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Benefits, Weaknesses, Opportunities and Risks of SaaS adoption from Iranian organizations perspective

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Abstract

Software as a Service (SaaS) is a new mode of software deployment whereby a provider licenses an application to customers for use as a service on demand. SaaS is regarded as a favorable solution to enhance a modern organization's IT performance and competitiveness which helps organizations avoid capital expenditure and pay for the functionality as an operational expenditure. SaaS has received considerable attention in recent years, and an increasing number of countries have consequently promoted the SaaS market. However, many organizations may still be reluctant to introduce SaaS solutions mainly because of the trust concern they may perceive more risks than benefits. This paper focuses on the analysis of Iranian organizations understand from the benefits, weaknesses, opportunities and risks of SaaS adaption.

Keywords: *Cloud services, Software as a Service (SaaS), Adoption, Binomial test*

1. Introduction

Effectively making use of Information technology (IT) can constitute a sustainable source of an organization's competitiveness. Cloud computing has become a topic of tremendous interest as organizations struggle to improve their IT performance. Cloud services can be viewed as a cluster of service solutions based on cloud computing, which involves making computing, data storage, and software services available via the Internet. According to the U.S. National Institute of Standards and Technology (NIST), major characteristics of cloud services are: on-demand self-service, ubiquitous network access, location independent resource pooling, rapid elasticity, and measured service. Cloud services based on cloud computing can free an organization from the burden of having to develop and maintain large-scale IT systems; therefore, the organization can focus on its core business processes and implement the supporting applications to deliver the competitive advantages [1]. Today, cloud services have been regarded not only as the favorable solutions to improve an organization's performance and competitiveness, but also as the new business models for providing novel ways of delivering and applying computing services through IT. Generally, cloud services can be divided into three categories: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Among them, SaaS is regarded as a potential segment and the utilization of SaaS solutions can lead to many benefits for enterprise users with profound consequences in improving IT performance [2]. SaaS delivers applications' functionality through the media of the Internet as a service [3]. Although many vendors announced that the SaaS adoption can bring out promising benefits, yet some organizations are still reluctant to introduce SaaS solutions due mainly to the trust concern (e.g., data security, network security). In fact, each service model (SaaS, PaaS, or IaaS) has its own security issues and calls for a different level of security requirement in the cloud

environment [2, 4]. Some surveys related to cloud services have enhanced our understandings of the factors involved in adoption of SaaS solutions. For example, in The Adoption of Software as a Service in Small and Medium-Sized Businesses (IDC #205798, 2007), the report remarked that while SaaS has strong growth potential, small and medium-sized businesses have not been adopting SaaS as quickly as originally anticipated. Concern about data security is the factor most frequently cited as discouraging the use of SaaS. This report also revealed that marketing efforts for the SaaS adoption should highlight the issue of trust by enhancing users' perceived benefits as well as decreasing users' perceived risks. The rest of this paper is organized as follows. In Section 2, presents the related work. In Section 3, the SaaS concept has been described. In Section 4, Effective factors on adoption of cloud is detected. In Section 5, the methodology has been defined.

2. Related Works

In [16], presumed that SaaS adoption is a trust issue involving perceived benefits such as pay only for what you use, monthly payments, costs and perceived risks such as data locality and security, network and web application security. The paper has proposed a solution framework that employs a modified DEMATEL approach to cluster a number of criteria (perceived benefits and perceived risks) into a cause group and an effect group, respectively. In [17], attempts to develop an explorative model that examines important factors affecting SaaS adoption, in order to facilitate understanding with regard to adoption of SaaS solutions. An explorative model using partial least squares (PLS) path modeling is proposed and a number of hypotheses are tested, which integrate TAM related theories with additional imperative constructs such as marketing effort, security and trust.in [12], analyzes the opportunities such as Cost advantages, Strategic flexibility, focus on core competencies and risks such as Performance, Economic, Managerial, associated with adopting SaaS as perceived by IT executives at adopter and non-adopter firms. Also developed a research model grounded in an opportunity-risk framework.
In [18], reports on research into SaaS readiness and adoption in South Africa as an emerging economy. Also discussed are benefits of Immediacy, Superior IT Infrastructure, Software Maintenance and Challenges of limited customization, integration Problems, Perceived Security concerns.

3. Software as a Service

SaaS is an outsourcing innovation that transforms IT resources into continuously provided services [5].That is, SaaS delivers an application's functionality through the Internet as a service and thus, eliminates the need to install and run the software on the client's computer [3,6]. Therefore, customers only pay for their use of the software because there are no licensing fees [7, 8]. This unique feature of SaaS has allowed the SaaS market to grow six times faster than the packaged software market and is expected to facilitate further development of SaaS. According to a study by Gartner, SaaS is predicted to become increasingly important in most enterprise application software (EAS) markets. The global SaaS market is expected to reach 12.1 billion USD by 2014, reflecting a compound annual growth rate of 26%. This rapid growth of the SaaS market has had considerable influence on the software market [9]. However, despite this rapid growth of the SaaS market, some of countries with SaaS markets in their initial stages have faced many problems in SaaS adoption. According to [9], in a new SaaS market, inducing SaaS adoption is likely to be difficult due to major inhibitors, such as limited integration and flexibility.
In fact, not everyone is positive about SaaS adoption. Some companies and market researchers are particularly skeptical about its viability and applicability in strong EAS markets such as ERP. The main adoption barriers are said to be reliability issues (i.e., stable access to services), information security and privacy concerns (i.e., security breaches and improper protection of firm data), and process dependence (i.e., performance measurement and service quality) [10]. Also there are vulnerabilities in the applications and systems availability may lead to the loss of valuable information and sensitive data or may be the money. These concerns discourage the enterprises to adopt the SaaS applications in the cloud.

4. Benefits, Weaknesses, Opportunities and risks of SaaS adoption

Understand the benefits, Weaknesses, Opportunities and risk of SaaS as a subjective manner that members collectively assess their cloud adoption. Hence they were identified as follows:

4.1 SaaS Benefits

Access Anywhere: one of the advantages of the SaaS is Applications used over the network are accessible anywhere and anytime, typically with a browser.
Zero IT infrastructure: When delivering business applications via SaaS, the complexity of the underlying IT infrastructure is all handled SaaS vendor.
Software Maintenance: the SaaS vendors are responsible for any software updates; and these happen almost without the customer noticing.
Lower cost: the cost of using SaaS can be significantly lower compared with on premise software, because the clients only pays for what they use.

4.2 SaaS Weaknesses

Immature SaaS: Some feel that the SaaS model is still immature and has yet to prove itself worthy, and are waiting for it all to settle down before moving forwards even if their own infrastructure is far from perfect.
Ambiguous and complex pricing: Often providers offer different rates for their services. Usage costs, support and maintenance can be different. There is no public standard tariff that all providers are required to follow it. So consumers are confused.
Dependence on the SaaS provide: The customer is dependent on the service provider. The service will develop or end based on service provider's actions. Also If the SaaS provider were to go bankrupt and stopped providing services, the customer could experience problems in accessing data and therefore potentially in business continuity.
Dependence on the Internet: In most cases, the service cannot be used offline. The service is available only over the Internet.

4.3 SaaS Opportunities

Cost saving: No purchase of software licenses, reduce staff IT, eliminating the cost of deployment and infrastructure leading to savings in the overall cost of organization.
Strategic flexibility: SaaS adoption provides a great degree of flexibility regarding the utilization of easily scalable IT resources. This flexibility makes it easier for firms to respond to business-level volatility, because the SaaS provider handles fluctuations in IT workloads. In this regard, a client company can leverage a SaaS vendor's capacity to adapt to change.
Focus on core competencies: SaaS adoption will also facilitate firms' refocusing on their core competences. This refocusing is possible by

completely shifting responsibility for developing, testing, and maintaining the outsourced software application and the underlying infrastructure to the vendor [12].
Access to specialized resources: SaaS clients benefit from economies of skills by leveraging the skills, resources, and capabilities that the service provider offers. These specialized capabilities (e.g., access to the latest technologies and IT related Know-how) could not be generated internally if the application were delivered in-house via an on-premises model [12].

4.4 SaaS Risks

Lack of control risk: When the SaaS goes down, business managers can find themselves feeling completely helpless because they suddenly have no visibility of the infrastructure.
Legal issues: There are legal risk include Governance, SLAs, service reliability and availability, etc.
Security risks: data protection and privacy are important concerns for nearly every organization. Hosting data under another organization's control is always a critical issue which requires stringent security policies employed by Cloud providers. For instance, financial organizations generally require compliance with regulations involving data integrity and privacy. Security and Privacy is multi-dimensional in nature and includes many attributes such as protecting confidentiality and privacy, data integrity and availability [15].
Performance risks: Performance risks are the possibility that SaaS may not deliver the expected level of service. Service Down time or slow it can be a huge economic losses inflicted to the organization.
Economic risks: if the client wants to customize the application core, he needs to own it. Even if the client can use the standard core, he may want to build components on top of the core functionality (using APIs) to suit his needs with regard to integration and customization. Higher-than-expected costs may thus arise from the additional or changing future requirements. In addition, increasing costs may emerge from the hold-up, because vendor ownership of the application core provides the vendor with more future bargaining power. This power enables him to increase prices, charge extra costs, or refuse to invest in backward-compatible interfaces for the client's customized code.
Internet resilience and bandwidth: SaaS does not provide application availability and/or network bandwidth as the provider originally stipulated [14]. System outages and connectivity problems can affect

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all customers at once, which implies a high value at risk [13].

Integration risk: risk of problems related to the SaaS application's interoperability and integration with homegrown applications located on the client side. Potential losses due to performance risks can be significant because the day-to-day operations will not be optimally supported [12].

Other Cases	2(3%)
Working experiences (Year)	
1~3	9(14%)
3~5	19(29%)
5~10	29 (45%)
>10	8(12%)

We measured the validity by factor analysis test and reliability by Cronbach's alpha test. According to the results of factor analysis to test kmo = 0.7 and α = 0.8 for the alpha test has demonstrated high reliability and validity. The questionnaire is designed in likert spectrum. We evaluate the normal distribution of the data by the Kolmogorov – Smirnov test. So according to the test results, the values of significance level all components are less than 0/05, so the non-normal data distribution. Therefore, in this study the binomial test was done (Sign-level=0.05, cut point=3) by SPSS software. So the research hypothesis is as follow:

Hypotheses A: Understanding and knowledge of cloud computing and SaaS.

H_{A-1}: Respondents' awareness of cloud computing is desirable.

H_{A-2}: Respondents' awareness of SaaS is desirable.

Due to the novelty of cloud computing, in this case we determine cut point on 2

5. Analysis Methodology

To analyze the factors identified in the previous section, a questionnaire among 192, employees and managers of government agencies and private companies distributed that were the 65 questionnaires were answered with a success. Frequency distribution of respondents' profile in table 1 is shown.

Table 1: Frequency distribution of respondents' profile

Characteristic	Sample composition
Type of Organization	
Governmental organizations	24(37%)
Private organizations	41(63%)
Roles	
Organization manager	4(6%)
IT manager	15(23%)
Computer and IT engineer	36(56%)
R&D	8(12%)

Table 2: The results of testing H_A hypothesis (sig. level 0.05)

Binomial test							
Awareness	Group	N	Category	Observed Prop.	Test Prop	Exact Sig. (2-tailed)	Reject/confirm the hypothesis
Cloud Awareness	1	15	<= 2	.23	.50	.000	Confirm
	2	50	> 2	.77			
	Total	65		1.00			
SaaS Awareness	1	24	<= 2	.37	.50	.046	Confirm
	2	41	> 2	.63			
	Total	65		1.00			

According to table 2 the values of significance level H_{A-1} and H_{A-2} is less than 0.05 and the frequency of observations category (>2) is more, so they are confirmed. Thus, according to all frequency of observations, respondents have confirmed hypothesis A.

Hypotheses B: Respondents believe that the SaaS has many benefits.

H_{B-1}: The SaaS is accessible anywhere at any time.

H_{B-2}: IT infrastructure is not needed for SaaS utilization.

H_{B-3}: SaaS utilization reduce software support and data management tasks dramatically.

H_{B-4}: SaaS utilization is lead to reduce costs.

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Table 3: The results of testing H_B hypothesis (sig. level 0.05)

Binomial test							
Benefits	**Group**	**N**	**Category**	**Observed Prop.**	**Test Prop.**	**Exact Sig. (2-tailed)**	**Reject/confirm the hypothesis**
Access Anywhere	1	24	<= 3	.37	.50	.046	Confirm
	2	41	> 3	.63			
	Total	65		1.00			
Zero IT infrastructure	1	40	<= 3	.62	.50	.082	Reject
	2	25	> 3	.38			
	Total	65		1.00			
Software Maintenance	1	46	<= 3	.71	.50	.001	Reject
	2	19	> 3	.29			
	Total	65		1.00			
Lower cost	1	20	<= 3	.31	.50	.003	Confirm
	2	45	> 3	.69			
	Total	65		1.00			

According to table 3 the values of significance level H_{B-1} and H_{B-4} are less than 0.05 and the frequency of observations category (>3) is more, so it is confirmed. The values of significance level H_{B-3} is less than 0.05 but the frequency of observations category (<= 3) is more, so it is rejected. The values of significance level H_{B-2} is more than 0.05, so it is rejected. Thus, According to all frequency of observations, respondents have rejected hypothesis B.

Hypotheses C: Respondents believe that the SaaS has many Weaknesses.
H_{c-1}: SaaS still has not matured in Iran.
H_{c-2}: SaaS pricing is Ambiguous and complicated.
H_{c-3}: SaaS utilization is leads to Dependency on the Provider.
H_{c-4}: cloud is Completely Dependent on the internet.

Table4: The results of testing H_C hypothesis (sig. level 0.05)

Binomial test							
Weaknesses	**Group**	**N**	**Category**	**Observed Prop.**	**Test Prop.**	**Exact Sig. (2-tailed)**	**Reject/confirm the hypothesis**
Immature SaaS	1	22	<= 3	.34	.50	.013	Confirm
	2	43	> 3	.66			
	Total	65		1.00			
complex pricing	1	39	<= 3	.60	.50	.136	Reject
	2	26	> 3	.40			
	Total	65		1.00			
Dependency on the provide	1	42	<= 3	.65	.50	.025	Reject
	2	23	> 3	.35			
	Total	65		1.00			
Dependency on the Internet	1	24	<= 3	.37	.50	.046	Confirm
	2	41	> 3	.63			
	Total	65		1.00			

86

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According to table 4 the values of significance level H_{C-1} and H_{C-4} are less than 0.05 and the frequency of observations per category (>3) is more, so they are confirmed. The values of significance level H_{C-3} is less than 0.05 but the frequency of observations category (<= 3) is more, so it is rejected. The values of significance level H_{C-2} more than 0.05, so it is rejected. Thus, According to all frequency of observations, respondents have rejected hypothesis C.

Hypotheses D: Respondents believe that SaaS adoption brings many opportunities.
H_{D-1}: SaaS adoption is leads to saving the cost.
H_{D-2}: SaaS adoption provides a great degree of flexibility.
H_{D-3}: SaaS adoption will also facilitate firms' refocusing on their core competences.
H_{D-4}: SaaS adoption Brings Access to specialized resources.

Table 5: The results of testing H_D hypothesis (sig. level 0.05)

Binomial test							
Opportunities	*Group*	*N*	*Category*	*Observed Prop.*	*Test Prop.*	*Exact Sig. (2-tailed)*	*Reject/confirm the hypothesis*
Cost saving	1	23	<= 3	.35	.50	.025	Confirm
	2	42	> 3	.65			
	Total	65		1.00			
Strategic flexibility	1	24	<= 3	.52	.50	.804	Reject
	2	41	> 3	.48			
	Total	65		1.00			
Focus on core competencies	1	57	<= 3	.88	.50	.000	Reject
	2	8	> 3	.12			
	Total	65		1.00			
Access to specialized resources	1	46	<= 3	.71	.50	.001	Reject
	2	19	> 3	.29			
	Total	65		1.00			

According to table 5 the values of significance level H_{D-1}, is less than 0.05 and the frequency of observations category (>3) is more, so it is confirmed. The values of significance level H_{D-3} and H_{D-4} are less than 0.05 but the frequency of observations per category (<= 3) is more, so they are rejected. The values of significance level H_{D-2} more than 0.05, so it is rejected. Thus, According to all frequency of observations, respondents have rejected hypothesis D.

Hypotheses E: Respondents believe that SaaS adoption has many risks.
H_{E-1}: SaaS adoption has many lack of control risks.
H_{E-2}: SaaS adoption has many legal risks.
H_{E-3}: SaaS adoption has many security risks.
H_{E-4}: SaaS adoption has many Performance risks.
H_{E-5}: SaaS adoption has many economic risks.
H_{E-6}: SaaS adoption has Risks related to Internet resilience and bandwidth.
H_{E-7}: SaaS adoption has risk related to problem of the application's integration.

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Table6: The results of testing H_E hypothesis (sig. level 0.05)

Binomial test							
Risks	*Group*	*N*	*Category*	*Observed Prop.*	*Test Prop.*	*Exact Sig. (2-tailed)*	*Reject/confirm the hypothesis*
Lack of control	1	24	<= 3	.37	.50	.046	Confirm
	2	41	> 3	.63			
	Total	65		1.00			
Legal issues	1	36	<= 3	.55	.50	.457	Reject
	2	29	> 3	.45			
	Total	65		1.00			
Security	1	17	<= 3	.26	.50	.000	Confirm
	2	48	> 3	.74			
	Total	65		1.00			
Performance	1	57	<= 3	.88	.50	.000	Reject
	2	8	> 3	.12			
	Total	65		1.00			
Economic	1	54	<= 3	.83	.50	.000	Reject
	2	11	> 3	.17			
	Total	65		1.00			
bandwidth	1	24	<= 3	.37	.50	.046	Confirm
	2	41	> 3	.63			
	Total	65		1.00			
Integration	1	23	<= 3	.35	.50	.025	Confirm
	2	42	> 3	.65			
	Total	65		1.00			

According to table 6 the values of significance level H_{E-1}, H_{E-3}, H_{E-6} and H_{E-7} are less than 0.05 and the frequency of observations per category (>3) are more, so all is confirmed. So values of significance level H_{E-4} and H_{E-5} are less than 0.05 but the frequency of observations per category (<= 3) are more, so they is reject. The values of significance level H_{E-2} more than 0.05, so it is rejected. Thus, According to all frequency of observations, respondents have rejected hypothesis E.

6. Discussion and conclusions

Software as a Service (SaaS) is a relatively new organizational application sourcing alternative, offering organizations the option to access applications via the Internet. We in study focuses on

the analysis of organizations understand of the benefits, weaknesses, opportunities and risks of SaaS. According to the results, Respondents believe that the more main benefits of the SaaS are reducing the cost and permanent availability. Also leading to savings in the overall cost of organization. Immature SaaS and Dependency on the Internet confirmed as a more main Weaknesses of SaaS. They are most concerned about Security and lack of control risks and risk related to problem of the application's integration and Internet resilience and bandwidth. Iranian organization perceived more SaaS risks than SaaS benefits. Thus, they are not tended to adopt SaaS. Emergence of successful SaaS business models can help to adopting the SaaS.

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