

The impact of cloud computing technology on improving the enterprise processes. Survey in Albanian enterprises.

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Abstract: Over the past few decades, dramatic advances in computer processing, storage space, and networking technology have enabled people to generate, process, and share an increasing amount of information. The development of new computer applications and technologies, of course, requires a more powerful computer infrastructure. To meet these infrastructure requirements, system designers are constantly looking for new system architectures and algorithms for faster processing of large amounts of data. In some cases, enterprises have used their hardware and software capabilities to provide storage space, data management and processing services for their internal users or to provide these services to external customers for a fee. The hardware and software environment that implements a service-based environment is otherwise referred to as a cloud computing environment. Cloud computing is a very important technological development. Numerous companies have used this technology and the number is always growing. The main purpose of the study is to present an analysis of cloud computing technology and the benefits and facilities that this technology offers to organizations. This study is realized based on cloud computing technology, focusing mainly on the architecture of this technology, models, illustration of use by enterprises and the benefits offered. In this paper first is presented the cloud computing technology, key features, and models. Then it analyzes of the costs of migrating to cloud computing technology, the process of analyzing the situation of the enterprise before making the decision to adopt cloud technology and analyses the advantages and disadvantages of cloud computing. In this paper has been done research through a survey. The survey is addressed to 70 enterprises operating in the Albanian market. They are different business types, small and large enterprises but having one thing in common, using of the internet. The aim of the survey is to analyze the development of Cloud Computing technology in Albanian enterprises.

Keywords: Technology Development, Enterprises, Cloud Computing, Business Strategy.

I. Introduction

Cloud computing is a model for enabling on-demand, convenient, ubiquitous network access to a shared pool of computing resources which are configurable (e.g., networks, servers, services, applications) that can be provisioned and released rapidly with minimum management effort or interaction from the service provider (Mell and Grance, 2010).

Organizations need knowledge of the applications to use the full potential of cloud computing. Maturity models provide effective methods for organizations to assess, evaluate, and benchmark their capabilities as bases for developing roadmaps for improving weaknesses.

Skendrovic 2013 stated that large organizations are increasingly adopting cloud solutions such as Office 365, SalesForce.com, and Google Docs. Approximately 80 percent of all enterprises use cloud services to some degree.

Lin and Chen 2012 discussed the adoption of such services, to form better networking infrastructures that enable real-time interaction through Internet technology.

Marston et al. 2011, Armbrust et al. 2010, Li et al. 2012, stated that Cloud computing offers cost savings in terms of batch processing of data, because in this way computations are done faster, and the cost is the same. For example, using 1000 computers for one hour might cost the same as using one computer for 1000 hours which enables organizations to perform computations in a cost-effective manner.

Mell and Grance 2010 discussed the convenience and maturity of solutions available and also the fact that cloud computing does not require large upfront investments, which reduces the financial risk to the adopter.

Galih 2012, Kuo 2011, Misra and Mondal 2011 discussed that Cloud computing can potentially provide a more cost-effective alternative than acquiring and maintaining large-scale systems operations in-house and the overall cost savings enabled by cloud computing have even been referred to as the principle advantage of cloud computing.

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Hoberg et al. 2012, Iyer and Henderson 2010 stated that Cloud computing can be used for various purposes, including business support and cost savings, business improvement by establishing a common infrastructure, and business transformation by enabling faster deployment of solutions, realizing business value, and creating flexible and agile business capabilities.

Berman, Marshall, Townes, Kesterson, and Srivathsa 2012 have defined that organizations are not only relying on cloud services to enhance internal efficiencies, but also to target more strategic business capabilities.

Sun 2013 stated that Cloud computing is a powerful tool in industries or fields of work that need a high degree of collaboration, transparency, and data sharing such as in watershed management where many independent government agencies must collaborate. These technologies are particularly relevant to small enterprises with insufficient resources for large capital investments.

Xu 2012 stated that Cloud computing is quickly spreading to the manufacturing industry and impacting business models. It is aligning product innovation efforts with business strategies and creating intelligent factory networks that encourage effective collaboration.

Li et al. 2011 address the challenge of integrating multiple cloud solutions with intra-enterprise IT, and, although possible manual integration, should be automated large-scale communication in order to enable scalability and optimization of asset use.

II. Material and method: Cloud Reference Model

Cloud computing service models can be thought of as a hardware/software stack. The Cloud Reference Model shown in Figure 1. The hardware or infrastructure is at the bottom of the stack and includes the network. By moving up the stack, each service model inherits the capabilities of the previous service model, located below it. IaaS has the lowest level of integration of functionalities while SaaS has the highest level.

A cloud can be created within the infrastructure of an organisation or it can be placed in another data center. Resources in a cloud can be real physical resources but, in most cases, they are virtualized resources as this way it is easier to make modifications and optimize. From a user perspective, it is important that resources appear to be infinitely scalable, so that service and costs are measurable. [1]

Cloud applications are often built from a set of components. A composite system uses components to assemble services, which can be customized for a specific purpose, using standard parts.

Going from IaaS, to PaaS and then to SaaS, the level of system composition is decreasing, but this from the user point of view. For a PaaS or SaaS service provider whose goal is to create platforms or services for developers or resellers of these services, working with a composite system is a powerful tool as it offers the following benefits:

1. Ease of assembling systems
2. System development with less cost
3. More reliable operations
4. More qualified developers
5. Logic design construction methodology

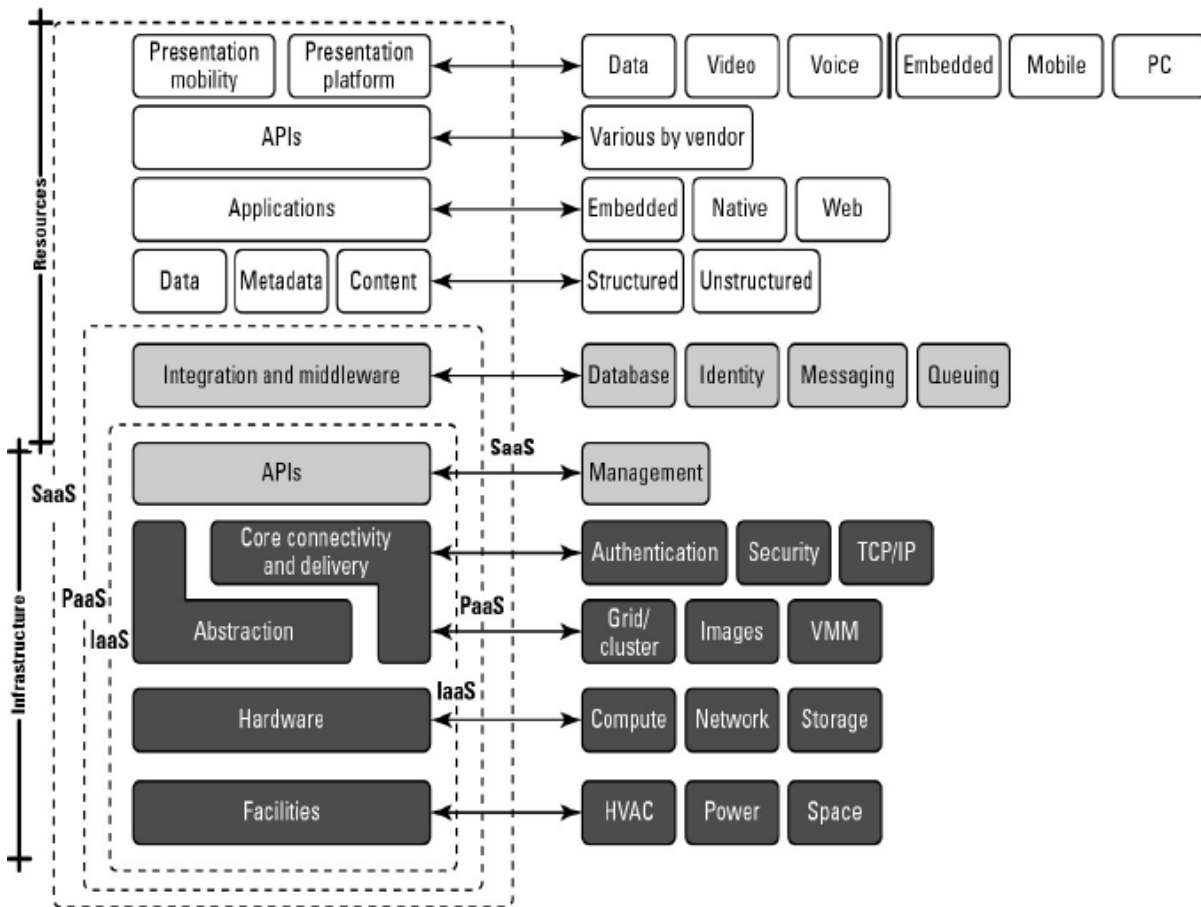


Figure. 1. Cloud reference model (Source: B. Sosinsky2011) [5]

2.1 Cloud computing and the benefits for organizations, Cost analysis for cloud computing.

Cloud computing technology offers many conveniences and benefits to organizations, but to decide for or against the adaptation of this technology, an organization can provide important data by conducting an empirical cost analysis. A study by KPMG International clearly shows that cost reduction is the most important objective for organizations adopting cloud computing technology. Almost half of the respondents listed it as a key objective of their cloud strategy, while 70% of organizations that have adapted cloud technology responded that this technology is cost effective. Although this is a significant figure, still 20% of organizations were unsure of cost-effectiveness, while the rest responded that cloud computing hampered their cost-effective operation. So, this means that cloud computing is not automatically the best way to develop software. In order to compare the economic aspects of local software development with their development in the cloud, a variety of factors need to be considered. The full costs of software development include infrastructure and software development. Also, for an organization to make the right decisions, it must compare the implementation costs of different cloud models. These aspects will be addressed in the following sections.

In some cases, infrastructure costs can account for up to 60% of the total cost of software development. These costs can be divided into two groups: operating costs and other costs related to the organization. Operating costs refer to three elements: hardware costs, software costs, and license fees. Expenses related to the organization refer to expenses such as renting the building or expenses for electricity.[2]

Table 1 lists some of the required operating expenses. The second column of the table indicates if the relevant attribute is relevant when using cloud services, and the third column of the table indicates whether this attribute is relevant to local infrastructure development. The last row of the table, the software licenses for the server, is dependent on the software selected. In case open-source software is used, license fees are not required.

Table. 1. Infrastructure costs

Operational Costs	Cloud	Local
Development Devices (computers)	+	+
Peripheral devices	+	+
Device maintenance	+	+
Server Infrastructure	-	+
Server maintenance	-	+
Subscription Fees	+	-
Software licence for the server	+	+

Choosing a cloud infrastructure certainly does not avoid all the basic costs of infrastructure development. However, the server infrastructure contains not only the server computers, but also the physical space, network connections, spare parts, and maintenance personnel. Thus, there are many cases that favour the IaaS cloud model over conventional hosting. Listed below are five such examples.

The first case: when the demand for a service is time dependent.

The second case: when the request is not known in advance.

The third case: when the use of batch processing can be divided into several instances.

Fourth case: refers to the advantage that cloud computing offers to small organizations that need a lot of computer resources, as it minimizes entry costs.

Fifth case: using IaaS the need for technology management is easier.

Table 2 illustrates some of the organization's costs that are part of the cost of infrastructure. In the table, the second column of the table indicates if the relevant attribute is relevant when using cloud services, and the third column of the table indicates whether this attribute is relevant for local infrastructure development.

Table. 2.Other enterprise costs

Organization's costs	Cloud	Local
Staff costs (wages)	+	+
Staff costs,training	+	+
Electricity costs	Limited	+
Physical location, rent	Limited	+
Network costs	+	Limited

The new staffing requirements do not come directly from the choice of an IaaS cloud model. In any case some development staff need to know the basic concepts about server software. If a PaaS is used, there may be no need for staff training at all as there is no need for low level access to the server software side. Using IaaS electricity costs and rent ones are lower. But if the developed system is very data intensive, the costs of data transfer are extremely significant. Currently transferring a terabyte of data from an Amazon EC2 instance online costs from \$ 50 to \$ 120. Cloud users need to optimize data placement and traffic at every level of the system in order to minimize costs.

Software development costs can be divided into four groups: product, platform, process, and personnel attributes.

2.2 Uses of cloud computing technology in organizations, Build or purchase a website

Instead of building their own IT infrastructure (which includes hardware, databases, software development, and application development), organizations choose to access these resources provided by some third parties over the Internet. [3]

In the table below is shown the use of computers with internet access by enterprises for the period from 2015 to 2020. As can be seen from the table the percentage of internet use from the persons employed in the companies with are observed has increased.

Table.3.Use of computers and the internet by employees in enterprises, without the financial sector(10 persons employed or more)

State/Year	2015	2016	2017	2018	2019	2020
European Union	48	49	50	53	54	56
Belgium	53	55	56	59	59	65
Denmark	71	73	73	75	77	77
Estonia	42	44	46	48	47	51

Greece	38	38	38	38	38	45
Italy	41	43	45	48	50	53
Finland	70	70	70	72	74	80
Sweden	72	73	75	76	82	83
Montenegro	:	46	50	52	52	50
Serbia	:	:	44	44	44	48
Turkey	26	25	25	26	25	:

(Source of data: Eurostat) [9]

In the table below is shown the use of cloud computing services used over the internet by enterprises for the period from 2015 to 2020.

Table.4. Cloud computing services, used over the internet by all enterprises, without the financial sector (10 persons employed or more)

States / Period	2015	2016	2017	2018	2020
European Union	:	19	:	24	36
Belgium	25	28	40	40	53
Ireland	35	36	:	45	51
Greece	9	9	11	13	17
France	:	17	:	19	27
Italy	:	22	:	23	59
Lithuania	16	17	23	23	31
Romania	8	7	11	10	16
Finland	53	57	66	65	75
Montenegro	:	12	:	18	:
Serbia	:	:	9	15	19

(Source of data: Eurostat) [9]

As we see from both tables the use of computers and internet access was available in almost all EU enterprises and enterprises in other countries, from 26% to 72% in 2015 and from 45% to 83% in 2020.

Cloud computing services are used over the internet from enterprises from 8% (Romania) to 53% (Finland) in 2015 and from 16% (Romania) to 75% (Finland) in 2020.

It is a considerable difference that can be observed across different countries. For example, in Finland 75% percent of businesses use cloud computing technology. On the other hand, 8% of enterprises in Romania use it.

Some of the enterprises use cloud technology for solutions for their email service. Instead of setting up a server infrastructure for their e-mail system, which would have capital and maintenance costs, these organizations have opted for cloud service by reducing costs.

Cloud computing services can meet a wide range of needs of communication and telecommunication technology companies. Some organizations use cloud technology to store data files electronically and some of them use it to access their databases, or they use cloud technology for office software.

Through the cloud, businesses can access more advanced software applications such as financial and accounting applications, or they can manage information about their customers through CRM systems.

The highest percentage of enterprises using cloud services was in the information and communication sector.

III. Research and findings: Survey to enterprises in Albania

Purpose of the survey

The following survey is addressed to 70 businesses operating in the Albanian market. They are different business types, small, large but having one thing in common, the internet is part of them. The aim of this survey was to analyze the development of Cloud computing, new technology, in Albanian businesses.

A total of 16 companies responded.

The survey contains 2 sections, where:

Section I - Introduces an introduction to the company. Section II - Position of companies towards Cloud Computing.

Below are the questions and responses for them.

1. What is the size of your business?

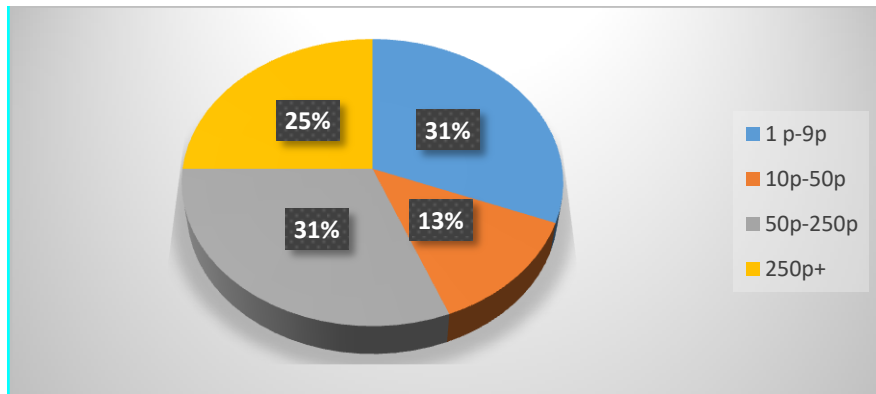


Figure. 2. Business size chart

As we see from the figure above, 5 businesses or 31% of them have 1 to 9 employees, 2 or 13% of them have 10 to 50 employees, 5 or 31% of them have 50 to 250 employees and 4 of them or 25% have 250 or more employees. Then, in the following analysis we have considered the first 2 groups as small and medium business and the other 2 groups as large businesses. So in our survey we have 7 businesses or 44% SMEs and 9 businesses or 56% of them are big businesses.

2. How many years have you been operating in the market?

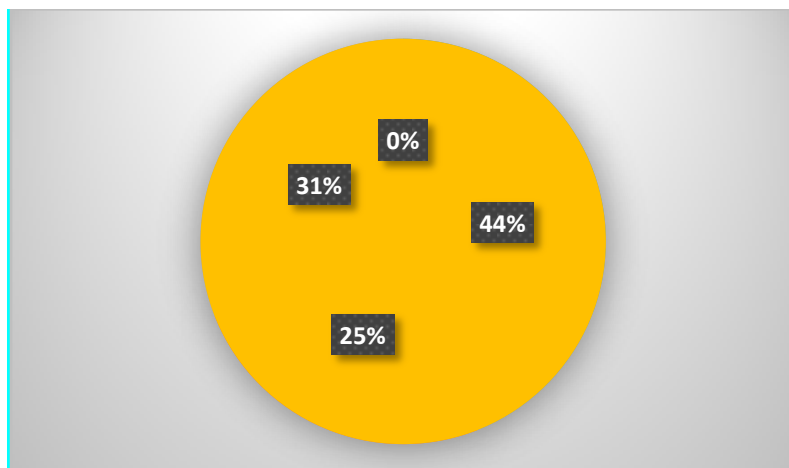


Figure. 3. Result for years of operation in the market

From the responses, 7 businesses or 44% of them have from 1 to 5 years operating in the market, 4 or 25% of them have 5 to 10 years while 5 or 31% of them have 10 or more years operating in the market.

3. Do you use the internet to communicate with customers?

15 out of 16 businesses or 97% of them answered that they use the internet as a means of communication with consumers, so they own a website. Only 1 or 3% of them do not use the Internet as a means of communication with consumers. Further these 16 businesses posed the following question.

3.1 If yes, does your company website offer online transaction services?

Of these 16 businesses, 9 or 54% of them offer online transaction services on their site, while the other 7 or 46% do not offer these services.

4. How would you assess the extent of information technology in your business?

10 businesses or 62% of them assess as complete the extension of information technology in their business, while 6 or 38% of businesses assess as partial this extension.

5. What are the IT costs to your business?

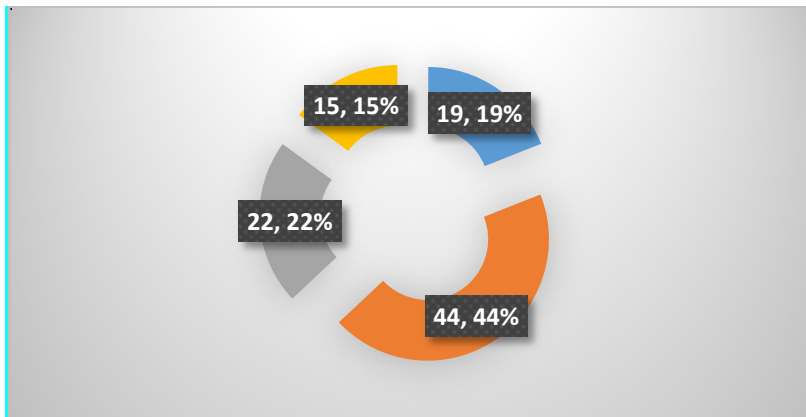


Figure.4. Outcome for IT spending across businesses

From the responses:

7 businesses or 44% of them have average IT expenditures relative to the overall level of expenditures, 3 of them or 19% have low IT expenses, 4 businesses or 22% have high IT expenses and 2 or 15% of businesses have very high IT expenses. Those businesses that have responded with low and medium costs are mainly SMEs.

6. Have you ever heard of cloud computing technology

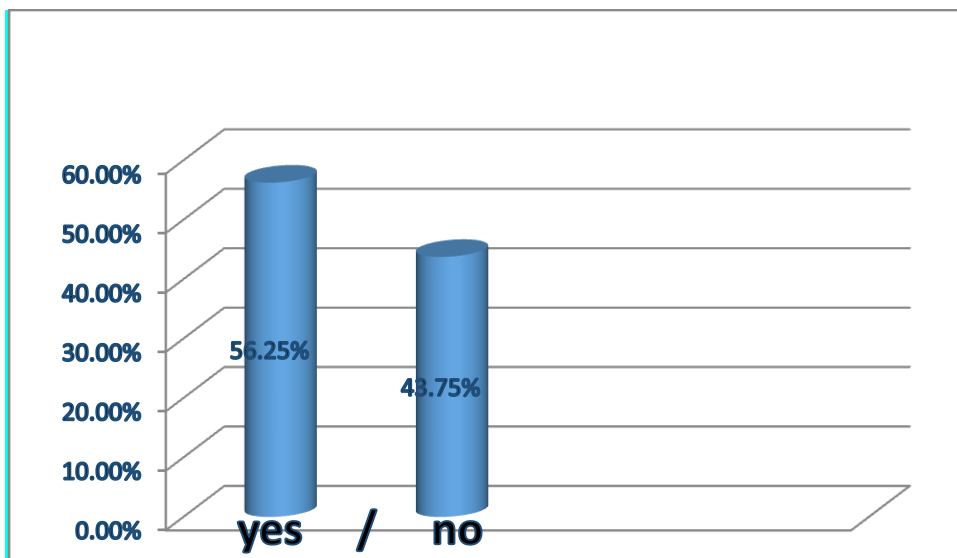


Figure.5. Results of business knowledge of Cloud Computing

This is probably the most important question in the first sector, where businesses needed access to Cloud Computing technology. And the result is this: 9 or 56.25% have heard of CC and 7 or 43.75% have not heard of this technology.

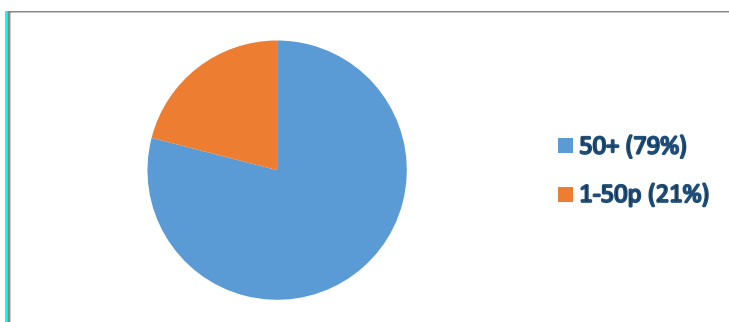


Figure.6. Result by business size

Of those 9 who have heard, 79% are large companies and only 21% are SMEs.

7. Your information about cloud computing is?

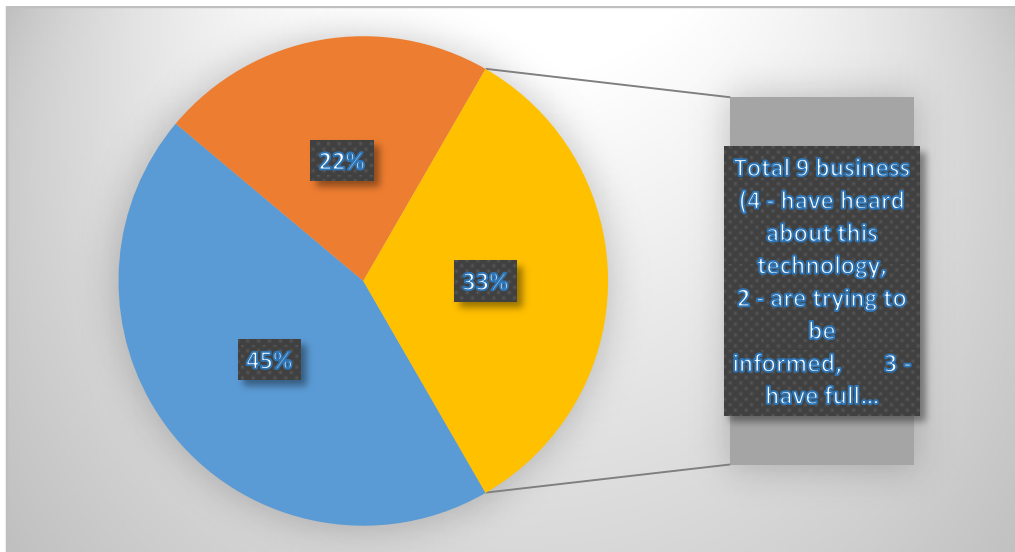


Figure.7.Outcome of information about Cloud Computing

We see that out of these 9 businesses in total, have heard about CC technology 44.44 %, (4), 22.22% (2) are trying to be informed and 33.34 % (3) have full knowledge.

8. If you would like to implement CC, what form of management do you think would suit you best?

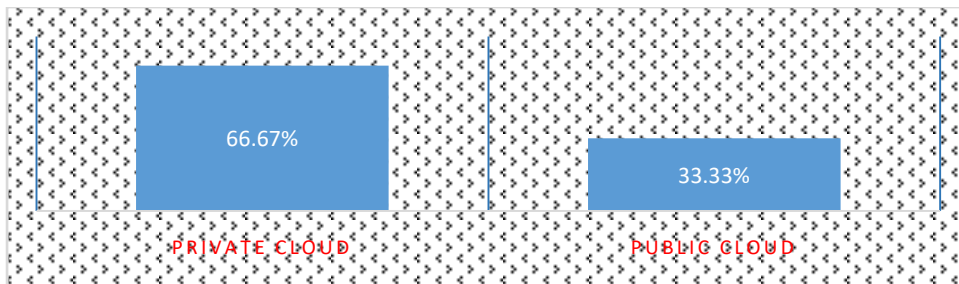


Figure.8. Graph of preferred management type

So, 6 businesses or 66.67% want private cloud as a model for placement in CC, while 3 others or 33.33% think of public cloud as a model for placement in CC.

Most large businesses tend to go private because they can provide the resources they need for infrastructure while maintaining the originality of their resources against exposure to competitors. Perhaps this is the reason why the IT costs of these businesses turn out to be relatively high.

Meanwhile, even small businesses are looking for partners because they cannot support the full cost of an individual private cloud and are willing to join other firms.

9. List the following CC advantages according to the importance you think they are expected to have in your business.

Table 5: Ranking of CC advantages by importance

1	IT efficiency
2	Convenience for development of the teams
3	Efficient use of Hardware

4	Software cost savings
5	Operating cost savings
6	Price flexibility
7	Increased cooperation in groups
8	Hardware cost savings
9	Ability to increase demand by usingIT
10	Ability to increase the speed of development of new products and services

In this question we asked businesses to rank the following advantages according to importance in their business. The result is that IT efficiency is seen as the main benefit of these businesses, followed by ease for development teams, followed by efficient use of hardware and ending with the ability to increase the speed of development of new products and services.

10. Evaluate from 1st to 3rd in your opinion the importance that will have the impact of CC on IT in the coming years?

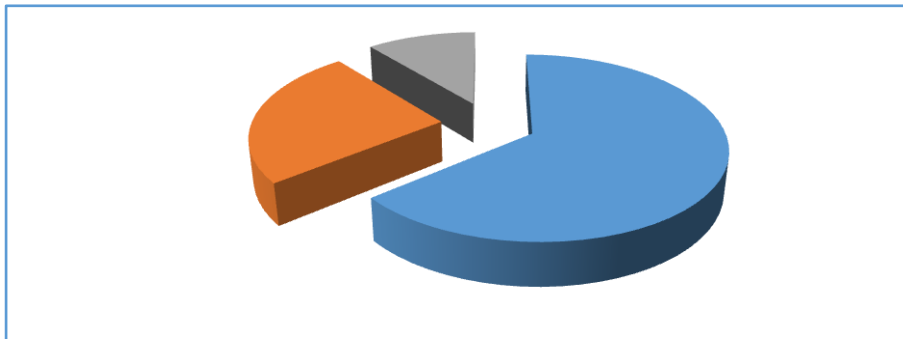


Figure.9. Assessing the impact of CC on IT (new services (blu), more strategic IT (orange), increase of competitive advantage (grey))

In this question, businesses could list three alternatives. It is clear that the main impact on IT will be: new service opportunities; then making IT more strategic and finally increasing competitive advantages.

IV. Conclusions of the survey and Discussion

In the first session we got acquainted with the companies interviewed, mainly they were companies that had more than 5 years operating in the market. Almost all of these companies used the internet as a means to connect with their customers and not just for company services. Information technology was widespread throughout the business as its function was complete in most of the respondents. Normally, those businesses that had a high level of information technology also had high costs in the IT sector, this is also noticed in the comparative graph built with the Excel program. From the graph we understand that larger companies are the ones that spend more on IT, while smaller companies make lower costs. Of all the companies surveyed only 9 of them had heard of CC technology and this is actually not a good indicator as it shows how far behind the technological development in our businesses and even more so what they had heard were mainly big businesses and with many years on the market.

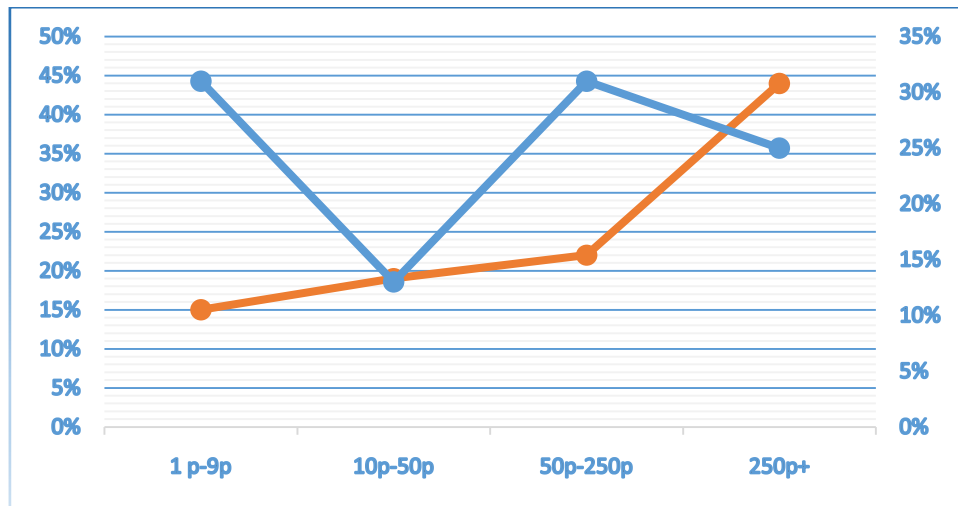


Figure.10: Indicative graph of IT expenditures by size of businesses (IT costs (orange), business size (blu))

After we found out that 56.25% of the businesses interviewed had knowledge about CC then we moved onto the second session to see the level of knowledge or let's say how deeply this technology has been introduced in Albanian businesses. Also more interesting is the fact that those who use IT costs are high. This does not indicate that CC increases costs but that high-cost companies tend to innovate to reduce excess costs. The fact that most had to choose the Private Cloud model shows that our businesses as well as businesses in international markets have a very big problem with data privacy and try by all means to achieve it even though it may have a higher cost than Public Cloud. The reason why everyone would choose CC is to make the IT sector more efficient where over time with business growth and competitive advantages in the market, Information Technology occupies an ever-increasing place. According to the respondents, the future will bring innovations in services by highlighting business techniques to become more competitive in the markets and to resist competitive advantages. Cloud computing technology remains a very important technological development. Numerous companies have embraced this technology since its inception and their number is always growing. This technology offers a range of benefits and facilities for organizations in terms of costs, almost unlimited storage space, ease of access to information and ease of implementation. An essential problem of this technology remains information security. So, organizations before making the decision to move their applications to the cloud, should make an analysis of their situation, benefits and risks that may be encountered.

The following recommendations help organizations that have decided to migrate to cloud technology.

The data and processing operations that will be passed to the cloud must first be clearly defined. For each processing operation the data used must be defined distinguishing between personal data, sensitive data, strategic company data and data used by business applications.

Second, switching to the cloud requires special attention to technical and legal security requirements.

Third, it is important to conduct a risk analysis to identify essential safety measures for the company. Some of the main risks are: technological dependence on the cloud provider (for example the inability to switch providers without losing data); the risk that data placed on a virtualized system may be modified or accessed by an unauthorized third party, problems with access rights management for data subjects, as a result of insufficient resources available from providers.

Fourth, the appropriate type of cloud to be adopted must be identified. Every cloud service offered is specific, so organizations need to compare them by comparing their strengths and weaknesses. An analysis of this type will make it possible to choose the most appropriate cloud offer.

Fifth, choose a cloud provider that offers sufficient guarantees.

Sixth, monitoring all the time. Cloud computing services need to be evaluated continuously and periodically in relation to risks, market solutions offered, legislation, etc. Risk analysis should be updated as soon as a significant change occurs in a service in order to adapt measures and solutions as soon as possible.

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