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Identification and ranking of relevant criteria for the selection of Software as a Service

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Abstract— **Software as a Service (SaaS) is a model for the provision of application software that allows them to be seen as a service rather than a product. A main challenge for organizations is to understand which applications in their portfolio are more appropriate to deploy in this way. This paper proposes an approach based on the Delphi method to identify and rank the relevant criteria for the selection ofapplications. The results show that the Delphi method is a flexible tool that allows the expansion of knowledge, by identifying relevant criteria to the problem not foreseen by the researcher, andby providing a ranking of importance of those criteria.**

Keywords-component; Delphi method; Software as a Service

I. INTRODUCTION

Software as a Service (SaaS) is a service paradigm related to cloud computing that enables applications to be consumed in the same way as utility services (e.g. electricity or water supply), where payment is made only for the used resources [1]. A challenge that this paradigm poses to organizations is to understand which applications of their portfolio are the most appropriate for SaaS deployment.

Delphi method is a structured group communication process in which participants, while maintaining anonymity, express their views on a subject for which there is an uncertain and incomplete knowledge. [2]. The aim of the method is to get consensus among participants regarding a particular issue,through an iterative process of response, feedback and simple statistical analysis.

The goal of this study is to identify and rankrelevant criteria, using the Delphi method, to choose applications to deploy using theSaaS model. An initial list of criteria identified by literature review was provided in the first round questionnaire. This list of criteria has been refined and increased in subsequent rounds, resulting in a ranking of criteria in accordance with their importance for the problem.

The study is presented in this paper with the following structure: Section II presents the state of the art on SaaS and the Delphi method. Section III focuses on the design and execution of the study, showing its schedule and a summary of relevantexecution details. Section IV presents the results of the study. The Section Vdescribes the metrics that have been used in the validation of this study, and its results. Conclusions and suggestions for future work are given in Section VI.

II. STATE OF THE ART

A. Software as a Service

Gartner [3] defines SaaS as software that is owned, delivered and managed remotely by one or more suppliers. The provider delivers an application based on a group of data definitions and a common set of code that is consumed in a one-to-many model by all consumers to whom the service is hired. To use the service (application) the provider charges a fee that is calculated on a pay-per-use basis (e.g. number of transactions) or a subscription basedon usage metrics (e.g.number of users or duration of use).

Google's or Microsoft'semail services are illustrative examples of what is SaaS. Each email service provider hosts and manages its application codeand data. Users can access their data (in this case, their email) anytime and anywhere over the Internet by using a browser. Overall, there arecommon characteristics to all SaaS implementations: (1) ubiquitous access via the Internet, (2) low level of customization, (3) monitoring by the customer, (4) administration by the supplier (5) licensing model based on usage or subscription, and (6) application lifecycle managed by the provider. [4]

Selecting theapplications with higher priority for SaaS deployment is a complex decision, especially considering that the knowledgeonSaaS it is still somehow incomplete. Therefore it essential to makea careful scrutiny of the problem from various perspectives [5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18], where multiple and diverse criteria are used on the analysis of several SaaS solutions.A critical analysis of these studies was made in the present work by identifying all criteria and, whenever possible, consolidating in one criterion several criteria whosescope or definition was similar. Furthermore,the criteria were also classifiedin distinctcriteria groups, associating those that possess common characteristics. The proposed criteria groups result from a critical analysis of several works [11, 12, 13, 15, 16, 19]. The criteriagroups and the proposed criteria, which were consolidated after the Delphi study, are presented in Section IV.

B. Delphi Method

The Delphi method is a structured group communication process in which participants iteratively and anonymously express their opinion on issues for which there is an uncertain or incomplete knowledge. The purpose of the method is to

obtain the consensus of a set of participants on the analysis of a particular problem, by usingan iterative process that collect opinions, provides feedback, and applies statistical analysis on several rounds.

The Delphi method has been used successfully in several studies for different areas of knowledge [2]. Given the diversity of use cases and also considering other works [20, 21] where the Delphi method is compared with other group techniques, in particular traditional questionnaires and Nominal Group Technique (NGT), we consider that, in the context of the present work, the Delphi method is the most appropriate option available. In this work, the participation of foreign experts was expected and for this reasonNGT was not adequate, since its implementation requires physical meetings. In addition, traditional questionnairesrequire a high number of participants, while the Delphi method can be implemented with a modest number of experts, and typicallyit is valid with 8 to 15 participants. Furthermore the Delphi method is also flexible, allowing a richer collection of data and knowledge generation, for instance, by discoveringnew criteria not previously expected. This fact combined with the iterative nature of the method leads to an improved understanding of the problem under analysis, particularly when there is incomplete knowledge in a certain area, as it is the case with SaaS.

III. DELPHI METHOD DESIGN AND IMPLEMENTATION

The Delphi method is a flexible tool and can be adapted to a wide range of studies. Therefore, it is important to detail and justify the choices that have been made in its design and how it has been implemented.

A. Delphi Method Design

The purpose of this Delphi study is to expand the list of criteria identified by literature review and to create a ranking of these criteria according to their importance to the problem. The adopted strategy, for the initial round of the Delphi study,consisted on the presentation of a list whose items were evaluated by the expert collaborating in this study. This initial list of items is formed by the criteria identified by literature review. This option does not require a high effort to the experts, who thus will be more motivated and focused on the problem.

Another critical point in the design of a Delphi study is the selection of the expert participant panel. This work has extended a previous process [20], which is one of the few references detailing a structured process to form the expert panel as illustrated in Figure 1.

This process has been improved with a more accurate formula to estimate the ability of each individual to participate in the Delphi study. The process starts with the preparation of a Resource Nomination Catalog (RNC)that lists the characteristics that individualsin the expert panel should have. In step 2 names of individuals who meet the requirements are added to the RNC. In step 3the network is widen by obtaining,from the individuals identified in step 2,contacts offurther individuals, whose skills are aligned with the characteristics defined in step 1. Finally, all potential experts are validated, eliminating those that do not have a profile to participate in the study. For this, an evaluation matrix is constructed, by analyzing the curriculum vitae and interests of individuals and by scoringthose according to formula (1).

Eight parameters have been considered to judge individual according to their training, experience and level of knowledge about SaaS. The parameters P_1 and P_2 consider the number of yearsworking inIT and level of academic training. The set of parameters P_3, P_4 and P_5 areobtained by self-assessment regarding the level of knowledge of SaaS and the interest shown by individuals for cloud computing and the SaaS. The set of parameters P_7, P_6P_8considersrespectively the number of SaaS-related events attended by the individuals, the number of relevant events organized and the number of publications or other scientific workonSaaS. Finally, individuals with a score greater than 10 out of a maximum of 20 points were selected as experts for this study.

Although this Delphi study startsby using a predefined list of criteria, it has been decided to take a semi-structured approach [22, 23]. The first round questionnaire consists of open and closed questions. This decision prevents the expert's diversion from the problem and simultaneously allows them to enrich the study. Each of the closed questions matches to one of the identified criteria, and aims to measure its importance to the decision on thedeployment of applications using aSaaS model. This importance is measured on a 5-point scale where 1 represents "Not at all important" and 5 "Very important". Open questions allow experts to contribute with relevant comments that may point out new criteria not previously identified, identify errors or clarify doubts.

One of the features of the Delphi method is the inclusion of feedback from the previous round. Thus, the main difference from the first round questionnaire to the subsequent round questionnaires is the inclusion of a compilation of results from the previous round in the form of graphs and descriptive statistics. These graphs displays the frequency of observations, together with the mean and standard deviation values observed in the previous round for each criterion and for the group as a whole.In this way expertsare informed with the opinions of their peers, before refining their own opinion on those criteria.

Despite being touted as a critical factorwhen implementingthe Delphi method, there is no clear definition of a criterion that determines when the execution of the methodshould end. Nonetheless this typically happens after 2 or 3 rounds. To take a more informed decision, in this work the stopping criterion is analyzed using multiple metrics. An analysis is made on the standard deviation and the coefficient of variation values to concludeif the mean is a good measure forthe expert opinion. A change of less than about 15% indicates that there is stability in the opinion and the consensus was reached [24].In addition, extensive monitoring is made on of the change of opinion and responses stability by analyzing charts constructedwithobserved mean values and standard

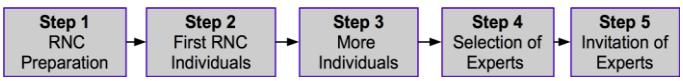

Figure 1. Process for selecting experts.

$$score = 0.2P_1 + 0.2P_2 + 0.05P_3 + 0.05P_4 + 0.05P_5 + 0.1P_6 + 0.15P_7 + 0.2P_8 \quad (1)$$

deviation [25].

B. *Delphi Method Implementation*

The Delphi study took place between 14 May and 27 June, a total of 46 days, with the collaboration of 42 participants. The two rounds were performed during 19 and 17 days respectively, with an interval of 10 days between rounds for data analysis and to prepare the next round. The schedule of execution is illustrated in Figure 2.

Of the 42 participants, 24 have completed the questionnaire of round 1, which represents a dropout rate of 47.19%. This is a typical value in Delphi studies [26]. Of these 24 participants, 2 did not finish the questionnaire, and for this reason it was not possible to consider them in the study. Thus 22 experts who participated in round 1 and that have finished the questionnaire were included in round 2. In the second round 17 responseshave been collected, representing a dropout rate of 22.73%. This is also a usual value for second rounds in Delphi studies [26]. The typical number of participants in a study Delphi ranges from 8 to 30 participants and a homogeneous panel of 10 to 15 experts is sufficient to obtain relevant results in this type of study, while not hindering consensus [2]. Thus, with ahomogeneous panel of 17 participants that have completed the study, we believe that the results are relevant and that are not constrained by the number of participants.

Of the 24 participants that completed the questionnaire in round 1, 54% (13 participants) contributed with a total of 116 comments, totaling an average of 3.2 comments per criterion. Analyzing each criterion individually, the 3 most commented criteria were: "Subscription Cost", "Usage Cost", "Support Cost", with 6 comments for the first one and 5 for the other. The comments of the participants have contributed to the increase in the number of criteria, by including the "Economic Environment" and "Team Motivation" criteria in round 2. In round 2 the number of comments was much lower.Only 9 participants have made comments.These have not beenfurther considered because they are not relevant to the study. The implementation of the Delphi study is summarized in Table I.

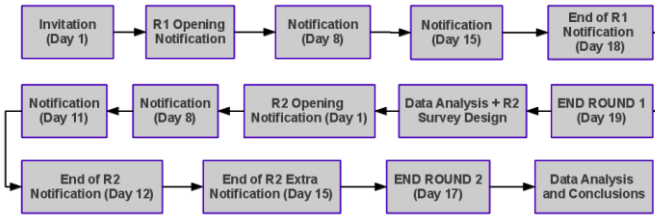

Figure 2. Schecule of the Delphi method execution.

IV. Delphi Method Results

TableII shows the obtained results from this Delphi method study. The "Order" column indicates the ranking of criteria.Rows marked with an asterisk signalsthat the criterionisin the top 10 criteria with the highest mean, after the second round.Rows marked with a double asterisk signalsthat the criterionhas been suggested by the experts in the first round. The mean and standard deviation values shown in the table were obtainedin the second round of this study.

V. Delphi Method Validation

A. *Consensus Stability*

The scale by which participants express their opinion is a 5-point scale where 1 is the lowest possible value (Not at all important) and 5 the highest (Very Important). Results with this scale may be analyzed quantitatively, which allows the use of descriptive statisticsmetrics such as mean and standard

TABLE I. Delphi Method Implementation Conditions

Round	Begin	End	Duration	No. Experts	No. Replies	Dropouts	Criteria	Comments
1	14 May	1 Jun	19 days	42	24	47,19%	36	116
2	11 Jun	27 Jun	17 days	22	17	22,73%	38	9

TABLE II. Delphi Method Results

	Group / Criteria	Mean	Std Dev	Order	CV
T1	Interoperability *	4,36	0,745	7	17,09
T2	Information Portability	4,14	0,77	14	18,60
T3	Information Security *	4,79	0,579	1	12,09
T4	Flexibility	4,07	0,475	18	11,67
T5	Performance *	4,36	0,633	7	14,52
T6	Reliability *	4,79	0,579	1	12,09
T7	Service Stability *	4,57	0,646	4	14,14
T8	Ubiquity	3,64	0,745	32	20,47
T9	Application Offering	3,79	0,579	31	15,28
T10	Usability *	4,5	0,65	5	14,44
T11	Implementation Time	3,86	0,535	27	13,86
T12	Scalability	4	0,679	24	16,98
O1	Technology Knowledge	3,21	0,699	37	21,78
O2	Sponsorship	4,14	0,949	14	22,92
O3	Environment Concerns	2,64	0,929	38	35,19
O4	Social Influence	3,5	0,76	34	21,71
O5	Organization Size	3,64	0,745	32	20,47
O6	Risk Acceptance	3,86	0,663	27	17,18
O7	IT Strategy	4	0,679	24	16,98
O8	Geographic Distribution	3,86	0,864	27	22,38
O9	Team Motivation **	4,07	0,73	18	17,94

	Group / Criteria	Mean	Std Dev	Order	CV
E1	Subscription Cost	4,06	0,659	23	16,23
E2	Usage Cost *	4,24	0,562	10	13,25
E3	Support Cost	3,88	0,6	26	15,46
E4	Exit Cost	4,18	1,131	13	27,06
E5	Implementation Cost	3,47	0,943	35	27,18
E6	IT Resources Savings *	4,41	0,618	6	14,01
E7	Human Resources Savings	4,12	0,857	17	20,80
E8	Economic Environment **	3,82	1,074	30	28,12
B1	Business Proc. Specificity	4,07	0,917	18	22,53
B2	Business Proc. Complexity	4,07	0,829	18	20,37
B3	Strategic Value	4,14	0,535	14	12,92
B4	Business Proc. Maturity	4,07	0,829	18	20,37
B5	Legal Liability *	4,36	0,842	7	19,31
B6	Business Proc. Criticality	4,21	0,579	11	13,75
B7	Information Sensibility *	4,71	0,825	3	17,52
B8	Support Suitability	4,21	0,426	11	10,12
B9	Usage Variation	3,36	0,842	36	25,06

* Top 10 criteria
** Criteria suggested by experts on Round 1

deviation. The average, a measure of the central tendency, considers the group's opinion on a particular issue while the standard deviation, a measure of dispersion, represents the level of agreement of the group on that issue [25]. For instance, whena criterion has an average value of about 4, this means that the group of experts considers that this criterion is important. In addition, if standard deviation is low it means that there is an agreement in the group of experts regarding the importance of this criterion, while if standard deviation is high it means that there is no agreement.

Two types of graphs are used to explore the stability of consensus: the fountain graph and the trajectory graph [25].

The fountain graph shows the mean (x-axis) and the standard deviation (y-axis) observed for all criteria in a given round, providing an overview of the opinion and the level of agreement reached in that round. The fountain graph of round 1 and round 2 are overlaid and their trend line is drawn, as illustrated in Figure 3. By analyzing this graph one concludesthat the level of agreement increasedfrom round 1 to round 2 mainly due to a reduced standard deviation in the second round. The smaller slope of the trend line evident in round 2 (shown with a solid orange line), compared with the slope of the trend line of round 1 (shown with a dashed blue line) denote that the consensus converged more significantly to less relevant criteria. It also shows that the consensus on the most relevant criteria is higher and has less variation.

Figure 4 exhibits the trajectory graphs of this Delphi study. The trajectory graph shows the mean (x-axis) and standard deviation (y-axis) forthe criteria in a group, for both rounds.Each criterion is represented by a vectorline, whichdisplays the evolution of the opinion and the agreement of experts. This vector line should be read from the mark with an "empty"circle (value observed in round 1) to the mark with a "filled" circle (value observed in round 2).Take as an example the criterion "E2" shown in Figure 4. The standard

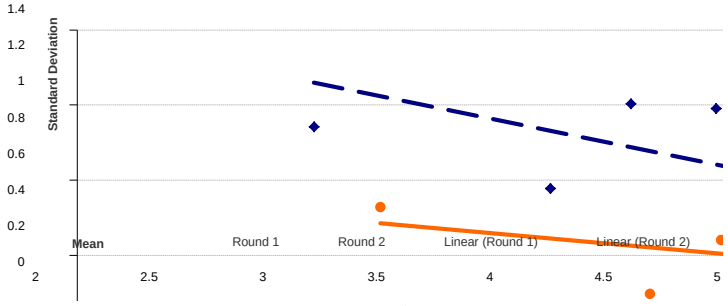

Figure 3. Delphi study fountain graph.

deviation observed in round 1 is 0.884 ("empty" circle) while in round 2 the observed value is 0.562 ("full" circle). Thus, the agreement for this criterion evolves in the positive direction, i.e. the experts between the rounds were more consensual that this criterion has a higher importance.

Analyzing the graphs shown in Figure 4 one confirms that 30 criteria (82.33%) have an evolution of agreement in the positive direction (reduced standard deviation) while forthe 6 criteria (16.67%) identified in Table III, the expert opinion evolves in the opposite direction which points to a change of opinion. Nevertheless, a percentage around or below 15% is compatible with the assumptionthat consensus has been reached, and for this reasonadditional iterations are not necessary [24]. Despite the negative evolutionin the above-mentionedcriteria one should note that the increase of the standard deviation is very small (less than 8%). As such, we believe that the results for these criteria, while not having reached astrong agreement as the other ones, are still relevant. Thus, it was concluded that stability was achieved and agreement among experts has been reached after two rounds.

B. Independence onthe Participants Profile

The final 17 experts were divided into two distinct groups, according to their profiles, as described in Table IV. The aim is

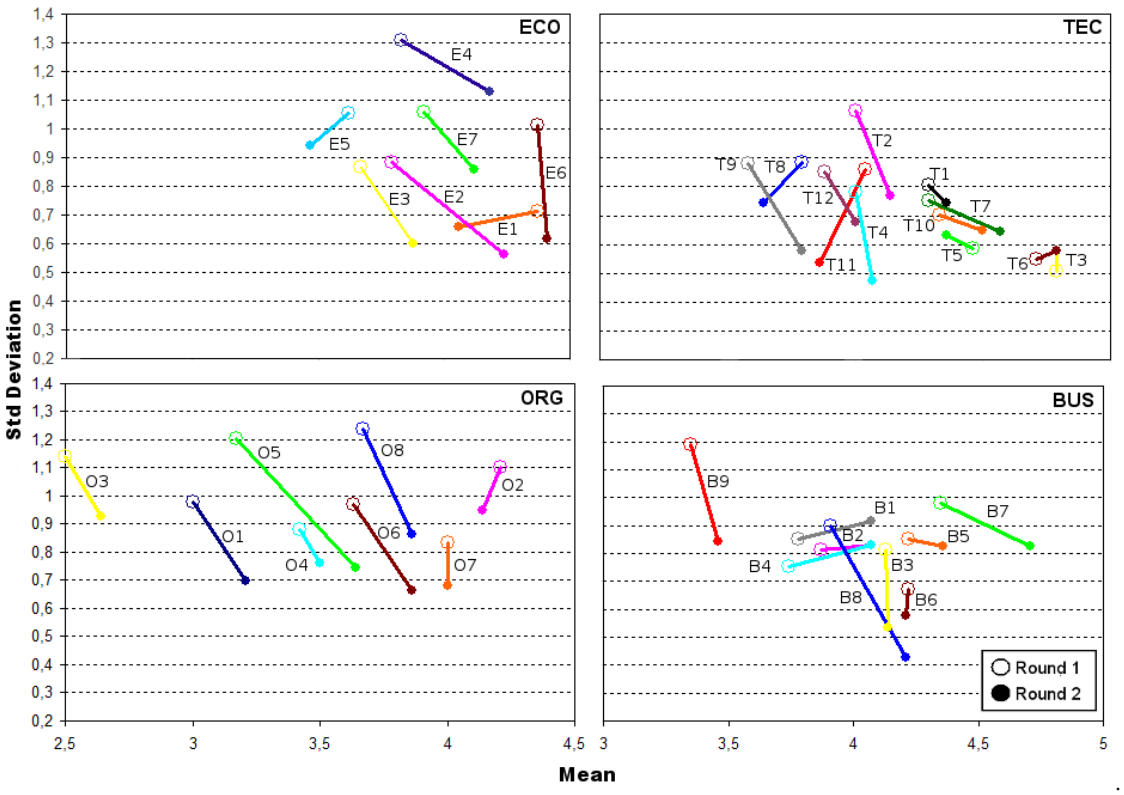

Figure 4. Delphi study trajectory graph.

TABLE III. CRITERIA WITH NEGATIVE EVOLUTION

	Round 1		Round 2		
Criteria	**Mean**	**SD**	**Mean**	**SD**	**Δ SD**
Information Security	4,79	0,509	4,79	0,579	0,07
Performance	4,46	0,588	4,36	0,633	0,045
Reliability	4,71	0,55	4,79	0,579	0,029
Business Proc. Specificity	3,78	0,85	4,07	0,917	0,067
Business Proc. Complexity	3,87	0,815	4,07	0,829	0,014
Business Proc. Maturity	3,74	0,752	4,07	0,829	0,077

ST=Standard Deviation; ΔDP= Standard Deviation variation from round 1 to 2

TABLE IV. EXPERTES PROFILE

Profile	**Description**
Management	Participant with a management degree that typically works in management oriented tasks (Manager, CEO, Business Manager, Sales Manager)
Technical	Participant with an information technologydegree that typically performs functions of a technical nature (Developer, System Architect, Consultant)

to check whether the profile of the participants has an influence on the results of this study. Of the 17 participants, 47.06% have a predominant technical profile and 35.29% present a management profile. The mean values observed for each criterion per profile were analyzed and it was found that there are no significant difference between participants either they havea management or a technical profile. Note that in a5-point rating scale, the highest difference in absolute value (0.67)was observed for theTechnologyKnowledge criterion.

Thus we conclude that in this study, the profile of participants is not a factor that influences results, i.e. results are independent of the participants' profiles.

C. Correct Representation of Opinion

This study also analyzesif the meanis a correct representation ofthe experts' opinion. This validation was performed by analyzing the coefficient of variation[1] of all criteria.

The coefficient of variationis a statistical normalized measure of dispersion that shows the extent of variability in relation to a mean. Values below 30% denote that there is little dispersion, and shows that the mean is a good measure of central tendency.Values above 30% require further investigation with other statistical measures. In this study it was found that the coefficient of variationis less than 30% for all criteria. The only exception is the "Environment Concerns" criterion. However it is considered the least important criterion obtaining the lowest mean value.As such, we cansafely concludethat the meanhas proved to be a good measure for the experts' opinion.

VI. CONCLUSIONS

This work relied on the commitment and collaboration of a homogeneous panel of 17 experts from the beginning to the end of the study. Thus, we believe that the results are relevant and are not constrained by the number of individuals who participated in the study.

In this study, an increase of consensus and its stability between the rounds was observed. For all criteria the agreement is reached and the obtained meanvalues correctly represent experts' opinion. In addition, this values have been proved to be independence of the experts' profile. Even with few criteria with negative evolution (16.67%), when considering the small variation of the standard deviation in absolute terms (less than 0.08), one can conclude that consensus has been reached for the study after the second round and that there is no need to make more iterations.

The final list of criteria and the obtained ranking result from the consensus reached in the study.

Meanwhile the work presented here has evolved, and the Delphi methodis now being usedto enhance adecision support tool, the Analytic Hierarchy Process (AHP) [27], enabling its integration in the construction of the hierarchical structure that supports the AHP.

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REFERENCES

[1] Furth, B. and Escalante, A. (2010) Handbook of cloud computing. pp. 3-19

[2] Skulmoski, G.J. ; Hartman, F.T. and Krahn, J. (2007) The Delphi method for graduate research. Journal of information technology education. 6 pp1.

[3] Gartner (2011) IT Glossary. Available on http://www.gartner.com/technology/it-glossary/saas.jsp, Consultado em Nov 2011.

[4] Ju, J. et al (2010) Research on Key Technology in SaaS. 2010 International Conference on Intelligent Computing and Cognitive Informatics.

[5] Godse, M. e Mulik, S. (2009) An approach for selecting SaaS product, Cloud Computing, 2009. CLOUD'09. IEEE International Conference on. pp.155-158.

[6] Benlian, A. ; Hess, T. and Buxmann, P. (2009) Drivers of SaaS-Adoption – An Empirical Study of Different Application Types, *Business & Information Systems Engineering.*1.(5) pp.357-369.

[7] Herbert, L. and Erickson, J. (2012) The ROI of SaaS, http://www.forrester.com/The+ROI+Of+SoftwareAsAService/quickscan/-/E-RES53885. consulted in Feb 2012.

[8] Balinas, T. , (2012) 100 best cloud & data stasts of 2011 … so far., http://www3.zenoss.com/l/3432/2011-10-18/86TZT consulted in Feb 2012.

[9] Neves, F. et al (2011) The Adoption of Cloud Computing by SMEs: Identifying and Coping with External Factors. CAPSI 2011 - 11ª Conferência da Associação Portuguesa de Sistemas de Informação.

[10] Misra,S. and Mondal, A. (2011) Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding Return on Investment. Mathematical and Computer Modelling, 53(3–4), pp.504-521.

[11] Lu, Y. and Sun, B. (2009) The fitness evaluation model of SaaS for Enterprise Information System, e-Business Engineering, 2009. ICEBE'09. IEEE International Conference on, pp.507-511.

[12] Wu, W.W. (2011a) Mining significant factors affecting the adoption of SaaS using the rough set approach. *Journal of Systems and Software.* 84(3) pp.435-444.

[13] Wu, W.W. (2011b) Developing an explorative model for SaaS adoption. *Expert Systems with Applications*. Elsevier

[1]Coefficient of variation = (Standard Deviation / Mean) x 100

[14] Klems, M. ; Nimis, J. and Tai, S. (2009) Do Clouds Compute? A Framework for Estimating the Value of Cloud Computing. *Designing E-Business Systems. Markets, Services, and Networks*, Lecture Notes in Business Information Processing. 22 pp.110.

[15] Jain, L. and Bhardwaj, S. (2010) Enterprise Cloud Computing: Key Considerations for Adoption, *International Journal of Engineering and Information Technology.*, 2. pp.113- 111.

[16] Khajeh-Hosseini, A. ; Sommerville, I. and Sriram, I. (2010) Research Challenges for Enterprise Cloud Computing, LSCITS Technical Report.

[17] Theti, J. (2012) Realizing the cloud computing value proposition. *Infosys.* April 2009, http://www.infosys.com/cloud-computing/white-papers/Documents/realizing-value-proposition.pdf. consulted in Feb 2012

[18] Smith, M.A. and Kumar, R.L. (2004) A theory of application service provider (ASP) use from a client perspective. *Information & Management*. 41(8) pp.977-1002

[19] Brijesh, D. (2010) Assess enterprise applications for cloud migration using the analytic hierarchy process to evaluate apps for the cloud.

[20] Okoli, C. and Pawlowski, S. (2004) The Delphi method as a research tool: an example, design considerations and applications, Information & Management. 42 pp.15-29.

[21] Rowe, G. and Wright, G.(1999) The Delphi technique as a forecasting tool: issues and analysis. International journal of forecasting. 14.(4) pp.353-375.

[22] Doke, E. and Swanson, N. (1995) Decision variables for selecting prototyping in information systems development: A Delphi study of MIS managers. Information & Management. 29.(4) pp.173-183.

[23] Mulligan, P. (2002) Specification of a Capability-Based IT Classification Framework. Information & Management. 39.(8) pp.647-658.

[24] Day, J. and Bobeva, M. (2005) A generic toolkit for the successful management of Delphi studies, The Electronic Journal of Business Research Methodology. 3(2) pp.103-116.

[25] Greatorex, J and Dexter, T. (2000) An accessible analytical approach for investigating what happens between the rounds of a Delphi study, Journal of Advanced Nursing. 32 pp.1016–1024.

[26] Wright, J. and Giovinazzo, R. (2000) Delphi-Uma ferramenta de apoio ao planejamento prospectivo. Cadernos de Pesquisas em Administração, 1.(12) pp.54-65.

[27] Saaty, T. (2008) Decision making with the analytic hierarchy process. Int. J. Services Sciences. 1.(1) pp.83–98.