and regulations create a risky environment for public servants to innovate, incentivizing the conservative approach that leads to the default answer of “it has never been done that way” – that represents the opposite of innovation.

To create better demand conditions the key challenges involve reforming government procurement rules and regulations so governments at the national, regional and local levels can become drivers of demand. Another challenge to the demand could be addressed by educating micro companies and SMEs in the value of using software to increase productivity, as well as educating public officials on how to think about technology so the government can be a client that drives demand – as happens with other sectors.

## 5 Recommendations

After evaluating the competitiveness of Colombia and Bogota on a macro- and microeconomic level we deep dived into Bogota's software cluster. As a result the here presented recommendations have the objective of helping the software cluster to further develop and grow to its full potential to drive Bogota's and ultimately Colombia's economic competitiveness through increased productivity for the short and long term.

### 5.1 Factor Input Conditions

In order to take the quality of products developed by the Bogota software cluster to the next level and compete internationally, significant efforts in research and development and innovation are to be made. We believe that R&D centers that have the ambition to reach international standards are to be created in collaboration with academia and with a focus on innovation and research for product development and creating commercial value for the cluster (i.e. applied research).

Concerned by the decreasing number of system engineers and other related degrees that result in an ill trained workforce for the cluster, a strong push is required to make a career in software attractive to the incoming student population. It should be heavily promoted for what it is, a fast growing sector full of entrepreneurial opportunities that can become a strong engine of the local economy very fast. In order to also expand the potential target markets in the long term learning English should be incorporated in all school and university curriculums. This will take time to show its effects and as such English training for professionals needs to be established as it would expand the potential market reach of the cluster.

The poor level of training in math and sciences in schools is from a long-term perspective the most troubling problem as it limits the number of potentially capable engineers. This is a structural issue that needs to be addressed at the national and a local level. Moreover, the cluster should seek to influence university, technical and vocational program curriculums in order to align it to their needs. Coordinating the participation of business representatives in university boards would help to achieve this goal in the short term and will help to secure that the number of engineers that are graduating fulfill the immediate needs of the industry.

The poor access to financial resources is one of the limitations that both micro and medium sized software enterprises are facing as a major constraint for growth. We believe that the problem should be addressed at two levels. First, IFC's, government and the private sector should work together to create business plan competitions, incubators and special sources for funding for the software cluster. Second, the cluster should work together with the financial sector in order to explore financial schemes that can help the industry grow and are financially attractive as well. Some ideas are encouraging the establishment of further VC and seed

funding companies, build bridges with VC funds in the developed world, further promote the participation of angel investors, etc.

## 5.2 Context for Firm Strategy and Rivalry

In order to take advantage of the growing international demand for software solutions, Bogota's software cluster should prepare to compete internationally by establishing regular market benchmarking and research projects, improving and focusing its international marketing efforts in key markets such as the Andean Region, Central America and Mexico, and by training microenterprises in international sales strategies or open sales organizations in partnership with other enterprises.

It is of paramount importance that a top intellectual property management policy be put in place, as the current system is by any standards below international quality levels. While improved IP protection will not necessarily prevent piracy, it will allow addressing other challenges. For example, IP protection provides an inventor with the security that his invention will be protected and provides an asset against which funds can be borrowed, can be sold or used to develop a business based on it and eventually capitalize on the invention made. Another very important aspect is that it allows others to see what has been invented and thus motivates others to licence the invention and build new solutions based on it furthering the development of new solutions. The importance of being able to patent software innovations should not be underestimated.

Since most of the companies in the cluster are microenterprises started by engineers it is advisable to build a support system or include business relevant classes to provide the graduating engineers with a strong tool kit to successful start and grow their enterprises. Furthermore, building shared spaces where many start-ups can work in the same environment and establish "hackathons" and product ideation and development sessions would encourage skill transfer, prototype creation and coordination through a stronger network among cluster companies.

## 5.3 Related and Supporting Industries

IFC's and government are playing a key role in the development, institutionalization and leadership of the software cluster of Bogota by providing services, launching key initiatives and coordinating collaboration spaces and programs. Nevertheless, it is a top down approach and we see the opportunity to significantly increase the participation of the private sector in the leadership of the cluster, by bringing more companies to work in the initiative as well as by leveraging the knowledge of the market and the particular experiences that each firm has. We believe the private sector should be leading all efforts and the IFCs and government entities should be supporting rather than leading the efforts. A stronger involvement of the private entities could help

mobilize the cluster to unite and drive the development of a sound value proposition and its implementation thereafter.

Another recommendation that we have toward the work of the IFC's is to "lead by example" by raising the level of technology usage in their own institutions. We were surprised to find poor quality websites, and no access to communication technologies such as Skype in the IFCs. Also systematic data collection and issuing of cluster relevant reports would allow to establish a common understanding of the clusters state and needs, thus add significant value and motivate the companies to work closer with the IFCs. Furthermore, to increase spill-overs and technology transfers we propose to intensify the efforts to attract smart money: foreign direct investment from sophisticated companies around the world and from fast-growing software companies from emerging markets (India, Ireland and Israel) looking to expand to Latin America. Costa Rica is an example of how successful this strategy can be.

#### 5.4 Demand conditions

Government procurement policies, regulations and procedures should be simplified to promote efficiency and accountability. By lowering the barriers of entry for software companies the public sector demand can help foster innovation. Training sessions for public and private sector officials in charge of procurement of software, digital technologies and services should be stabled in order to increase the level of understanding and sophistication when it comes to buy software services. Another recommendation is to include a course on digital technology in the public sector at ESAP (Escuela Superior de Administración Pública) for public sector officials to understand the value and possible applications technology can have for government entities.

One of our concerns is that buyers express low credibility and reputation for Colombian software products, especially in the most sophisticated markets such as the US and Europe. We recommend adopting innovative methods for marketing and sales for software solutions, like mixing direct sales with online offerings of beta versions to increase demand and spread Colombian software.

Cluster companies should adopt, when possible, Free and Open-Source Software (FOSS) to tap into a wider network of developers worldwide, and potentially a broader client base. Government entities, IFCs and the cluster should work together to raise awareness on the importance of the adoption of international standards to upgrade software capabilities and to combine marketing efforts by participating in forums, fairs, international challenges, marketing campaigns and road shows to spread the word that the Bogota Software Cluster is here to stay and is capable of providing good quality software development services.

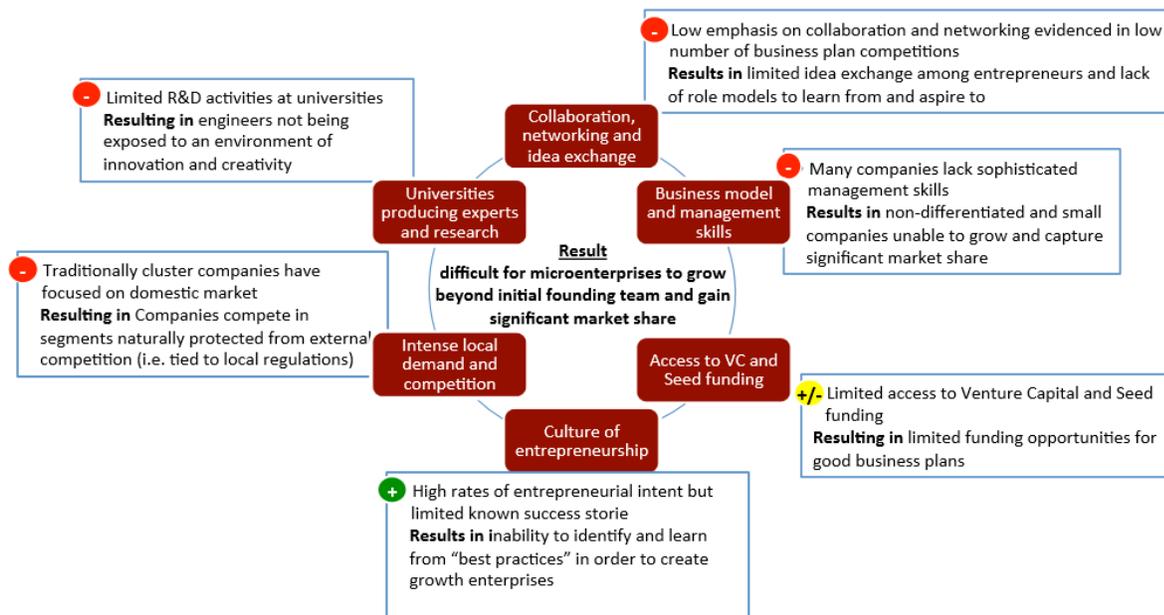
## 6 Conclusion

In conclusion, Bogota must provide an internally coherent and mutually-reinforcing set of conditions to foster the development of a buoyant software cluster, especially for high-growth start-ups. In other words, it must implement a *strategy* by offering simultaneously the elements illustrated in Exhibit 21. We propose a set of six main elements that are present in successful software clusters around the world, and that are pursued by new initiatives in cities that want to become tech players (e.g. New York). The elements are

- |   |  |
|---|--|
| 1) Collaboration                        | 2) Business model and management skills  |
| 3) Venture capital and seed funding     | 4) Culture of Entrepreneurship           |
| 5) Intense local demand and competition | 6) Universities providing training & R&D |

Today only the Culture of Entrepreneurship stands out as a positive element of the business environment in Bogota. Access to financial resources through VCs and other means has started to emerge, yet needs to be further developed to provide the support structure that traditionally VCs provide in developed markets such as the US. All the other elements are still in their infancy or not existent, thus all the energy of the IFCs, government entities, universities and the larger software players in Bogota's software cluster should be channeled to address the challenges identified here. Once this self-reinforcing cycle has started to function the software cluster will start to gain momentum and grow beyond everyone's expectation as starts across the country will choose to set up shop in Bogota given the positive business environment. Many challenges need to be tackled and much work is required to get to that point, and the competition is working on moving their software clusters forward (e.g. Brazil). Thus, the time to act is now.

**Exhibit 21: Environment for the creation of high-growth start-ups**



Source: author's own development based on Porter's diamond framework

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