

Safety and Threats in Cloud Computing Survey Paper

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ABSTRACT

The concept of cloud computing is not newfangled or complicated with networking and technology resources perspective. Although there are several benefits of cloud computing for individuals and organizations; however, they face several security risks too associated with this service. There are major threats related to cloud computing security: data in transit, data lineage, data at rest, processing of data, data provenance, including multi-tenancy, and data remanence. Data in transit needs to be encrypted to preserve its confidentiality. If data is not encrypted, there emerges the issue of data in rest [1]. Thus, this paper presents the security issues related to cloud computing and identify the security measures or model that can prevent those risks. To achieve this objective, this paper will be organized in different stages that include an introduction, methodology section including how data collected and analyzed, and discussion. A conclusion will be given at the end of the paper to prevent the security issues related to cloud computing.

Keywords:- cloud computing, security, threats, data privacy, security measures

I. INTRODUCTION

Cloud computing is characterized as the delivery of computing services to users via the Internet. Individuals and organizations can use hardware or software remotely which are managed by another party. Online file storage, social networking sites, and business applications on the Internet are some examples of cloud computing. Users are allowed to access computer resources and information with cloud computing regardless of their location but with Internet connection [2]. Cloud computing gives the shared information that includes networks, data storage, specialized user applications, and power of processing the computer. As represented by the US National Institute of Standards and Technology (2014), cloud computing is the model that enables on demand a convenient network access to computing resources than can provide and released with less effort of management or interaction with the service provider [3].

Cloud computing services provided in different forms: infrastructure as service, software as service, and platform as service. In its mode of infrastructure on duty, users are allocated resources for computing to help them run the virtual machines that consist of operations and operating systems. An example of infrastructure service model is Elastic Compute

Cloud of Amazon.com. The platform as service allows the user to write applications to run on specific environment provided by the service provider, such as Google Apps Engine. The software as a service model gives the consumers a software application that they can run on The Internet. For instance, Google Doc program that includes spreadsheet, word processor, and PowerPoint tools [4].

II. METHODOLOGY

Cloud computing provides the shared information that includes networks, data storage, specialized user applications, and power of processing the computer. The customers of cloud computing are benefited from increased opportunities to lower the cost and for having core competencies; however, there are several challenges associated with cloud computing that needs attention before the ubiquitous adoption of the technology. The security issue for cloud computing systems, such as a network that connects the system needs to be secured. Also, the virtualization in cloud computing causes many safety issues. The current study is aimed to identify the security issues related to cloud computing. Thus, this paper designed to identifying the security risks of

cloud computing and to find the solutions that can prevent those risks.

We took a sample of one hundred and fifty people and asked them different questions. But, only the following questions were selected for the analysis portion as they provide a good model of the sample

data. Further, to judge the sample as per this is the best option due to accurate results produced therein. Further, the other questions were text based. Therefore, their analysis is impossible. So, we will stick with data which can be analyzed on the scale and a conclusion be generated from it.

Do you have any experience with cloud computing technologies?				
Statistics				
Do you have any experience with cloud computing technologies?				
N	Valid	150		
	Missing	0		
Mean		1.53		
Std. Error of Mean		.041		
Median		2.00		
Mode		2		
Std. Deviation		.501		
Variance		.251		
Range		1		
Minimum		1		
Maximum		2		
Sum		230		
Do you have any experience with cloud computing technologies?				
<p>Do you have any experience with cloud computing technologies?</p> <p>■ Yes ■ No</p>				
		Frequency	Percent	Valid Percent
Valid	Yes	70	46.7	46.7
				Cumulative Percent
				46.7

No	80	53.3	53.3	100.0
Total	150	100.0	100.0	

A lot of our sample does not have a good idea or have not used the cloud computing at the very least. Only 46.7% have used cloud computing. This is a very less percentage to consider the outcomes of this survey to be successful.

How would you rate the usefulness of cloud computing to an organization?			
Statistics			
How would you rate the usefulness of cloud computing to an organization?			
N	Valid	150	
	Missing	0	
Mean		2.51	
Std. Error of Mean		.090	
Median		2.00	
Mode		2	
Std. Deviation		1.104	
Variance		1.218	
Range		3	
Minimum		1	
Maximum		4	
Sum		376	
<p>How would you rate the usefulness of cloud computing to an organization?</p> <p>Legend:</p> <ul style="list-style-type: none"> Extremely Useful Very Useful Useful Not Useful 			

How would you rate the usefulness of cloud computing to an organization?					
Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	Extremely Useful	35	23.3	23.3	23.3
	Very Useful	41	27.3	27.3	50.7
	Useful	37	24.7	24.7	75.3
	Not Useful	37	24.7	24.7	100.0
	Total	150	100.0	100.0	

A lot of the users claim that the usefulness of the cloud computing in an organization is really very important. The percentage goes to 27.3% and is considered as very useful. The results obtained herein are good and can be evaluated further, with more statistical procedures.

Do you know any other people using cloud computing technologies?			
Statistics			
Do you know any other people using cloud computing technologies?			
<p>Do you know any other people using cloud computing technologies?</p> <p>■ Yes ■ No</p>			

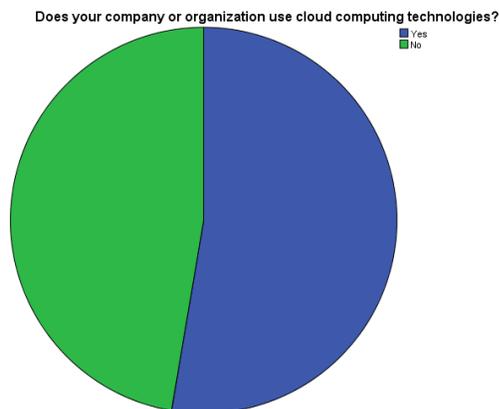
N	Valid	150			
	Missing	0			
Mean		1.53			
Std. Error of Mean		.041			
Median		2.00			
Mode		2			
Std. Deviation		.501			
Variance		.251			
Range		1			
Minimum		1			
Maximum		2			
Sum		229			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	71	47.3	47.3	47.3
	No	79	52.7	52.7	100.0
	Total	150	100.0	100.0	

The results should a lot of negative response as 52.7% of the people did not know about more people who were using this service. This is a really negative response and more workings on it will generate negative results which will not be a correct sample data for us.

Does your company or organization use cloud-computing technologies?					
Statistics					
Does your company or organization use cloud computing technologies?					
N	Valid	150			
	Missing	0			
Mean		1.47			
Std. Error of Mean		.041			
Median		1.00			
Mode		1			
Std. Deviation		.501			
Variance		.251			

Range	1			
Minimum	1			
Maximum	2			
Sum	221			

Does your company or organization use cloud computing technologies?

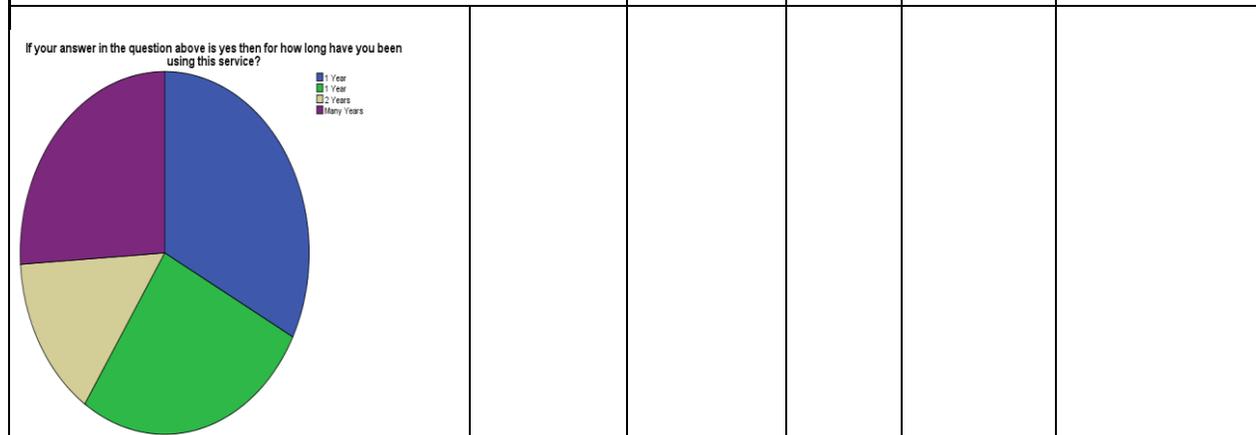


		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	79	52.7	52.7	52.7
	No	71	47.3	47.3	100.0
	Total	150	100.0	100.0	

Most of the company's of the people use cloud computing a lot. There is a majority of 52.7% in this case. Thus, the sample data can also be analyzed statistically for more results.

If your answer in the question above is yes then for how long have you been using this service?				
Statistics				
If your answer in the question above is yes then for how long have you been using this service?				
N	Valid	150		
	Missing	0		
Mean		2.34		
Std. Error of Mean		.097		

Median	2.00			
Mode	1			
Std. Deviation	1.186			
Variance	1.407			
Range	3			
Minimum	1			
Maximum	4			
Sum	351			



If your answer in the question above is yes then for how long have you been using this service?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Year	49	32.7	32.7	32.7
	1 Year	40	26.7	26.7	59.3
	2 Years	22	14.7	14.7	74.0
	Many Years	39	26.0	26.0	100.0
	Total	150	100.0	100.0	

The technology and service are relatively new that is why most of the people using it just claim to have been using it for just a year. The majority is 32.7 percent. The sample data is very good. And the same

There are 4 types of deployment models used in cloud include ; public, private, community and hybrid cloud. Which 1 do you use most?

Statistics				
There are 4 types of deployment models used in cloud include; public, private, community and hybrid cloud. Which 1 do you use most?				
N	Valid	150		

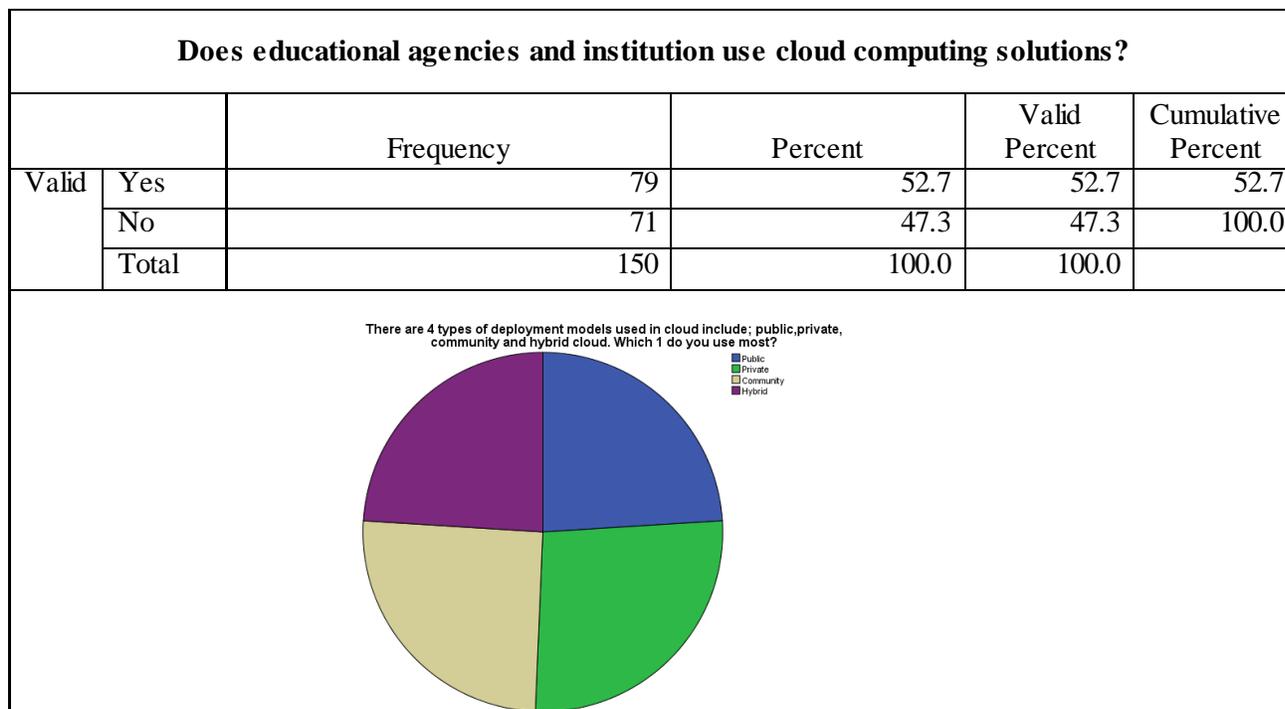
	Missing	0		
Mean		2.49		
Std. Error of Mean		.090		
Median		2.00		
Mode		2		
Std. Deviation		1.104		
Variance		1.218		
Range		3		
Development Minimum		1		
Maximum		4		
Sum		374		

There are 4 types of deployment models used in cloud include; public, private, community and hybrid cloud. Which 1 do you use most?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Public	36	24.0	24.0	24.0
	Private	40	26.7	26.7	50.7
	Community	38	25.3	25.3	76.0
	Hybrid	36	24.0	24.0	100.0
	Total	150	100.0	100.0	

The private model has been used the most by maximum of the respondents. The response was 26.7% for the private. This is a good response so that our focus can shift onto the major sector.

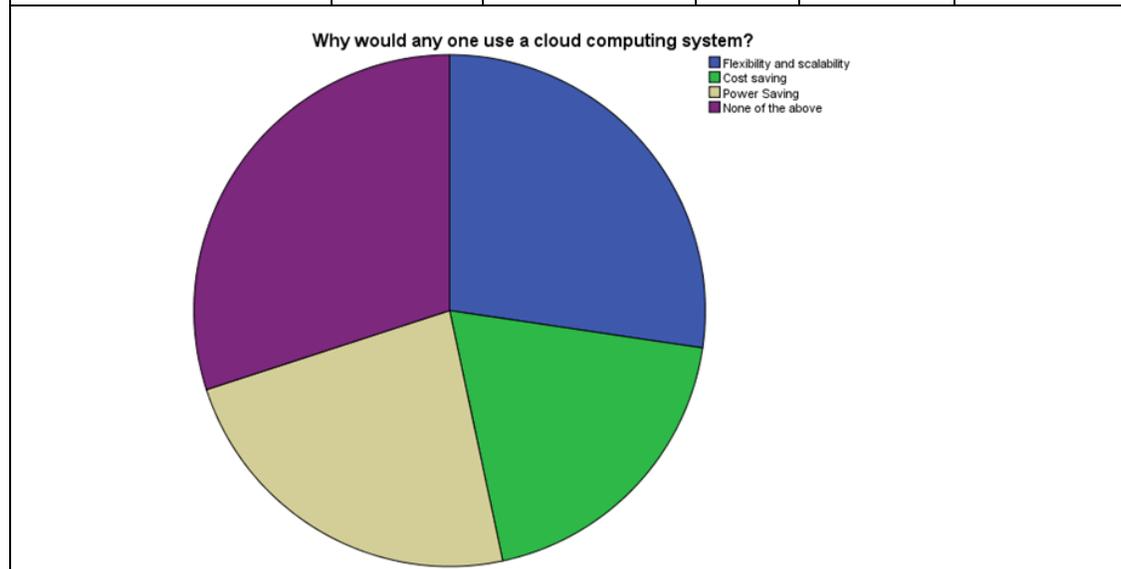
Does educational agencies and institution use cloud computing solutions?				
Statistics				
Does educational agencies and institution use cloud computing solutions?				
N	Valid	150		
	Missing	0		
Mean		1.47		
Std. Error of Mean		.041		
Median		1.00		
Mode		1		
Std. Deviation		.501		
Variance		.251		
Range		1		
Minimum		1		
Maximum		2		
Sum		221		



Yes, fortunately most of the educational institutions use cloud computing. The response was overwhelming at 52.7% and this shows that by focusing on the educational agencies and educational institutions we can obtain a lot of material and data for these purposes.

Why would anyone use a cloud computing system?			
Statistics			
Why would anyone use a cloud computing system?			
N	Valid	150	
	Missing	0	
Mean		2.56	
Std. Error of Mean		.097	
Median		3.00	
Mode		4	
Std. Deviation		1.184	
Variance		1.402	
Range		3	
Minimum		1	
Maximum		4	
Sum		384	
Why would anyone use a cloud computing system?			

Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	Flexibility and scalability	41	27.3	27.3	27.3
	Cost saving	29	19.3	19.3	46.7
	Power Saving	35	23.3	23.3	70.0
	None of the above	45	30.0	30.0	100.0
	Total	150	100.0	100.0	



Many of the respondents used the cloud computing for its special flexibility and its great scalability. The response in this section was the highest at 27.3%. This shows us that we should look for people with higher job stresses and inquire from them as well to develop an informed opinion.

Cloud computing is a common term known to many people.				
Statistics				
Cloud computing is a common term known to many people.				
N	Valid	150		
	Missing	0		
Mean		1.52		
Std. Error of Mean		.041		
Median		2.00		
Mode		2		
Std. Deviation		.501		
Variance		.251		

Range		1			
Minimum		1			
Maximum		2			
Sum		228			
Cloud computing is a common term known to many people.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	True	72	48.0	48.0	48.0
	False	78	52.0	52.0	100.0
	Total	150	100.0	100.0	
<p>Cloud computing is a common term known to many people.</p> <p>Legend: True (Blue), False (Green)</p>					

No, the technical term cloud computing is not known to many of the people. Almost 52% of the respondents were unaware of the term. This means that this term is mostly confused regarding its real purposes.

Cloud computing is about gracefully losing control while maintaining accountability. So can I trust it?					
Statistics					
Cloud computing is about gracefully losing control while maintaining accountability. So can I trust it?					
N	Valid	150			
	Missing	0			
Mean		1.45			
Std. Error of Mean		.041			
Median		1.00			
Mode		1			
Std. Deviation		.499			

Variance		.249			
Range		1			
Minimum		1			
Maximum		2			
Sum		217			
Cloud computing is about gracefully losing control while maintaining accountability. So can I trust it?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	83	55.3	55.3	55.3
	No	67	44.7	44.7	100.0
	Total	150	100.0	100.0	
<p>Cloud computing is about gracefully losing control while maintaining accountability. So can i trust it?</p> <p>■ Yes ■ No</p>					

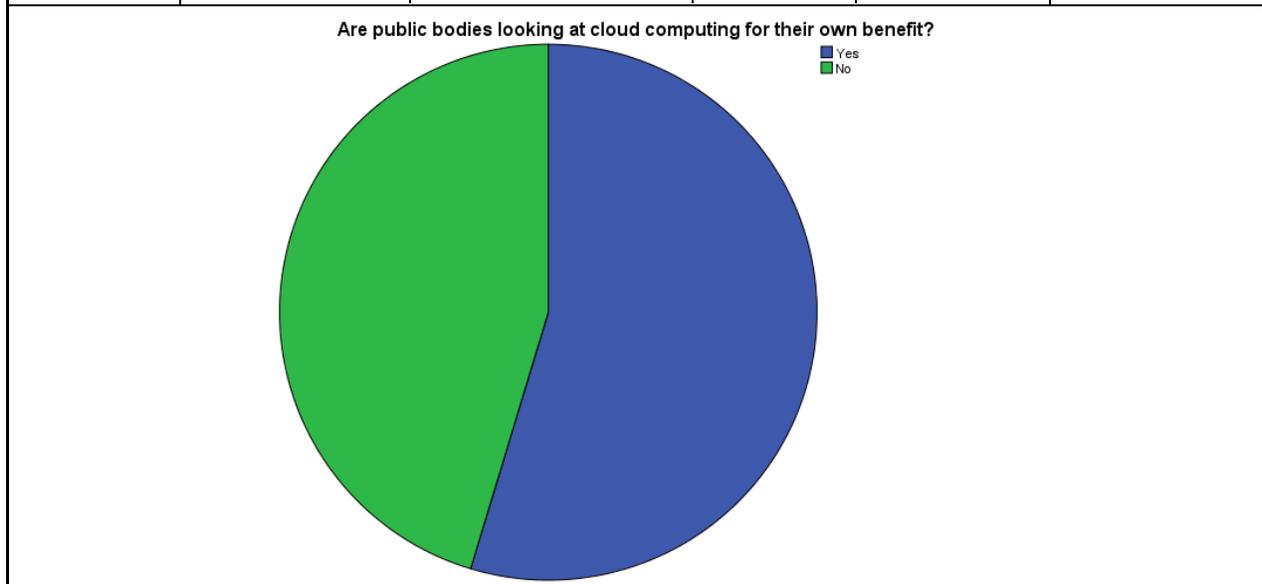
Yes, a lot of the people trust the cloud computing even though they loose control almost 55.3% accepted that they trusted the system. The entire cloud computing system. This means that this trustworthy system can be encashed.

Are public bodies looking at cloud computing for their own bene fit?			
Statistics			
Are public bodies looking at cloud computing for their own benefit?			
N	Valid	150	
	Missing	0	
Mean		1.45	
Std. Error of Mean		.041	
Median		1.00	

Mode	1			
Std. Deviation	.499			
Variance	.249			
Range	1			
Minimum	1			
Maximum	2			
Sum	218			

Are public bodies looking at cloud computing for their own benefit?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	82	54.7	54.7	54.7
	No	68	45.3	45.3	100.0
	Total	150	100.0	100.0	



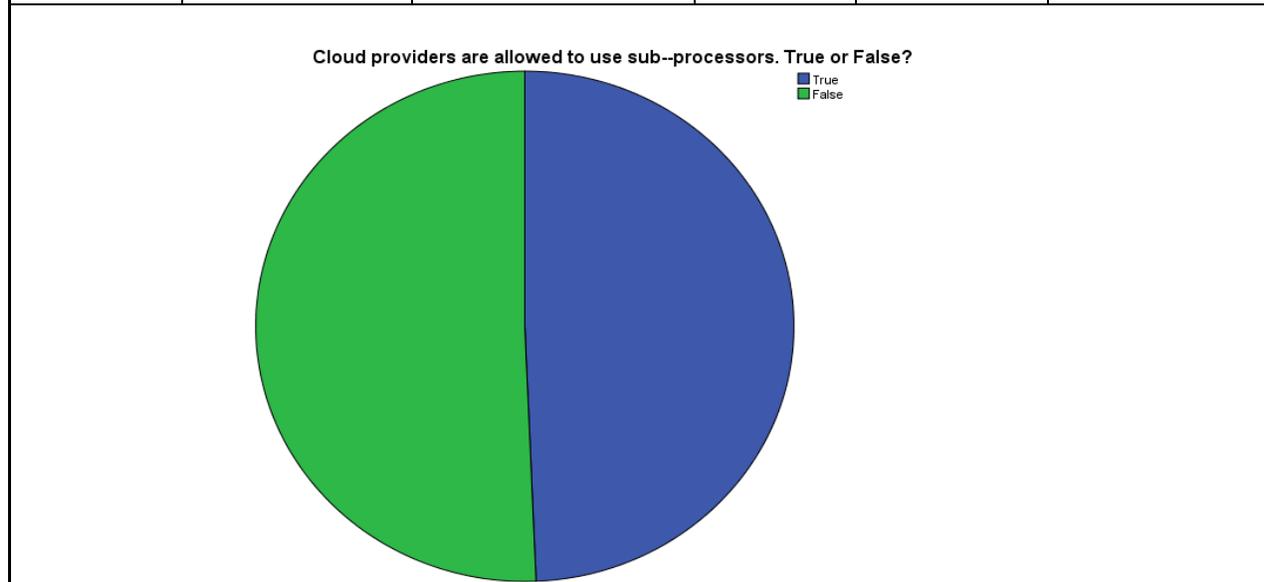
Yes at the current time, public and governmental bodies are also exploring the possibilities of the cloud computing with almost 54.7% people in the government setups looking to crack into the economy of this cloud computing.

Cloud providers are allowed to use sub--processors. True or False?				
Statistics				
Cloud providers are allowed to use sub--processors. True or False?				

N	Valid	150		
	Missing	0		
Mean		1.51		
Std. Error of Mean		.041		
Median		2.00		
Mode		2		
Std. Deviation		.502		
Variance		.252		
Range		1		
Minimum		1		
Maximum		2		
Sum		226		

Cloud providers are allowed to use sub-processors. True or False?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	True	74	49.3	49.3	49.3
	False	76	50.7	50.7	100.0
	Total	150	100.0	100.0	



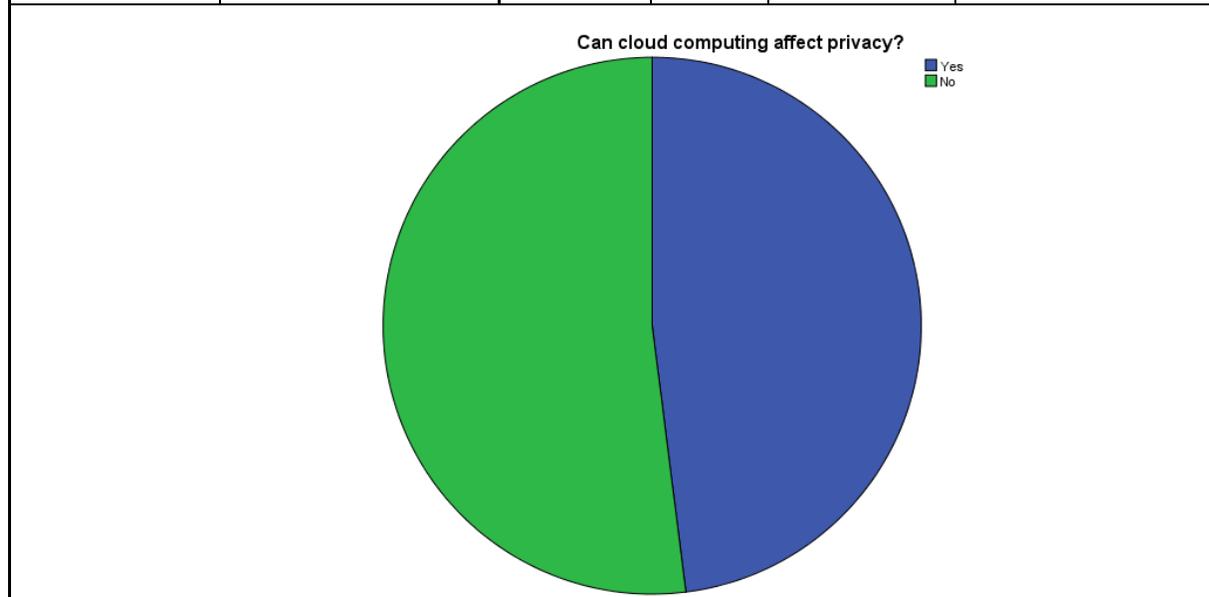
No, as per most of our respondents cloud computing is not allowed to use sub-processors. The response was 50.7% and this shows a high level of mistrust towards the cloud computing.

Can cloud computing affect privacy?			
Statistics			
Can cloud computing affect privacy?			

N	Valid	150		
	Missing	0		
Mean		1.52		
Std. Error of Mean		.041		
Median		2.00		
Mode		2		
Std. Deviation		.501		
Variance		.251		
Range		1		
Minimum		1		
Maximum		2		
Sum		228		

Can cloud computing affect privacy?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	72	48.0	48.0	48.0
	No	78	52.0	52.0	100.0
	Total	150	100.0	100.0	

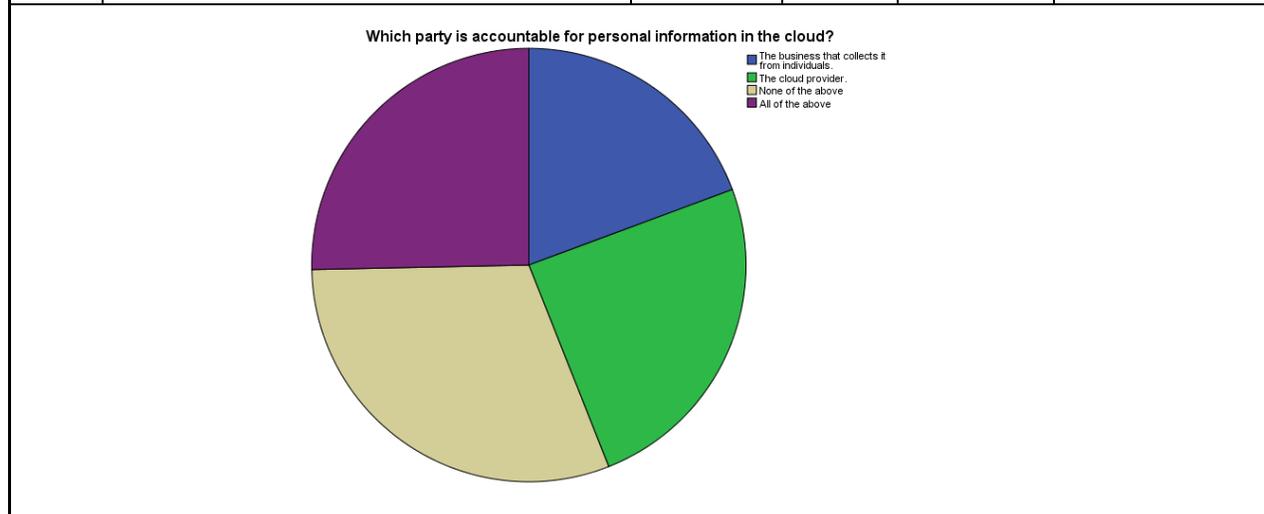


A lot of our respondents disagree with the fact that cloud computing can affect their privacy. This is due to the reason that they trust the cloud computing and it takes good care of their private information. Almost 52% agree with this fact.

Which party is accountable for personal information in the cloud?		
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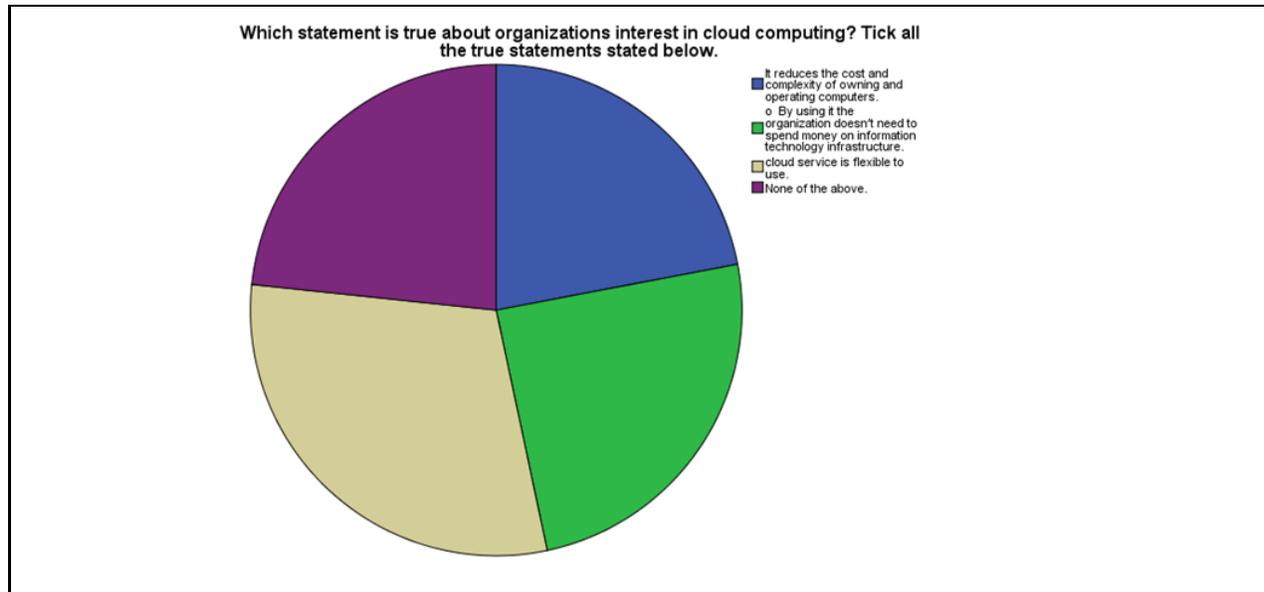
Statistics				
Which party is accountable for personal information in the cloud?				
N	Valid	150		
	Missing	0		
Mean		2.62		
Std. Error of Mean		.087		
Median		3.00		
Mode		3		
Std. Deviation		1.066		
Variance		1.137		
Range		3		
Minimum		1		
Maximum		4		
Sum		393		

Which party is accountable for personal information in the cloud?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	The business that collects it from individuals.	29	19.3	19.3	19.3
	The cloud provider.	37	24.7	24.7	44.0
	None of the above	46	30.7	30.7	74.7
	All of the above	38	25.3	25.3	100.0
	Total	150	100.0	100.0	



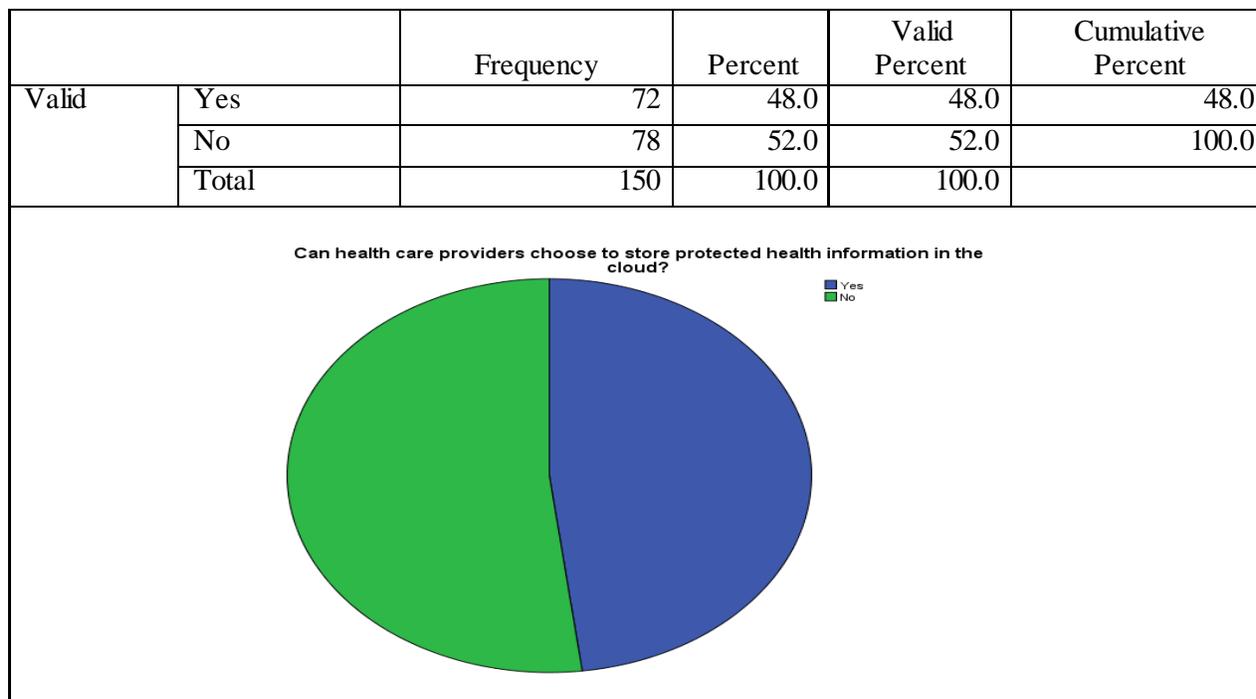
As per the respondents no one is responsible for the personal information in the cloud computing. This is a really dangerous problem as a lot of people trust the cloud computing with their personal data. Almost 30.7% agree that there is no one looking at their personal information and no one appears.

Which statement is true about organizations interest in cloud computing? Tick all the true statements stated below.					
Statistics					
Which statement is true about organizations interest in cloud computing? Tick all the true statements stated below.					
N	Valid	150			
	Missing	0			
Mean		2.55			
Std. Error of Mean		.088			
Median		3.00			
Mode		3			
Std. Deviation		1.078			
Variance		1.162			
Range		3			
Minimum		1			
Maximum		4			
Sum		382			
Which statement is true about organizations interest in cloud computing? Tick all the true statements stated below.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	It reduces the cost and complexity of owning and operating computers.	33	22.0	22.0	22.0
	By using it the organization doesn't need to spend money on information technology infrastructure.	37	24.7	24.7	46.7
	Cloud service is flexible to use.	45	30.0	30.0	76.7
	None of the above.	35	23.3	23.3	100.0
	Total	150	100.0	100.0	



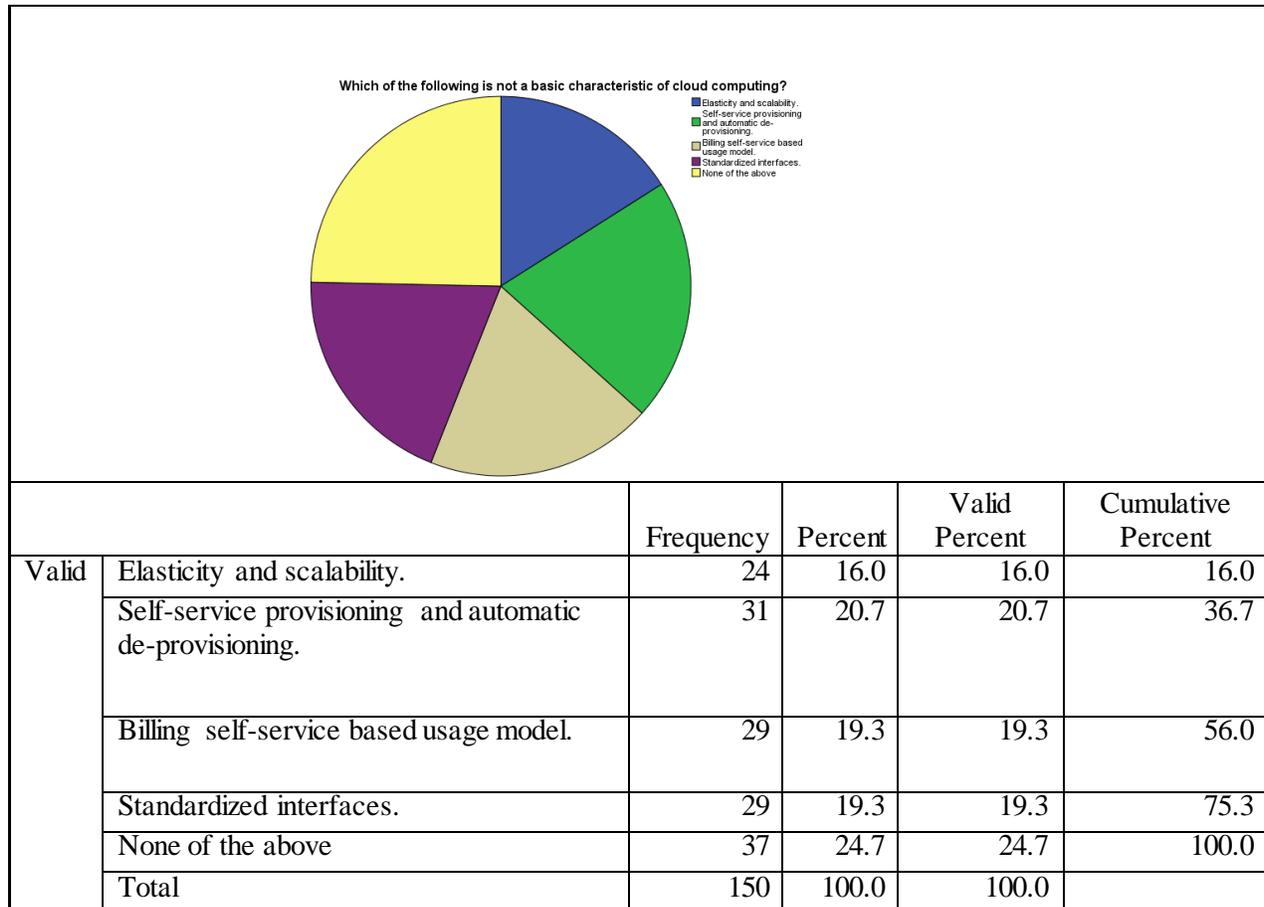
Most of the people in touch and using the cloud-computing device agree that the service is best because it is easier to use and is flexible. The majority was at 30%.

Can health care providers choose to store protected health information in the cloud?			
Statistics			
Can health care providers choose to store protected health information in the cloud?			
N	Valid	150	
	Missing	0	
Mean		1.52	
Std. Error of Mean		.041	
Median		2.00	
Mode		2	
Std. Deviation		.501	
Variance		.251	
Range		1	
Minimum		1	
Maximum		2	
Sum		228	
Can health care providers choose to store protected health information in the cloud?			



A lot of people disagree with the health services department to take on the cloud computing. The reason is due to the threat of leakage of the sensitive data. Almost 52% people opposed this idea.

Which of the following is not a basic characteristic of cloud computing?				
Statistics				
Which of the following is not a basic characteristic of cloud computing?				
N	Valid	150		
	Missing	0		
Mean		3.16		
Std. Error of Mean		.116		
Median		3.00		
Mode		5		
Std. Deviation		1.419		
Variance		2.014		
Range		4		
Minimum		1		
Maximum		5		
Sum		474		
Which of the following is not a basic characteristic of cloud computing?				



None of the above mentioned are a characteristic of the cloud computing. This was the response of our respondents when asked and confronted with this question. Almost 24.7% the highest majority accepts that none of the afore mentioned are the characteristics of the cloud computing.

III. DISCUSSION

The matter of fact is that cloud computing is a new term and is being used in recent years by most of technology users. The services being delivered through The Internet is on its advancement zone. Over the past few years, the internet users prefer to use the internet to take and provide technology services and the transformation of such services through internet medium comes under the definition of cloud computing. The same fact was also examined through our analysis when respondents

were asked about the experience of cloud computing, a low percentage of internet users was found having experienced with cloud computing.

According to [2,5,6], Internet users are benefitted a lot with cloud computing. In business world, the users with cloud computing resources have easy access to different resources and information, regardless of the location they based but with Internet connection only. The same results were found with the researcher analysis, when respondents were asked about eth usefulness of cloud computing in an organization. As the questionnaire survey was close ended, and the results found were quite mixed. According to some respondents, the cloud computing is extremely useful, some revealed its importance as very useful, some marked it as useful and some also examined it not useful at all. However, on average cloud-computing plays an important role in developing technology advancements while delivering different services in different sectors [7].

Cloud computing provides shared information between different users. Social networking sites, web mail, online file storage and business applications are some examples of cloud computing [8]. When respondents asked about the people aware using cloud-computing technology, the result found was not according to the expectations. It was expected that people are aware of its advantages and they are also using cloud computing technology but the results found revealed that only 47.3% know other people using cloud computing technology.

Cloud computing services are provided in different organizations in different forms: infrastructure as service, software as service, and platform as service [9]. Answering cloud-computing services while adopted by managements in respective organizations, the results found were according to the researcher expectations. The results revealed that 52.7% of the organizations use cloud computing. As more organizations are using cloud computing, the cloud computing platform as service allows the user to accomplish different task, such as to write applications to run on specific environment provided by the service provider. The organization despite of using cloud-computing services, also asked about the time they are providing cloud-computing services. The results were also mixed, revealed that 32.7% of respondents claim they are using for 1 year, 26% exposed that they are more than one years and about 26% of respondents stated that they are using cloud computing services for many years.

There are four basic cloud computing delivery models: private cloud, public cloud, community cloud, and hybrid cloud. Private cloud computing services are provided only managed by one organization and provided within the organization. Public cloud computing, on the other hand, is available to public; and owned by the organization that sells these services. Cloud computing services are shared by different organization in the category of community cloud computing. Finally, hybrid computing consists of different infrastructures of cloud computing, such as community, private or public cloud computing. When respondents asked about the type of cloud computing development model, the results found was also mixed one. 24% of respondents use public development mode, 26% use private development cloud mode, 25.3% of

respondents use community development model and 24% of respondents use Hybrid development model. The researcher agreed the results found as it was pointed to be good response because researcher can also focus onto major sectors through such response. Cloud computing services despite using in organizations and in business environment, the service are also being utilized in educational sector. The results found were highly encouraged, it shows that 52.7% of the educational institutions are using cloud-computing services, however the results explored are under expectations. The educational institutions are focusing towards the usage of cloud computing in order to take the benefits of Internet and increasing technological advancements.

Cloud computing has transformed the way of using information technology for cost efficiency, innovation, availability of applications, and fast demand to market. After the rapid development and utilization of cloud computing since 2008, there have emerged economic, legal, service, interoperability, and privacy issues. Therefore, cloud computing system being used by users for many reasons, including flexibility and scalability, cost saving and power saving purposes. The 27.3 respondents revealed that for flexibility and scalability purpose, cloud computing g services are used, about 19.3% respondents revealed that cloud computing is used for cost saving purpose and 23% of them use for power saving purpose.

Cloud computing is being used by the private organizations, educational institutions and business environments but now public bodies are moving towards the utilization of cloud computing. The survey stated that 54.7% of the public bodies prefer using cloud-computing services. Public and governmental bodies are also exploring the possibilities of the cloud computing with almost 54.7% people in the government setups looking to crack into the economy of this cloud computing.

IV. CONCLUSION

Cloud computing has enabled on-demand and convenient access to computer resources, such as storage, networks, servers, services, and applications. Cloud computing affects privacy, and it was explored with the results revealed through the survey. While

asking the effect on the private lives of organizations, the 48% respondents stated that it effects on privacy of organizations. As it was noted above that through cloud computing, the information is shared between different users. Therefore, there remains a high percent of chances that privacy of organization could be leaked and their information could be exposed to other organizations.

However, it is summarized that cloud computing is very useful, delivering a lot of benefits to the private as well as public organizations and other institutions. The cloud computing service is used in different models, and it is not only used for sharing of data but also used for data storage as well. Besides, business environment, health care providers also prefer cloud computing for data storage, and it was revealed through the survey.

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