

ICT Infrastructure in the Metal Mechanical SMEs of Quito and its Relationship with Business Management

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ABSTRACT

The central argument which supports this research is that Information and Communication Technologies (ICT) are not only a key element for economic and social development of towns, but also introduce new variables to the analysis of the effects of the exchange of information in the markets, such as those related to productivity and competitiveness. In addition, from a business perspective, small and medium-sized enterprises (SMEs) play a very important role in the development of any economy, mainly because of its impact on the generation of jobs and promoting economic growth. In this study of SMEs in the metal mechanical sector of Quito, capital of Ecuador, it determines the importance that this business group gives to ICT from three different areas but they are related. The first of these is focused on determining the importance that this type of SMEs gives to investments in ICT in the annual budget for management, the second relates to know what type of ICT infrastructure invests this type of SMEs in and in which productive activities they use them. Finally, the study analyzes how ICT can help this business group to face the challenges of increasing productivity and competitiveness in the domestic and international markets. By grouping these three components of the research, it will determine if there is evidence of the positive impact of ICT on the productivity of the companies.

Keywords: Information and communication technologies, infrastructure, investment, SMEs, budget, business.

1. INTRODUCTION

One of the parameters that measures the Global Competitiveness Index (GCI) is the ability of a country to use its resources and institutions to be more productive as reported by the GCI 2015-2016. Ecuador is located in the position 76 of 140 economies around the world, improved 10 posts by comparing data from three years ago, yet their indicators are still below the average for Latin America and the Caribbean [1]. It is for this reason that from the perspective of global competitiveness, the Ecuadorian industry has a very important role, particularly small and medium-sized enterprises (SMEs).

During the year 2013, the Information and Communication Technologies (ICT) sector generated 29 thousand jobs, and the work of its three thousand companies represented approximately 3.1% of the Gross Domestic Product (GDP). The subsectors in which they were involved are companies working in software, hardware, Internet provider and telecommunications companies [2].

In accordance with the Global Information Technology Report 2016, Ecuador ranks 82 out of 143 countries in the Networked Readiness Index (NRI), which is the indicator that measures the

propensity of countries to take advantage of the opportunities offered by information technologies and Communications (ICT) [3]. The evolution of the NRI for Ecuador in recent years has been as follows: in 2008 it ranked 116 out of 134 countries [4], by 2016, it was ranked 82 out of 139 countries [5]; That is to say, it increased 35 positions. Additionally, compared to the Latin American and Caribbean region, Ecuador is in ninth place above average.

Conforming to the Internal Revenue Service (SRI), SMEs represent a group of small and medium-sized enterprises, which according to their sales volume, social capital, number of workers and their level of production or assets, are characteristics of this type of economic institutions [2]. The economic activities, which Ecuadorian SMEs develop primarily are focused on the following:

- Wholesale and retail trade.
- Agriculture, forestry and fisheries.
- Manufacturing industries.
- Construction.
- Transportation, storage, and communications.
- Property and business services.
- Community, social and personal services.

In addition, conforming to the SRI, one of the characteristics of small and medium-sized companies, according to their income levels are divided in two subgroups.

- Small businesses: operating revenues of between USD 100,000 and USD 999,999.
- Medium-sized enterprises: operating revenues of between USD 1,000,000 to USD 5,000,000.

In line with the Ministry of Foreign Trade of Ecuador (2015), SMEs in Ecuador in similar proportions to the region of Latin America, represent nearly 99% of the number of companies, these occupy about 75 per cent of the economically active population, while contributing to the 25% of the non-oil GDP of the country; and contribute with the 11.11% of non-oil exports. [3].

As reported by INEC (2016), in the year 2014 the Ecuadorian companies invested in ICT close to US\$ 205 million, of that value only 14.4 % corresponds to the investment of small and medium-sized enterprises [4]. This value is greater than the 12.8% and 10% of the years 2013 and 2012 respectively, which shows that each year the investment in ICT has increased in SMEs in Ecuador.

SMEs are facing major challenges when their products go to the international markets, as reported by the Institute for the

Promotion and imports of Ecuador (Pro Ecuador). The infrastructure of the 20th century, high tariffs and an informational vacuum in international trade are the current obstacles to SMEs from various countries in the world, which is why it is important to strengthen. The participation of this business group in the international market, as it strengthens the diversification of products and services, and above all provides to SMEs access to technology [5].

2- SMEs IN THE METAL MECHANICAL SECTOR

Upon the metallurgical sector, Pro Ecuador in 2014 registered 400 companies in this sector; in the same year, the 90% of the annual production of this sector stayed in the country, and the rest was exported.

In addition, this industrial group represents 1.5% of the Gross Domestic Product of Ecuador, the weight of the Ecuadorian industry sector was 11.3% [6], and these data determine that the metalworking industry is the most important within the manufacturing sector.

Furthermore, the same source points that the operational costs of the metallurgical sector in 2014 were 10% lower than the average annual cost of the countries of the Andean region and to be a priority sector does not pay income tax during the first 5 years that generate income.

The main countries with exporting SMEs in the metalworking industry are Colombia, Peru and the United States. SMEs are distributed mainly in the provinces of Pichincha and Guayas, the most populated of Ecuador. In the first province, it is estimated that there are 43.29% and 40.46%, respectively.

1. ICT AND INDUSTRY

A central element of this study is the metal mechanics industry, with ICT as the protagonist, such as other technological tools are "general purpose technologies", which are characterized by its technological dynamism and its possibilities of application in a wide range of activities, particularly those related to the production of goods and services [7].

The use of ICT at an industry level is causing great changes, resulting in a better transfer of information between the companies and organizations linked to each other. These technologies are used primarily in large companies, because these have high amounts of capital to invest in new technological equipment and qualified staff; however currently SMEs are starting to use ICT as a tool to achieve their business goals.

According to Katz, there are four dimensions of the digital divide economic, one of them, the fourth refers to the differences in the adoption of ICT between large firms and SMEs. Considering that latter contribute on average 40% of the GDP of Latin American countries, the underinvestment in media is able to increase the productivity of the sector and ease their coordination with regional and global economies, so it will tend to impact on the economies of the region negatively [8].

Other important element to consider about the use of ICT at the enterprise level in Ecuador clearly is the intensive use of the Internet, especially in areas such as e-commerce. In consonance

with data of ICT Module of the surveys of manufacturing and mining, Domestic Trade and Services 2014, published by the National Institute of Statistics and Census (INEC), the 95.9% of the companies investigated in 2014 have had access to Internet, of which 17.1 % is participating in e-commerce.

In addition, in line with the same source 45.2% of surveyed enterprises invested in ICT in 2014, which is 9.5 percentage points higher than the percentage of companies registered in the 2013 [9].

As stated in the ICT Observatory of the Ministry of Telecommunications and Information Society (MINTEL) in 2014, year until which the information is updated by the INEC, 42.8% of the companies in Ecuador invested in ICT infrastructure. Being the Sector of the manufacturing industry to which SMEs belong, the second in investment between 2012 and 2014 [10], as shown in Fig. 1.

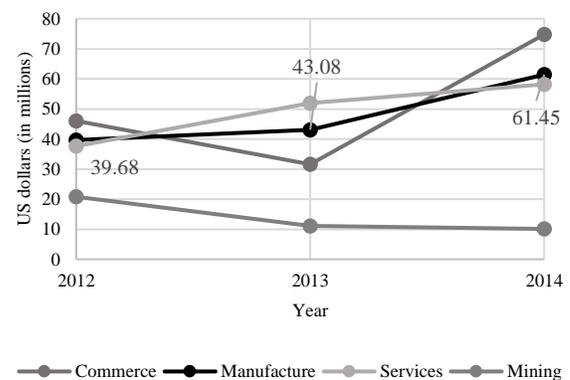


Figure 1. Investment in ICT.

In the Fig. 1, investment in the manufacturing industry grew from 39.68 to 61.45 million dollars; that is increase by 63% in the last three years in indicated period.

2. METHODOLOGY DESCRIPTION

The inductive method was selected for this study, since this uses the reasoning for the conclusions that derives from a hypothesis; using the concrete data to achieve a general conclusion. A descriptive research was developed, very adequate when selecting important characteristics to fulfil the proposed objective and detailed description in parts, categories, and classes; the use of this type of research is well known, since it is used in ungraduated and postgraduate work. [10] Said "Descriptive research is supported mainly in techniques such as survey, interview, observation and documentary review." In the present study, the survey used this method. The information was collected through the technique of the survey done personally and by telephone, and the respondents were the management personnel of SMEs in the metalworking sector of Quito. The survey consisted of a questionnaire with closed questions between dichotomous and multiple choice, facilitating an agile and specific response to the surveyed [11].

For the determination of the sample size, the population is chosen as the group of SMEs of the metallurgical sector, found

in the database of the Chamber of Small and Medium-sized Enterprises in Pichincha (CAPEIPI). In this Chamber, 254 companies are registered in a data base lastly updated in 2014, this database has been carried out a random sampling in where it has selected 15 companies for our research, a number that is consistent with the calculation of the size of the sample. It has been obtained through the use of the calculation formula for finite populations, that is to say, less than 100,000 people.

$$n = \frac{Z^2 \cdot N \cdot p \cdot q}{B^2(N - 1) + Z^2 \cdot p \cdot q} \quad \text{Eq. (1)}$$

Equivalences:

N = Population = 254 companies

Z = Confidence level ($Z=1,645$ for 90%)

n = Size of the sample

B = Margin for error (7% = 0.07)

p = Probability of event favorable (97%)

q = Probability of event non-favorable (3%)

$q = 1-p$

The values of p and q were obtained through a pilot test to 10 companies in the metal sector.

$$n = \frac{1,645^2 \cdot 254 \cdot 0,97 \cdot 0,03}{0,07^2(254 - 1) + 1,645^2 \cdot 0,97 \cdot 0,03}$$

$$n = \frac{20,00}{1,32}$$

$n = 15$ companies

The minimum sample size is 15 SMEs of the metallurgical sector, however, we surveyed of 23 SMEs randomly selected, which are located in the north, center and south of Quito.

The questionnaire used for the survey was divide into the following areas: ICT investment in SMEs, type of ICT infrastructure is most commonly used in the productive processes, and use of the Internet in business management. The data obtained from the surveys companies were selected are processed using statistical software, whose results are detailed in the remainder of the document.

3. ICT INVESTMENTS IN SMEs

As a point of departure was important to evidence, if SMEs of the metallurgical sector were aware of the benefits of ICTS in their business management, of the companies surveyed the 87% recognizes the important benefits offered by ICTS, while 13% do not know the usefulness of ICT in the company. Of that 13% of SMEs, the 8.70 percent stated that the use of ICT would be a distraction during working hours and the 4.30% that ICT would represent to them an increase of cost.

One of the requirements for investments in technology is fundamentally that there is Return On Investment (ROI), that is to say, there are benefits of the investments made. In fact, most companies take items selected for investment in ICT into account in their budgets, Of SMEs surveyed the 57% have financial capital to invest in ICTS, while a 43% do not consider it in their annual budgets.

To consult about the benefits perceived by SMEs of the metallurgical sector, the results were as follows: 76.9% of SMEs recognizes that investments in ICT enabled them to improve their production areas, for the 53.8% served to encourage the growth of productivity and 38.5% helped them to increase their financial capital.

The use of ICT also generates significant changes in business management, that is displayed when the 95% of the companies consulted said that. It improved its efficiency and productivity, 80% allowed him to communicate quickly, to 70% allowed it to reduce costs, the 70% increase their technical capacity, to 60% innovate existing products, 55% access to new markets and a 50% the creation of new products.

The investment in renewal and updating of ICT infrastructure is an important aspect to be considered in this study. So much that, the 30.4% of SMEs invest in renovations and update in a period of three months to a year, the 26.1% made it in a period that exceeds one year and the 43.5% of companies is only done when it is considered necessary.

In addition, it is important to know the items per year that are dedicated to investment in new ICT, 39.1% of SMEs invests a value less than US\$3.000; the 8.70% invests between US\$3.000 and US\$5.000, while the 8.7% invests values higher than US\$5.000. On the other hand, the 43.50% of companies do not have a budget to invest annually in ICT. As shown in fig. 2.

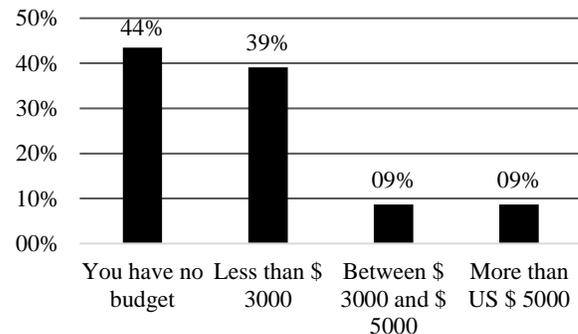


Figure 2. Budget used for ICT for one year.

It is important to analyze the reasons why companies do not invest in ICT, from the results obtained on the survey. Of the companies, which do not invest in ICT, 80% considers investment is not a priority and 20% that their cost is higher than their benefit.

The study suggests that if SMEs of the metallurgical sector would have budget to invest in ICT, they would do so in the following way: 90% would buy software, 40% would buy computer equipment and a 20% would get a better Internet Service.

Another important fact to consider is that SMEs in the metal-mechanic sector invest in ICT mainly for activities related to management and customer service, as seen in Tab. 1.

Table 1.
Use of ICT by department.

Departments of the company	Percentage
Management	100%
Customer Service	91.30%
Production	86.96%
Projects	78.26%
Logistics	60.87%
Human talent	56.52%
Maintenance	56.52%
Cellar	52.17%
QA	30.43%

4. ICT INFRASTRUCTURE IN SMEs

Of SMEs surveyed, 87% have computers for their administrative and production departments. On the other hand, 13% do not have computers. Of the number of computers available for each department or area of the Organization, indicate that a 45% of SMEs have a single computer by area, the 25% have two computers by area and 26% have more than two computers by area. The 13% of companies do not have computers in their areas of production.

One important aspect is to know what type of computer is used by SMEs in their business activities, the result of the survey shows that the 95.7% used desktop computers and the 73.9% used laptop computers. The latter are more used in management activities of the company.

Another important aspect was to study how long the workers of this type of business use computers in their daily day, the results were as follows: 78.30% uses more than 4 hours, the 8.6% employed up to four hours. At the other extreme, 13% of SMEs do not use computers during their working hours, whenever they consider that it is not necessary for the type of work they do. See Fig. 3.

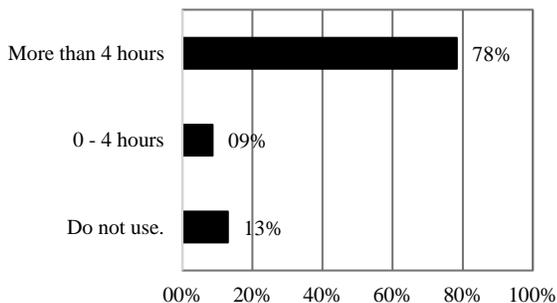


Figure 3. Daily use of the computer.

Sharing information is an important feature for all team work, and in order to achieve this goal it is currently used computer networking. Consulted SMEs said about either they have internal networks of computers or not that, the 69.6% have an internal network of communication and the remaining 30.4% do not have this media of communication.

5. ICT AND BUSINESS MANAGEMENT

From the study, 100 % SMEs of the metallurgical sector have access to the Internet, the 82.4% of companies' access via broadband, 70.6 per cent through wired or wireless access wi-fi and the 47.1% through cellular telephony. These results demonstrate compliance with the goal of 80% broadband connectivity for Ecuadorian SMEs proposed by the government of Ecuador in 2013 [17].

Another aspect to be considered in the study is to know the confidence that the companies in this business group have in Internet service providers, which are divided into public and private. The results were as follows: 52.2% has contracted the service from a public provider which is the National Telecommunications Corporation, the rest is divided among the private companies, as well: the 17.4% access through the companies Netlife and Claro, a 13% through the company Punto Net and the company Grupo TV Cable and the 8.7% through Panchonet, Telconet and Movistar.

The 73.9% of SMEs has web portal for its business management, while the remaining 26.1% does not have, as shown in Fig. 4. The benefits identified that companies obtained through their web portal are the following. For the 92.9% of SMEs It allows them to publicize their products and services to national and international clients, the 71.4% recognizes that the portal serves to manage the sales to their clients and to the 28.6% serves as a way of acquisition of raw material and inputs to suppliers.

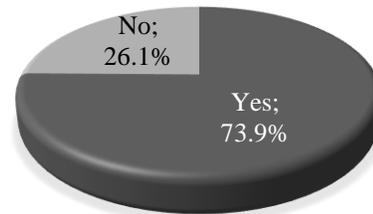


Figure 4. SMEs has web portal for its business.

To investigate the reasons why SMEs do not have a web page, the 21.8% said it is not required for their business, while the remaining 4.3% said that it is not recognized as an important benefit.

Among the uses that companies give to the Internet are the following: 45.1% of SMEs will use it for sending and receiving e-mail, the 37.3% to manage their web portals and the 17.6% in e-commerce activities.

Regard to the type of social networks that SMEs use in their business management, the results were as follows: 63% use WhatsApp in technological devices; the 25.9% use Facebook and 11.1% use Twitter.

6. RESULTS AND DISCUSSIONS

The manufacturing sector to which SMEs belong in the metalworking sector is the second sector that has invested more in ICT in the years 2012 - 2014, until you have updated data. This shows, it is a sector that contributes substantially to the use of ICT at an industrial level.

From the results of the study, we can say that most companies in the metal mechanical sector of Quito recognize important advantages of working with ICT. In fact, the intensive use of ICT has allowed them to improve their productivity and competitiveness. This group of companies plan annually their investments in ICT to face the new challenges of the market, although the use of them still represents an increase in their costs. On the other hand, there is still a small number of companies that are not aware of the benefits could bring them the use and access to ICT in their productive processes. Change this reality is a great challenge for government, industry, university and the whole of Ecuadorian society.

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