

Benefits of adoption of Cloud Computing in Mexico

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The objective of this paper is to show the benefits that can bring the implementation of cloud computing was the development sectors of the country , whether public and private , are entering a new evolution in computing era , in which installing the tools on your computer is no longer necessary , which seeks this new era of cloud computing is to exploit the information highway available to everyone on the Internet , with the correct use of the internet can have everything available , provide mobility and tools available at any time , there are many benefits that come from implementing cloud computing for both SMEs as well as the government sector in all aspects, from saving energy, infrastructure savings , reduced operating costs all these benefits can be reflected to open new jobs in small and medium enterprises which can support economic development. What this article is to open a panorama towards this new era of cloud computing and can be seen as an option to the use of a technology that forecasts agreements to bring enormous benefits for developing countries to implement this technology .

Evolution, Internet, Cloud Computing

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Introduction

Mexico is one of the emerging countries, OECD member which shows to our country as one of the most backward in the field of ICT according to a study by the INEG, until 2012 only 26% of the population has internet, this is caused by the low productivity that is generated in the country. Information technology can be an important development in Mexico and one of them is the cloud computing that can support a large extent to give impetus to the growth of enterprises, the creation of jobs.

Cloud computing is an opportunity that many countries are adopting and which has given excellent results helping economies to have savings in order to create job opportunities that can benefit the U.S. population. As an example U.S. with 50% of its services of IT in the cloud, Japan with 12% and Europe 29% have implemented this technology that will promote their development, there are other success stories such as Colombian with implementation of online assessment in its educational system⁷

Undoubtedly it is a good alternative to deploy it to Mexico and promote the development of the country since the technologies information have acquired a great economic importance to the country's growth. The potential of services of technology information in both large companies and SMEs is the highly demanded due to improving business productivity.

What is Cloud Computing?

Definition⁸

The cloud computing is defined as a way of obtaining computing services on demand, a crude example would be the water we use at home, which only is pay without the need to invest in pipe, that takes the water to home. It is able to minimize the time spent on lower-value activities and allow the staff working in areas of information technology, focus on strategic activities that have a real impact on the business processes of the organization

The use of this concept is spreading with considerable speed, resulting in an increase in the number of companies that provide services through this technology, as well as organizations that are seriously considering the adoption of cloud computing as an entirely viable alternative.

The cloud computing is a bit more complex than this simple principle and is described as follows

Services⁹

The cloud basically offers three services:

⁷ IMCO. (2012). Computo en la nube detonador de competitividad. Pag 17 from http://imco.org.mx/wp-content/uploads/2012/6/computo_en_la_nube_detonador_de_competitividad_doc.pdf

⁸ Francisco Carlos Martínez Godínez, B. V. G. G. Computo en la Nube Ventajas y Desventajas. 2014, from <http://revista.seguridad.unam.mx/numero-08/c%C3%B3mputo-en-nube-ventajas-y-desventajas>

⁹ IMCO. (2012). Computo en la nube detonador de competitividad. Pag 7 from http://imco.org.mx/wp-content/uploads/2012/6/computo_en_la_nube_detonador_de_competitividad_doc.pdf

- Software as a Service (SaaS) Where the supplier provides applications and software through a subscription model parcel (email, business applications, Office, Stata, etc..) in exchange for a rent. In other words, instead of buying a full license, users can save millions and only rent what they need. Generally this service, unlike the others do not charge time.

SaaS is the best known in levels of cloud computing. It is a software distribution model that provides customers access to it, via network (usually the Internet). In this way they do not have to worry about the configuration, deployment and maintenance of applications because all these tasks become the responsibility of the vendor. They distributed applications through a Software model as a Service that can reach any company regardless of its size or geographic location.

This model is aimed to the final customers using the software to cover they organization's processes. The Software as a Service (SaaS) can be described as an application consumed over the Internet, usually through the browser, which payment is conditioned and where the logic application and data reside on the platform of the provider. Examples of SaaS are Salesforce, Zoho, and Google App.

- Platform as a Service (PaaS) to make use of internet technology platforms. A company that develops its own applications or get a license from a third, can rent a cloud technology platform that includes hardware, operating system, middleware, and communications to run them online, without being worried about buying and managing their own infrastructure . In this way the rental technology platform can expand or contract based on their demand where is charge usually by hour.

Cloud computing and its fast growth has required "include platforms for building and running custom applications, this concept is called PaaS (or Spanish Plataformas como servicio). The PaaS applications are also known as over demand Web-based or SaaS solutions. "

The provider, besides solving problems in the hardware infrastructure, also handles the software. The client who uses these solutions do not need to install, configure or maintain operating systems, databases and application servers because all of these are provided under this platform. A platform as a service (PaaS) solves more problems when is compared to a solution that only provides an infrastructure as a service (IaaS), since it presents many limitations related to the runtime environment. These include the type of system, the programming language (in some cases they may use libraries) and the database manager. Companies like Amazon.com, eBay, Google, iTunes and YouTube are some of those using this model and make possible the access of new capabilities and new markets through the Web browser, the PaaS model provide faster and cost-benefit advantage for development and delivery application. "

- Infrastructure as a Service (IaaS), "Infrastructure as a Service is a provision model in which an organization placed 'outside' the equipment used to support operations, including storage of the information, hardware, servers and network components. The service provider. Sometimes IaaS is also referred to as Hardware as a Service or HaaS "

The most obvious advantage to use an IaaS, is to transfer to the supplier problems related to the administration of computers. Another attractive advantage is the cost reduction, as usually happens in the technologies associated with cloud computing, to pay only for what is consumed. Infrastructure as a Service also allows automatic and transparent scalability to consumer, leaving the responsibility to service providers.

Other features include: providing Internet connectivity, services and policies based on the layout of a virtual desktop. Is the access under demand to servers, storage and network subsystems. For example, instead of storing all the information on your personal computer or on the server of the company, this space is rented to an IaaS provider, saving the cost of investment in the infrastructure. The income of this service is usually estimated by consumed time of computing power of servers, storage space and width.

Implementation models of the cloud ¹⁰

¹⁰ EYE OS. Defining the Cloud: Deployment Models. from <http://blog.eyeos.org/es/2012/03/30/definiendo-la-nube-modelos-de-implementacion/>

There are many methods of implementation that are described:

Private Cloud. The cloud infrastructure is only used for an organization. It can be given by the company or by a third and can stay at their locations or outside of them.

Community Cloud. The cloud infrastructure is shared by several organizations and binds a specific community that has common preoccupations (eg, mission, security requirements, policy, and compliance requirements or conditions). It can be given by the company or by a third and can stay at their locations or outside of them.

Public Cloud. The cloud infrastructure is available to general public and is owned by a company that sells cloud services.

Hybrid cloud. The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are united by standardized technology that allows the portability of data and applications.

Benefits¹¹

There are several benefits that brings cloud implementation and several competitive opportunities for organizations that use them. Following there is a list of the main advantages in the use of cloud computing. Costs. Is one of the most attractive advantage presented by cloud computing, leaving the responsibility of the infrastructure implementation to the provider.

¹¹ Francisco Carlos Martínez Godínez, B. V. G. G. Computo en la Nube Ventajas y Desventajas. 2014, from <http://revista.seguridad.unam.mx/numero-08/c%C3%B3mputo-en-nube-ventajas-y-desventajas>

The client does not have to worry about buying computer equipment or training the staff for the setup and in some cases, the development of the software.

Competitiveness. By not having to buy expensive equipment, small businesses can access to the latest technology at prices within paying only for consumption. Thereby organizations of any type could compete on equal terms in areas of IT against companies of any size. Competitive advantage is not the one that has computing resources but is who uses them better.

Availability. The supplier must ensure that the service is always available to the client.

Abstraction of the technical part. The cloud computing allows the customer the ability to forget about the deployment, configuration and maintenance; transferring this responsibility to the service provider.

Access from any location. Using applications designed on cloud computing can be accessed from any computer equipment in the world if is connected to Internet.

Scalability. The client has no need to worry about updating the computer equipment on which it is running the use of the application and the upgrade of the operating system or the installation of security patches. It is the duty of the service provider to perform this kind of updates. In addition, they are transparent to the client, so the application must be available to the user wherever even when the update process at the supplier is in process. Updates and new features are installed almost immediately.

Concentrated efforts in business processes.

As a result of the mentioned advantages, the customer was able to concentrate more resources and efforts to an strategic and important aspect, which has a direct impact on the business processes of the organization, transferring to the vendor the responsibility of them implementation, configuration and maintenance of the infrastructure needed to run the application.

As you can see is a technology that can support us to keep our business sector with benefits and the government sector could employ it to further their development.

Analysis of the benefits of the adoption of cloud computing in Mexico.

According to an analysis by the ISACA institution only 26 percent of companies that were part of the study have employed the use of an activity of cloud computing and 38% do not use any application of it, the other percentage lives in uncertainty, due to the great doubt that the security of information generetes as shown in Graphic 1.

Graphic 1

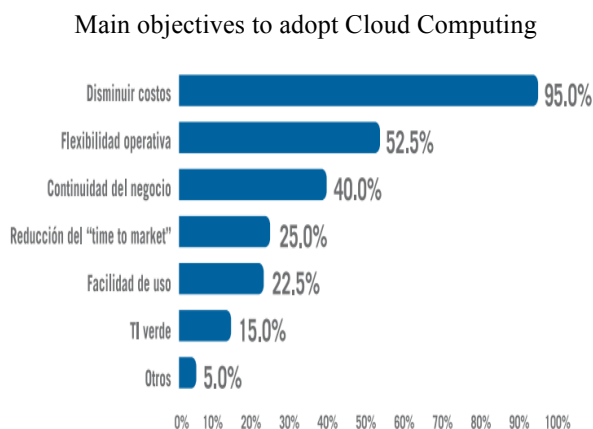
Companies plans to adopt cloud computing



Fuente: ISACA 2011, IT Risk/ Reward Barometer—Mexico Edition

One of the most important points for the adoption of cloud computing in the surveyed Mexican companies is to reduce operating costs and increase the flexibility of the other companies, the other point is the business continuity in the adoption of this as shown in Graphic 2.

Graphic 2



Fuente: Cloud Computing End User Analysis Mexico, Frost y Sullivan, 2011.

Consider the following comparison between the investment that would make a company that acquires its IT infrastructure as the traditional way shown in Graphic 3.

Graphic 3

Diagram of premise vs. cloud costs for a company that uses Lync + Exchange + SharePoint (Cost is pesos)



* Excepto por la inversión en los 6 servidores que no es anual sino de acuerdo a la vida útil y uso del hardware.

**CAL es Client Access License y este costo se multiplica por los empleados en la oficina (45) ponderado por el número de PCs promedio por empleado (0.9)

Fuente: Elaboración propia con datos de Microsoft 2011

Definitely the use of cloud computing has a significant advantage in system implementation costs, if this was done through the SME sector, savings would be meaningful and businesses would use them to increase their operation. Mexican Institute for Competition analyzed the structure of the 2011 IT budget of some companies from different sub-sectors of the economy in Mexico that require large financial investments in IT to operate. These are:

- No Stock Market financial institutions.
- Trading supermarkets and departments.
- Food industry.
- Radio, television and other telecommunications.
- Savings between 25 and 40% of spending on software to migrate to SaaS applications. (Gartner Inc.)¹²
- Savings between 65 and 85% due to lower support and maintenance costs after the investment costs (Alford and Morton).¹³
- Savings of 30% by changing the data center and the infrastructure of the software services of PaaS (Appirio57 based on customer experience)¹⁴.

¹² SaaS CRM Reduces Costs and Use of Consultants. Gartner Inc. 2008

¹³ The Economics of Cloud Computing: Addressing the Benefits of Infrastructure in the Cloud. Booz, Allen, Hamilton 2009

¹⁴ Cloud Computing Savings – Real or Imaginary? Appirio 2009

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The assumptions used are the most conservative scenarios: 25% savings on software, 65% on support and maintenance and 30% of capacity of utilization of the servers through PaaS.

Through these employed assumptions in the unbundled business spending (software, support and maintenance of hardware and servers) in each sub-sector IT all savings were estimated.

The results showed that credit and financial intermediation institutions could save 1.8% of GDP in their sector if they were implemented to the cloud. Between the companies that increased savings we can find Banamex (1.258 million pesos), Bancomer (1,184,000 pesos) and HSBC (407 million pesos) with savings of 44%, 39% and 32% of their total IT budget, respectively. On average, the companies in this subsector can save 38% of their IT budget equivalent to 1% of total revenues.

Migration to cloud companies in supermarkets save 0.57% of the subsector's GDP. Companies with more savings would be Bodega Aurrera (304 million pesos), Soriana (191 million pesos) and WalMart of Mexico (190 million pesos). These savings represent 33, 30 and 35% of the total IT budget, respectively. On average, the savings in IT spend in the subsector is 31%, equivalent to 0.24% of its total revenue.

According to IT spend into companies in the food industry, moving to the cloud could generate savings of 0.42% of the subsector's GDP. Companies with higher savings would be Grupo Bimbo (426 million pesos), Sigma (127 million pesos) and Grupo Industrial Lala (92 million pesos). The IT saving budget of these agencies is 46% for the first two companies and 44% for the third.

The average saving of the subsector companies is 36% of IT spending and 0.25% of total revenues.

Finally, for companies located in the subsector, television and other telecommunications, the estimated savings by migrating to the cloud is 0.27% of the subsector's GDP. Companies with higher estimated savings are Telcel (544 million pesos), Telefonos de Mexico (145 million pesos) and Televisa (74 million pesos). Savings as a percentage of the total IT budget are 35%, 22% and 29%, respectively.

On average, companies in the subsector save 30% of their spending, which amounts of 0.2% of its total revenue.

In total, the estimated savings that migrate to the cloud computing are these four subsectors that represent 0.08% of total GDP. If these savings are calculated towards large companies imagine what would happen to our country with SMEs, the savings in initial capital costs allow the entry of new competitors in the market, especially with SMEs, democratizes access to technologies.

In other words, the implementation of the cloud allow to SMEs to compete on the same technology scale that large enterprises. Due to the following factors:

- Not require high investments.
- Take advantage of the Economies of Scale and Large Companies.
- They are no longer concerned about the maintenance and support.
- Obtain better security schemes only with those who have the capability of accessing.

- Improve the time-to-market of new services.

An increased access to technology not only benefits companies, but also to citizens and governments. Anyone can get advantage from the access with more certainty and security (as a patient, student, employee, etc.), Allowing anyone to access or share their data and files in a simple way via Computer or cell phone, generating significant benefits.

Economic impacts in the adoption of cloud computing¹⁵

The use of cloud computing, has an immediate impact on the budget of businesses and individuals since it eliminates the initial investment related to IT and costs. This simple transfer of investment costs to operating costs move from Capex to Opex will allow the opening of more companies, especially the small ones.

The starting point to explain the benefits of cloud computing are the monetary savings. In order to estimate the potential savings of moving around the cloud, the Mexican Institute for Competition analyzed the structure of the IT budget of 2011 of the top companies in different subsectors of the economy as well as the main institutions of the Federal Public Administration (APF). The results show that the 6 sub-sectors of the national economy could have set a saving of 20 billion pesos, equivalent to 0.16% of GDP savings. These sub-sectors are intensive in the use of IT, and which represents the 36% of total expenditure of Mexico in computer equipment and peripherals (excluding government activities).

Therefore, to estimate an impact of cloud computing on the Mexican economy, (which accounts for 75% of total is spend on computer equipment and peripherals) are extrapolated, we exclude the primary sector (0.04 % of total expenditure on computer equipment and peripherals) and we add government savings (0.08% of GDP) to give an estimated total of savings of 0.31% of GDP. The detail of the calculations for each of the sectors analyzed is described.

Savings in the private sector

The study that was used by the Mexican Institute for Competition to estimate the effects of "cloud computing" in business is 'The Economic Impact of Cloud Computing on Business Creation, Employment and Output in Europe' Etro (2009)", which presents a general stochastic and dynamic equilibrium model that shows a change in the cost, from fixed costs to variable input costs, allows greater openness of companies, job creation and growth economic. The idea behind the model is: the falling of the fixed costs (between 1 and 5%), which promotes the entry of new companies resulting in an increased of production and consumption. It is noteworthy that the model does not consider efficiencies, generated by network economies or positive externalities of energy savings replicating the model used in Europe to Mexico and using the most conservative scenario (1% drop in fixed costs of entry to SMEs)we find that in Mexico could create 1,800 new SMEs, the equivalent of 63,400 jobs. On the other hand, using the optimistic scenario, a fall in the cost of 5% involve the creation of 9,500 SMEs and about 330.300 new jobs.

¹⁵ IMCO. (2012). Computo en la nube detonador de competitividad. Pag 31 from http://imco.org.mx/wp-content/uploads/2012/6/computo_en_la_nube_detonador_de_competitividad_doc.pdf

Graphic 4

Employment Generated by the adoption of cloud computing in SMEs



Fuente: IMCO con el modelo de Etro 2009 y con datos del Censo Económico 2009 INEGI.

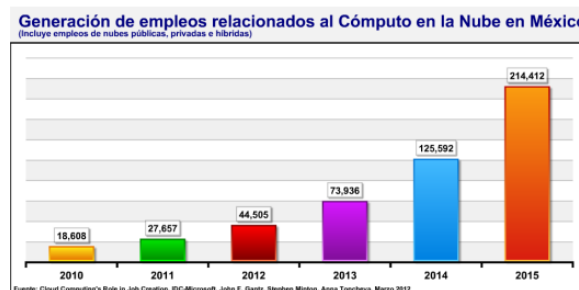
The generation of businesses and jobs for transiting at the "cloud computing" come from savings generated by businesses, especially those who start from scratch because the initial investment is minim, but also those who are already in operation.

The costs involved in operate a system on premise compared to a cloud system are summarized in Graphic 3. As seen in the diagram, the traditional enterprise, is purchasing an IT equipment for operation, where spent \$ 1,248,480 pesos per year. This expenditure does not include the cost of computers and the cost of Internet access (with or without cloud).

An investment in the cloud computing allows savings in economies of scale, without the need of having to pay an infrastructure investment.

Graphic 5

Generation of jobs related to cloud computing in Mexico



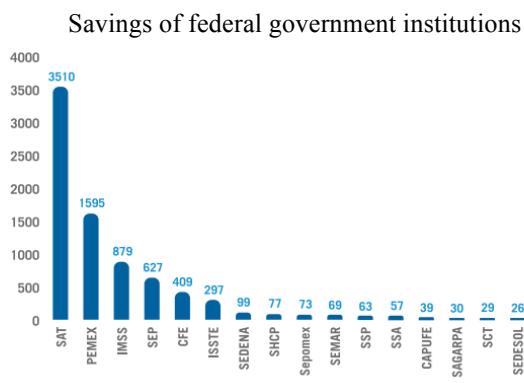
Savings in the public sector

For governments, the Mexican Institute for Competitiveness also use the same assumptions for savings and analyze the structure of the 2011 IT budget of the institutions of the federal government, state and some municipal governments to estimate potential monetary savings to transit cloud.

The estimates show that the public sector would save 1.7% of GDP if the subsector migrates to the cloud. Among the institutions of the federal government that could generate higher monetary benefits to such migration, there is the Tax Administration Service (3,510 million pesos), (1.595 million pesos), the Mexican Institute of Social Security (879 million pesos) and the Secretary of Public Education (627 million pesos). Savings as a percentage of IT budget for these entities would be 64% for TSS, 34% for PEMEX and 33% for the IMSS and the SEP. On average the institutions of the federal government would save 35% of their annual IT spending or approximately 0.58% of the Expenditure Budget of the Federation (PEF) .62 This saving is equivalent to the budget of the Navy (0.53% PEF) and is 10% higher than the National Council of Science and Technology (CONACYT).

As the chart shows, the main savings above the rest of the units would be for the SAT. Migrating SAT platform to the cloud, in addition to the significant savings to the treasury, would better serve taxpayers and avoid saturation of the system during the last days of the annual return of income. As shown in Graphic 6.

Graphic 6



Fuente: IMCO con información de Microsoft.

Among state governments to generate more savings to migrate their infrastructure to the cloud are the Federal District (190 million pesos) first the State of Mexico (152 million pesos) second the government of Nuevo León (47 million pesos).

The savings of such entities amount 28% of the total IT budget for the DF government and 33% for the other two governments. On average, 32 states would save 27% of their total annual spending, equivalent to 0.1% of their total annual income. As shown in Graphic 6.

Using other methods to estimate the savings from the transition to the cloud, the Mexican Institute for Competitiveness mentions that these estimates may be greater than those described above. Giving the example, Alford and Morton (2009), in which model considers the costs of server hardware, server software for basic, technical support during the transition phase, support and maintenance of hardware and software, labor costs of the IT and energy costs and cooling savings estimated to migrate to the cloud to the Federal Government of the United States of 66% on the cost of maintaining traditional data centers.

For state governments, the savings by migrating to a hybrid cloud in three years represent 87% of their total IT budget and 0.23% of its total expenses while transitioning to a public cloud would generate savings of 95 % of its IT budget, equivalent to 0.25% of its total expenditures.

Using this methodology, PEMEX, with data centers having up to 2000 servers, could save up to 87% of annual IT spending, or 0.65% of its annual budget, migrating to a hybrid cloud in 3 years. The savings could increase to 95% of their IT budget to choose a public (0.7% of its annual budget) cloud.

If you do the same calculation for the Federal Public Administration (without PEMEX and CFE) 65 with about 3000 servers, estimates savings of migrating to a hybrid cloud in 3 years, from 88 % of annual IT spending of the APF , equivalent to 1.13 % of the Expenditure Budget of the Federation 66 (PEF) and 1.23 % of PEF to migrate to a public cloud.

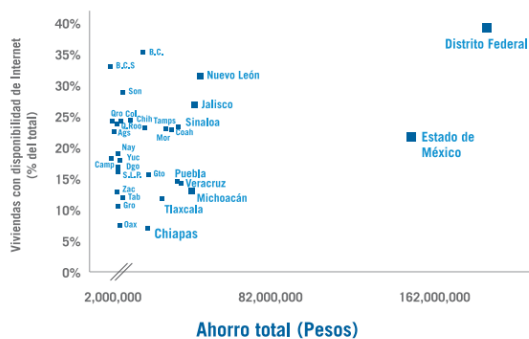
In addition to the savings that migration brings, computing cloud services, cloud computing capacity and improve response times in the public sector. This promotes citizen participation and provides information that promotes government transparency and accountability while reducing costs, simplify operations and improve government efficiency.

Thus, the benefits of migration to the cloud can be multiple; therefore the savings compared to the potential benefits of citizenship, estimated from the percentage of households with Internet access by state (see Graphic 7).

The greatest potential benefit is in the Federal District, followed by the State of Mexico. See Graphic 7.

Graphic 7

Saving state governments and households with Internet access by state, by changing the Federal cloud, followed by the State of Mexico.



Fuente: IMCO con información de Microsoft y del Censo de Población y Vivienda 2010, INEGI.

To evaluate the different economic sectors analyzed with the same criteria, the Mexican Institute for Competitiveness think a point system scale of 1 to 5 to sort each potential social impact, according to the following criteria:

Score 5 for the government: the social impact of cloud computing in the government allows ample benefits. At the same time, citizens also benefit directly from increased collaboration between government agencies, as well as improvements in efficiency and transparency.

Score 4 for educational services: universities can benefit not only the citizens savings and efficiencies, but increased availability of computing power for research.

Score 3 for the sector of Radio, Television and other telecommunications: to facilitate collaboration between business and the user, more people can benefit from the ideas of others.

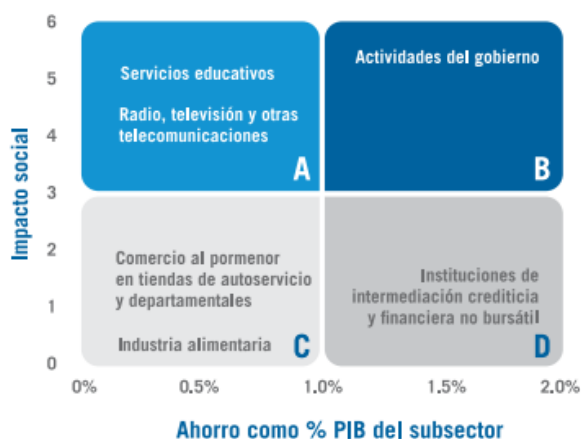
Score 2 for credit institutions and financial intermediaries: these institutions also generate social benefits, to improve customer service across platforms (internet banking) and easier access everywhere

Score 1 for large companies: they do not offer as many externalities for citizens compared to other sectors. In the case of the sectors studied, food industry and retail, like other sectors, impacts citizenship fostering collaboration between employees and improving customer service.

In summary, the major impacts of cloud computing (in monetary and social savings) to Mexico are located in the quadrant. Quadrant D followed then by B, C being the lowest quadrant, both monetary and social impact. The influence to migrate towards the quadrant sectors have important implications for the country.

Graphic 8

Saving and social impact move to the cloud by sectors



Fuente: IMCO con información de Microsoft y del Banco de Información Económica (BIE), INEGI.

According to these studies by the Mexican Institute for Competitiveness, migration towards cloud computing would bring enormous benefits in the areas of the country.

Environmental impacts

Now we will talk about the environmental issue and how it affects simply migrate to cloud services because in recent years, an increase in the processing capacity and the digitization of information has stimulated a demand for infrastructure and systems of increasingly powerful information, resulting in an increase in the energy demand.

The cloud computing represents significant savings in energy and therefore carbon emissions, so it is considered as Green IT. These savings stem mainly from the optimization of servers that exist in the world.

A study by Accenture, estimated energy savings by migrating to the cloud can be up to 30 % for large deployments (over 10,000 users) and up to 90 % for smaller deployments (100 users).

According to the study, the factors that contribute to these savings are:

- Efficiency: optimize the use of existing servers at full capacity (to tie the server capacity with demand).
- Multiple Tenure: different users using the same application simultaneously, reducing loads during peak hours, to serve large numbers of users and organizations in shared infrastructure
- Higher efficiencies of energy consumption in data centers (places where the servers are hosted) using advanced infrastructure reduces energy consumption by cooling systems, as described below.

Mexican Institute for Competitiveness estimated savings in energy consumption and emissions for Mexico, based on the consumption based in a company of 45 people and CO2 emissions in the sector of medium and large enterprises.

So if a company with 100 employees reduce their CO2 emissions by 90% per user, to change its email, calendar, contacts and collaboration portal. On the other hand one with 1000 workers reduce their emissions by 85%, due to the electricity consumption of a medium-sized 23 Mw / h per year to maintain their infrastructure, CO2 emissions for these companies fall 13 tons per year while for large companies in 12 CO2e per year.

This means that the sector of medium and large companies in Mexico could reduce overall to 680,000 t CO₂e per year if all companies migrate to the cloud, which is equivalent to removing 90 thousand vehicles circulating¹⁶.

Conclusions

Cloud computing offers many advantages for a company to be competitive and to government institutions provide greater value to the population, in this article we talk about all the savings and benefits in key sectors of our country in the private, public and environment field, it is important to address the myths that have concerning the use of this technology as the aspect of security, availability, fear of losing control over the data, is one of the main barriers that are encountered to implementing but before taking this step we have to know, establish and manage a recognized provider of the interoperability system in the cloud. It is found that the cloud computing can be a good investment in all productive areas and government institutions as the costs and the flexibility in its implementation and operation.

Regarding the development, is necessary to promote reforms in the field of communications that help to the spread of technologies such as computing to help the development of enterprises, today many places in the country do not have Internet feature which makes the use of this technology revolutionizing countries and accelerating their growth.

¹⁶ According to estimates of Microsoft, a company that uses 6 servers spent 33,600 pesos a year on energy (mainly electricity). The use of 23 Mw / h annual results from dividing the total annual cost of electricity between the average price for industry average for 2010 was 1,447 pesos

Hopefully strengthen the National Digital Agenda in internet antennas for all and do not left the writing which is very important to Mexico that begins to restore growth.

The cloud computing can be a good investment and can be the door for companies to open new jobs and governments, can save costs that can leverage to invest in other programs that support communities to develop.

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