Cloud Computing Adoption in Albania: An Empirical Study

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Abstract

Cloud technologies have covered the information technology landscape in the recent 15 years. They have been huge enablers of various IT startups and also empower large organizations through increased performance, scalability, and unprecedented resources optimization. Despite the potential for cloud technology to quickly bridge gaps in know-how, infrastructure, and budget that are common in developing countries, the pace of cloud adoption has varied across different regions and countries.. In this paper we report on an empirical study that aimed highlighting the influencing factors of cloud adoption in Albania. Various cloud adoption influencing factors that are reported in the literature have been investigated through a questionnaire filled by 71 members of the Albanian information technology community. Most of them work as software developers and the their respective organizations have an international market scope (offshore services). Through inferential statistics, results show that the most influencing factor of cloud adoption in Albania's case is availability. Other confirmed influencing factors are cost, performance, and security.

Keywords

cloud computing, technology adoption, empirical study

1. Introduction

Cloud computing technologies, coined around 2007 [1, 2], are nowadays a long standing reality of most modern information technology systems. They consists of huge computing resources made largely available through networked devices [3]. Quick provisioning, on demand usage, highly customizable setups, and diverse pricing models are some of their defining behaviors.

Developing countries often lack of financial and human resources that would enable large data centers empowering private or public sector information systems. Cloud computing technologies benefits seem like a perfect fit for them [4], however this doesn't always results the case [2, 5].

Albania, a country still under development, hasn't already adopted in full the various cloud technologies [6, 7]. Similarly to the situation in other countries, there are several factors that influence the adoption or not [8].

In this paper we aim on identifying the specific factors (mostly from a technological point of view) that have influenced the current adoption level in Albania by surveying several members of the information technology ecosystem of the country. Since recent developments in the IT market have consisted on a noticeable shift towards offshore services offering, many IT professionals have invested themselves in increasing their know-how on cloud related technologies.

This shift was needed in order to cope with the actual demand of developing / maintaining cloud based information systems for an international market. Therefore, the adoption level of these technologies cannot be measured solely based on the usage within local organizations, as it also depends on the extent to which IT services companies of varying sizes are incorporating cloud-related practices.

The rest of the paper is organized as follows. Section 2 highlights various related works that report on cloud adoption studies and some previous surveys conducted in Albania in relate to this. Section 3 details the used research model including the adopting factors investigated and the raised hypotheses. Section 4 presents the methodology and results. Lastly, Section 5 concludes the paper.

2. Related Works

Several cloud computing technologies adoption including focused studies related to developing countries have been reported in the literature [9, 10, 2, 8, 11, 6, 7]. They investigate various influencing factors using quantitative and qualitative (interviews) surveys. The most common means of investigation makes use of a questionnaire of information technology actors in the countries in question.

The Technology-Organization-Environment (TOE) is a common framework of conducting empirical research on cloud adoption [12]. It consists of investigations of technological, organization, and environment related influencers. Table 1 shows the factors that were used in some of the consulted related works.

Security and privacy have been shown to prevent cloud adoption based on many studies, while quality of service,

Table 1
Adopting Factors Reported in the Consulted Works

	Al Khater et al. [2]	Sallehudin et al. [10]	Senarathna et al. [9]	Khairuddin et al. [13]	Alite and Shkurti [6]	Kycyku and Ali [7]
Technological						
Quality of Service	x		x	x		
Security	x		x	x	x	x
Privacy	x		x			
Trust	x					
Relative Advantage	x	x	x			x
Compatibility	x	x		x	x	
Flexibility		x	x			
Perception / Knowledge		x	x	x		x
Complexity		x		x	x	
Organizational						
Top Management Support	x				x	
Company Size	x	x			x	
Environmental						
Regulations	x			x	x	
Physical Location	x	x				
Competitive Pressure					x	

availability, and flexibility are some of the positive influencing factors.

In the remaining of this section are mentioned some previous works that investigated cloud adoption in Albania. All of them present case studies of cloud technologies usage and report on surveyed data (through questionnaires). It was noted that the inferential statistics methods were not fully reported for most of them.

Alite and Shurti [6] have conducted a study about the cloud technologies adoption in Albania. They have surveyed the insights reported by the Albanian government and the main telecommunications companies. Furthermore they have conducted a survey of 250 IT professionals working in Albania regarding the factors that have influenced adopting or not adopting the technologies in question. Their results point out that the adoption is at a low level mostly because of privacy and security concerns.

Kycyku and Ali [7] have reported about another study related to the cloud computing adoption in Albania. They have surveyed 51 enterprises located in Albania from different business sectors and of various sizes. Their results show that most of the surveyed enterprises have adopted cloud computing till some degree, but many of them do not report on noticeably perceived benefits. Security and privacy concerns have also been highlighted, while it is pointed out that a hindering factor is the current state of internet services nationwide.

Shkurti [11] has reported on the adoption of cloud technologies from accounting and financial information systems providers in Albania. It is a qualitative study showcasing case studies from major players offering these services in Albania. Results show that cloud technologies are fully adopted from all of them.

In another study, Kruja et al. [14] investigate about the adoption of SaaS systems from small and medium sized hotels in Tirana, the capital of Albania. Their results show that most of the surveyed hotels use traditional systems (non cloud based) so far. When an alternative cloud based solution was proposed to them, most replied positively, however the authors point out differences based on the position of the hotel representative (manager, owner, etc.) and the star rating of the hotel. The study does not report on perceptions / factors reported in other works (i.e. cost, privacy, security, reliability).

3. Research Model

In this section will be detailed the research model (Figure 1) that was used by us in order to investigate the influencing factors in the cloud technologies adoption in Albania. We mostly based this on previous works related to cloud adoption reported in the reviewed literature. Considering that cost may play a significant role in developing countries with smaller market contexts, it was additionally included as a potential influencing factor.
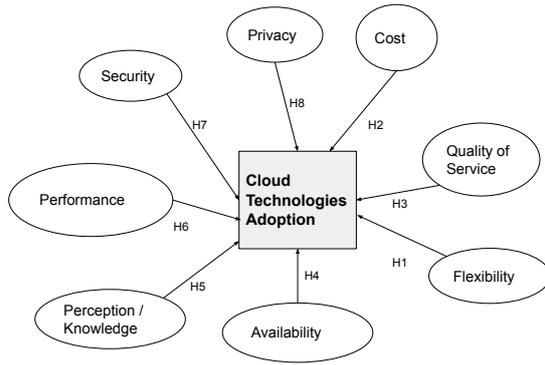
Figure 1: Cloud Adoption Research Model

3.1. Adopting Factors & Hypotheses

Cloud technologies offer a high level of *flexibility*. Al Khater et al. [2] highlight that the cloud may automatically provision computation services independent of human interaction. They also point out that even though usually computing resources are shared in a cloud setting, the availability of monitoring and controlling tools aids on maintaining a high degree of flexibility.

H 1 *Cloud technologies flexibility positively influences their adoption.*

Li et al. [15] point out that cloud adopters offload their computation / information processing needs to public cloud services providers. The main gain of this is a considerable difference related to infrastructure *costs* and *reliability*. On demand pricing schemes empower the scalability of various systems. Infrastructure power may be scaled up on a demand basis. Furthermore, there is no need for dedicated personnel on maintaining / monitoring the related hardware.

However, smaller markets (like Albania) sometimes do not involve very large infrastructure costs and often are hesitant in regards to adopting the cloud, believing that cost benefits might not be noticeable [11].

H 2 *Cost positively influences cloud technologies adoption.*

Cloud technologies need to be elastic. The time needed to perform an infrastructure change shouldn't affect the running information system *quality of service*. As pointed out in [2], end users need not to be aware of the exact location of their data. A high level of abstraction should be offered in order to achieve this. If these criteria are not met, customers may be burdened with needless complexities that would render the adoption of cloud infrastructure unjustifiable.

H 3 *Quality of Service positively influences cloud adoption.*

Availability is a key benefit when adopting cloud technologies. Redundant infrastructures spread over different geographic zones are easier to achieve and maintain [16]. Furthermore, Content Delivery Networks (CDN) affect the speed of access of web based services through connecting end users with infrastructure clusters nearer to them. This is especially true in Albania's case. IT systems in Albania often do not cope well during increased system loads. Electrical power instability also affects the cost related to maintaining a reliable IT infrastructure in certain areas.

H 4 *The availability benefits positively influence cloud adoption.*

Cloud technologies are offered in varied service models [3, 17, 16]. Examples include *Infrastructure as a Service (Iaas)* where computing resources are configurable from the end users at an operating system and application level [3]. *Network as a service (Naas)* enables bandwidth demanding applications (i.e. video conferences) to make use of high quality network infrastructures in the cloud. *Data manipulation and storage (STaaS, DBaaS)* may also be offered as managed cloud services [16].

At an application level, Platform as a service (Paas) and Software as a service (SaaS) are two example service models [17, 3]. Consumers may develop / run their own applications or just make use of a cloud based web application. Other examples include *Email as a service (EaaS), Testing as a service (Taas), API as a service (APIaas)*.

The high diversity of service models requires a good knowledge and perception of them in order to make the right adoptions. Since the data storage is offloaded to the cloud providers in most cases, privacy remains a high concern too [6].

H 5 *Good knowledge and perception of Cloud Services models positively influences cloud adoption.*

Cloud computing architectures are often layered similarly to the OSI model. The most common layers are the infrastructure, platform, and application [18]. One of the main benefits is that it offers quickly scalable high performing computing power. It is possible to execute a particular computation within a predetermined time frame on a cloud-based computing cluster that is exclusively reserved for the duration of the computation.

H 6 *Cloud systems performance positively influences cloud adoption.*

Security and privacy are one of the main concerns related to wide spread cloud technologies adoption. This has also been confirmed problematic in related works that investigated this concern in the Albanian settings [6, 11].

Ali et al. [19] point out that organizations that are used to legacy processes having full control of the data virtually and physically, see a real challenge on handing over their data to third party cloud providers. Proper measures related to these serious concerns would aid on increasing the cloud adopting.

Hybrid cloud models [3] may also aid on smoothing these concerns. Organizations may still have full control of part of the data in this case, but at the same time benefit from the performance, reliability, and availability gains of cloud based technologies.

H 7 *A high level of security measures positively influences cloud adoption.*

H 8 *A high level of privacy positively influences cloud adoption.*

4. Methodology

In the same line with other related works [7, 6, 14, 8, 10, 2], in order to validate the above mentioned hypotheses a survey was conducted.

An online questionnaire was spread online through a combination of social network platforms and contacts in various Albania based IT companies. The non profiling questions of the questionnaire used a 4-point likert scale: 1 -> "Strongly Disagree, 4 -> "Strongly Agree".

The actual questions that aimed on measuring the influencing factors were mostly based on [9].

4.1. Survey Participants

71 members of the information technology community in Albania filled the questionnaire. Table 3 details the participant profiles.

Most of the participants have been in the industry long enough to have the experience needed on judging the cloud technologies benefits and related problems. Most of the respondents are software developers (74.6%), while a couple of them act as managers / team leaders in their respective organizations.

About 70% of the respondents' organizations are in the Banking, Finance, Telco, and marketing industries. Regarding the cloud technologies adoption from their working organizations, 76.1% of them replied that they have already been adopted to some degree. 37 of the participants responded about the market scope of their organizations. 64% of them (24) work in organizations that offer offshore services (international). Due to this, we checked the adoption level in regards to the respective market scope (Table 2). As expected, the level of adoption for companies that have an international scope is larger than the ones that target the local market. However the adoption level for companies that act locally is

still considerable (69.2%). Need to be noted though that market scope data is not available for all questionnaire responses.

Table 2
Organization Market Scope vs Adoption Level

Market Scope	Adoption #	Adoption %
Local	9	69.2%
International	23	95.8%

4.2. Validity and Reliability Check

Before proceeding with the hypothesis testing through statistical analysis a variables validity (accuracy of measure instruments) and reliability (consistency) check was performed.

In the same line with the works of Sallehudin et al. [10] and Al khater et al. [2] we used the "Crombach's alpha" (CA), "composite reliability" (CR), and "Average Variance Expected" (AVE) for conducting the actual checks (Table 4).

A value greater than 0.7 is considered highly reliable for both CA and CR, while a value between 0.6 and 0.7 for the same is considered acceptable. In order for the variables to be valid, they need to have an AVE value of at least 0.5. Considering this we ignored the "Quality of Service" variable due to low CR and AVE values.

4.3. Results

In order to check the relationship between the influencing factors in the above mentioned hypotheses a Spearman's rank correlation including a two-tailed significance test has been performed. This is an usual test that is used for analyzing likert scale questionnaires. The acceptable significance level is less than 0.05.

Results are shown in Table 5. The strength of the relationship has been labeled using the scale mentioned in [13]. The hypothesis H3 couldn't be tested due to the invalidity of the "Quality of Service" variable as mentioned above.

Based on the achieved results there is a strong relationship between "Availability" and "Cloud Adoption". This support the hypothesis H4. A medium relationship has been evidenced between the "Cost", "Performance", and "Security" factors and "Cloud Adoption" (hypotheses H2, H6, H7). The correlation coefficient of H7 has a negative value, security concerns play a hindering role in cloud adoption in Albania. This is in the same line with other works that have investigated this [6, 7].

Results show that "Perception / Knowledge" has a weak relationship with Cloud Adoption (hypothesis H5), while

Table 3
Profile of Questionnaire Participants

Variables		Frequency	Percentage
Work Experience	<1 year	5	7.0%
	1 - 5 years	46	64.8%
	5 - 10 years	13	18.3%
	>10 years	7	9.9%
Organization Size	5 - 20 employees	23	32.4%
	21 - 100 employees	17	23.9%
	>100 employees	31	43.7%
Job Position	Owner / CEO	2	2.8%
	Manager / Team leader	12	16.9%
	Software Developer / QA Specialist	53	74.6%
	DevOps / System Administrator	4	5.6%
Industry Sector	Banking / Finance	20	28.2%
	Media / Telco	16	22.5%
	Marketing	13	18.3%
	Health	4	5.6%
	Tourism	2	2.8%
	Others	16	22.5%
Market scope	Local	13	18.3%
	International	24	33.8%
	N / A	34	47.9%
Cloud Adoption from the Organization	Adopted	54	76.1%
	Not Adopted	17	23.9%

Table 4
Reliability of Research Variables

Variable	Items	CA	CR	AVE
Flexibility	2	0.68	0.78	0.64
Cost	2	0.82	0.79	0.65
Quality of Service	2	0.62	0.55	0.39
Privacy	2	0.697	0.84	0.73
Perception / Knowledge	2	0.611	0.76	0.62
Performance	3	0.66	0.84	0.5
Security	1	N/A	N/A	N/A
Availability	1	N/A	N/A	N/A
Adoption	3	0.839	0.91	0.6

it was not able to show that "Privacy" and "Flexibility" do influence the adoption (hypotheses H1, H8).

4.4. Remarks / Discussion

Need to be noted that the majority of the questionnaire respondents of our study are software developers. They are not always part of decision making related to data governance or cost related issues. Furthermore most of them work in organizations that have an international scope (offshore services), therefore many decisions are not made locally.

This might explain the fact that privacy was not shown to have an influence in the adoption based on the collected answers. Same for "Perception / Knowledge" or "Flexibility". In offshoring settings, when only the software development has been outsourced, infrastructure related decisions might have been made beforehand.

Also most of the participants work in the banking, telco, and marketing industries. Further studies need to investigate the level of adoption in startups other small and medium enterprises. Interesting insights may be also gathered when surveying not technical business actors similarly to the work reported from [14].

5. Conclusion

Cloud technologies are known of various benefits that have made possible many modern information systems. Even though this has been proven from many years of success stories and huge investments from cloud providers, they are is still hesitation on adopting them, particularly in developing countries.

Table 5
Relationship between the influencing factors and cloud adoption

Hypothesis	Relationship	Spearman's Rho	Sig. (2-tailed)	Relationship Strength
H1	Flexibility ->Adoption	0.15	0.203	None
H2	Cost ->Adoption	0.44	<.001	**Medium**
H4	Availability ->Adoption	0.63	<.001	**Strong**
H5	Perception / Knowledge ->Adoption	0.26	0.027	Weak
H6	Performance ->Adoption	0.42	<.001	**Medium**
H7	Security ->Adoption	-0.32	0.006	**Medium**
H8	Privacy ->Adoption	-0.16	0.172	None

In this work we reported on an empirical attempt on investigating influencing factors of cloud adoption in Albania. In the same line with many previous studies, a questionnaire was conducted with 71 participants from the Albanian information technology community.

Results showed a strong positive correlation between "Availability" and "Adoption", while a medium positive correlation with the latest was noticed for "Cost" and "Performance". Similarly to other studies it was shown that "Security" has a negative correlation (hinders) with "Adoption". We used Spearman's rank correlation with a significance level of 0.5. As it is usual with other inferential statistics checks, correlation doesn't definitively mean that there's a causative relation between the factors in question, however tend to show that a relation within them exists.

Our findings also were in the same line with previous cloud adoption investigations targeting the Albanian market [6, 11, 14, 7].

As a limitation, the survey participants were mostly software developers and many of them work in companies that have an international market scope (the systems under development are not located in Albania). Further studies are needed to improve insights on organizational and environmental influencing factors (local scope).

In conclusion, the empirical findings of our study can serve as valuable starting points for researchers and practitioners investigating cloud adoption. By highlighting both the positive and negative factors that influence adoption, our findings can help guide future investigations and inform decision-making in this area.

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