Trends in The Study of Cloud Computing: Observations and Research Gaps

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ABSTRACT

In spite of its potential impact on current business world, cloud computing technology still offers fertile and untapped research opportunities. We conduct a systematic literature reviews for the purpose of identifying research gaps in cloud computing literature. It included 188 referred journal and conference articles. Each article was studied carefully to understand its general theme and then extract a pattern to which the article can be classified. Our review efforts led to the identification of four cloud computing general areas: (1) benefits and risks, (2) adoption, (3) outcomes, and (4) its current state from technological and research perspectives. The study is concluded by introducing a number of research questions that need to be empirically and theoretically investigated. This review provides a reference source and classification for IS researchers interested in cloud computing, and identifies research gaps in the literature.

Keywords: cloud computing, systematic literature review, themes, SAAS, IAAS, PAAS.

1. INTRODUCTION AND ANALYSIS METHOD

Armbrust et al. (2009), define cloud computing as the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. It is motivated by the construction of large scale datacenters, new technology trends such as scalability and portability, new business models, and new application opportunities such as mobile interactive applications. While information systems research on cloud computing appears to be an emerging area, cloud computing, in practice, has attracted good deal of providers who look for more business benefits and users who seek services that are offered in low cost. However, these stakeholders are still concerned about how reliable these services are with respect to whether to adopt it or not, its benefits/risks, and its outcomes. For the purpose of identifying research gaps in the cloud computing literature, a systematic literature reviews was conducted based on a structured search process. The key word "cloud computing" was used and the search was limited to ABI/INFORM database and Google scholar. These articles were used to draw a pattern and understand the current research areas in cloud computing to identify non-exploited gaps in research. Next, the results, derived from the literature, are discussed leading to number of research questions. To identify its general theme, each article was investigated carefully. Our review efforts led to the identification of four cloud computing general areas: (1) benefits and risks, (2) adoption, (3) outcomes, and (4) its current state from technological and research perspectives, see Table 1.

2. BENEFITS AND RISKS OF CLOUD COMPUTING

2.1 Studies on general benefits and risks

Three studies analyzed the benefits and risks of cloud computing. Hosseini et al. (2010), in an empirical study, studied the benefits and risks while migrating an IT system to the cloud. Blumehnthal (2011) and Aljabre (2012) discussed risks and benefits from their own viewpoints. Table 2 depicts a list the benefits and risks discussed in these studies.

According to Hosseini et al. (2010), cost savings, one of the most perceived benefits of cloud computing, can be realized by migrating a traditional system to the cloud. They empirically investigated the potential benefits and risks associated with the migration of an IT system in the oil and gas industry from an in-house data center to Amazon EC2 from a broad variety of stakeholder perspectives. They studied a single firm where interviews and documents were utilized to calculate the costs and then compare them to their counterparts in amazon EC2 cloud. Their findings indicated that migrating to the cloud introduces significant savings to the company, especially in those costs related to the support and maintenance.

Moreover, Aljabre (2012) found that the cloud computing can also help overcome high infrastructure costs as well as software costs. This finding can open a venue for new startups overcome the high startup cost entrance barriers. Other benefits may include the ability to use the online web services rather than having to develop the same software components internally. The study, also, noted that cloud computing can help facilitate online collaborations for teams that are geographically separated. Other benefits, indicated by Hosseini et al. (2010), referred to the important role that stakeholders of an organization may play through sharing opinions about existing products/services or even suggesting new ones, which lead to improve their satisfaction. Cost effectiveness, scalability, and opportunity for employees to increase their skills are also examples of other benefits. On the other hand, there are several risks associated with cloud computing. Blumehnthal (2011) suggested that risks and benefits of adopting cloud computing need to be studied for each industry independently as they may differ from one to another. Blumehnthal, also, warned from jumping into the cloud without considering many of the security threats of the technology. Security risks may be associated with each level of the cloud source chain starting from a cloud end user, the organization, and the cloud provider. Other risks may be related to services availability, reliability, policy and regulations. For small businesses, Aljabre (2012) suggests that the benefits of cloud computing exceed their risks. This is due to the fact of improving the added value of the small businesses as well as the cost cuts related to the infrastructures and the costs of operations personnel.

Cloud computing research area	Studies
Benefits and risks	Hosseini et al. (2010), Blumehnthal (2011), Aljabre (2012), Morar et al. (2011), Russell et al. (2010), Wang (2010), Katzan (2010), Rose (2011), Bisong and Rahman (2011), Durowoju et al. (2011), Marston et al. (2011), Berman et al. (2012).
Adoption	Heinle and Strebel (2010), Low et al. (2011), Yang and Hsu (2011), Barnes (2010), Truong and Dustdar (2010), Klems et al. (2009), Vaezi (2012) .
Outcomes	Etro (2011), Truong (2010), Sharif (2011), Bajenaru (2010), Shen (2011), Han (2011).
Current state	Marston et al. (2011), Zhang et al. (2011), Hosseini et al. (2010), Wang et al. (2011), Limbasan (2011), Armbrust et al. (2009), Hoberg et al. (2012).

Table 1 –Research Areas

Benefits	Risks	Studies
Cost savings	Security threats	Hosseini et al. (2010) Aljabre (2012) Blumehnthal (2011)
Opportunity to concentrate on core competencies	Availability	
Elasticity of service	Reliability of service	
Facilitate online collaboration	Regulations	
Modules reusability	Privacy concerns	
	Lack of standards	

Table 2- General Benefits and Risks of Cloud Computing

2.2 Studies on specific risks or benefits

Several studies went into studying one specific benefit or risk of cloud computing. For instance, Morar et al. (2011), in an empirical study, explored the increased efficiency. Two other empirical studies investigated the potential risks of using cloud computing technologies in an organization such as the risks on service availability by Russell et al. (2010), and the risks on privacy by Wang (2010). Durowoju et al. (2011) studied the effect of security and scalability on cloud business processes. Table 3 summarizes some details about these studies. The efficiency, offered by Morar et al. (2011) as a benefit, emerges from the capability of employing virtually unlimited resources depending on the processing power or storage needs. They demonstrated how workflows and cloud resources can be used to achieve speedup for an application without the need of spending large amounts of money on computational resources. A case study was implemented using a workflow for an E-bay data retrieval application. A simulation was then run using a system that demonstrated how a better speedup can be achieved by paralyzing certain sections of the application just by a workflow with a parallel section and without need for high parallel programming skills. They found that their system using cloud parallelism improved scalability and achieved high speedups that were significantly better than not using the system. Russell et al. (2010) evaluated the effects of fluctuations in cloud service availability on the successfulness of decision outcomes in a Decision Support System (DSS) context. For the purpose of their study, researchers used a simulated decision making scenario of a trading stock chosen from S&P500. They used probabilistic model to model resource availability and then evaluated the effect of interruption of service on the outcome of the DSS. The study concluded that availability context information can impact the efficacy of cloud-based DSS. Additionally, there is a probabilistic relationship between decisions related computing resource availability and correct decision outcomes.

Based on the queuing theory, the second stage looked at why scalability is an important consideration in selecting cloud partners and how it can be evaluated. The study found that a cloud service can only prove beneficial to supply partners under a highly secured and highly scalable computing.

Katzan (2010) advices that privacy should be evaluated and understood before adopting cloud computing, and notes that privacy is more complicated in a cloud context in terms of laws,

policies, and consequences. On the other hand, Rose (2011) warned from the risk caused by the tragedy of the commons. That is, organizations sharing a cloud would share the fate with other organizations in the same cloud. So that, if the data or the cloud service of an organization gets attacked, crashes, or consumes higher than expected resources, this would affect the performance of the whole cloud, and may compromise the availability of the cloud for all organizations sharing it

Bisong and Rahman (2011) and Marston et al. (2011) discussed security in cloud computing and suggests steps that an enterprise can take to reduce security risks and protect their resources. Authors recommended that organizations should carefully verify and understand issues related to cloud security, analyze them, and plan for ways to resolve them before implementing cloud computing. Finally Berman et al (2012) surveyed 572 business and technology executives across the globe. The results indicated that although cloud computing was recognized as an important technology, its full potential was not yet exploited. The research identified three categories of "business archetypes", which explains the use extent of cloud computing in organizations. These archetypes are: (1) the optimizers that used cloud to improve efficiency of their business, (2) the innovators that created new cloud based revenue streams within their ecosystem, and (3) the disruptors that created totally different value propositions.

3. ADOPTION OF CLOUD COMPUTING

The second general area of research is the adoption of cloud computing. Four empirical studies identify the organizational determinants of the cloud computing adoption. Low et al. (2011) studied factors that affect the adoption in high-tech industry. Heinle and Strebel (2010) studied the determinants of the adoption of infrastructure as a service (IaaS) in organizations. On the other hand, Yang and Hsu (2011) suggested using a different approach (organization lese) for studying the adoption of cloud computing at an industry level. Vaezi (2012) used the grounded theory approach and collected secondary data sources (e.g. interviews and case studies) to build a general framework that would help better understand cloud computing from different perspectives. Different papers used different theoretical models and different theories to understand the adoption decision. For instance, Heinle and Strebel (2010) developed a theoretical model of IaaS acceptance which focused on drivers and barriers for adopting IaaS.

Study	Benefit/Risk	Context	Main Findings
Morar et al. (2011)	Efficiency	Workflows	Using cloud parallelism improved scalability and achieved higher speed
Russell et al. (2010)	Service availability	DSS	Even minor availability fluctuations caused serious changes in results of DSS
Wang (2010)	Privacy	Cloud Databases	Developed two privacy models for cloud DBs.
Durowoju et al. (2011)	Security/Scalability	Cloud enabled Business Functions	Guidelines to evaluate security and scalability
Berman et al (2012)	Innovation	Processes and Business model	Guidelines to help drive business innovation.

Table 3 – Studies on Specific Risks or Benefits of Cloud Computing

The model was tested using expert's interviews and found that some of the most important drivers are the existence of innovation champions in organizations, and the existence of positive IaaS provider's characteristics such as: relative and absolute size and positive reputation. These factors were found to positively affect IaaS adoption propensity. They also found that some of the most important barriers are the lack of understanding of IaaS and difficulty in cost-benefit evaluation of current IaaS offerings. Low et al. (2011) used Technology-Organization-Environment (TOE) to develop a theoretical model that investigated the factors that hinder firms in the sector of the high-tech industry from adopting the cloud computing. A questionnaire-based survey was used to collect data from 111 firms in Taiwan. Relevant hypotheses were derived and tested. It was found that relative advantage, top management support, firm size, competitive pressure, and trading partner pressure characteristics had a significant effect on the adoption of cloud computing. On the other hand, Yang and Hsu (2011) used a different approach for studying the adoption at the industry level, namely through the lens of "organizing vision", therefore recognizing the role of the industry as a whole on single organizations. They presented a secondary analysis on the institutional processes of forming the cloud computing industry in Taiwan. The authors note that an organization should not be studied individually and that each individual organization belongs to the complex community of organizations in the dialogue process of technology development. The study found that when considering adoption decision, many considerations do not come from within the organization; rather, they are embedded in a larger community network, connecting mainly with internal cycles of interpretation to those at the institutional level.

To help with the adoption decision, a study by Klems et al. (2009) proposed a basic valuation step-by-step guiding framework to estimate the value of cloud computing and compare it to conventional in-house IT infrastructure. Finally, Vaezi (2012) utilized interviews, case studies and published journal articles to analyze the landscape of adopting cloud computing from different perspectives using grounded theory approach. He found different categories of adoption related concepts in the literature. Those categories were: causal conditions, phenomenon (cloud computing), contextual conditions, intervening factors, action/reaction strategies, and consequences of the phenomenon. A theoretical model was built on those categories, and it depicted factors that intervene with adoption, in addition to strategies for successful adoption. Table 4 summarizes the articles reviewed on the area of adoption of cloud computing. In addition to the above studies, two conceptual studies discussed the adoption in particular contexts, suggesting some enablers and barriers of cloud computing. For instance, Barnes (2010) discussed migrating records and Records and Information Management (RIM) to cloud computing, introducing cloud computing to RIM community. Barnes offered some advices on choosing vendor, and noted that cost, security, performance availability, business viability, and legal compliance issues should be evaluated. On the other hand, Truong and Dustdar (2010) studied adoption of cloud computing for small CSE research groups. They have identified several issues that prevent a wide adoption of cloud computing by small CSE research groups such as the non-existence of cost estimation tools, and complexity of using IaaS for researchers. They also identified some benefits such as cost savings, improvement of data sharing, and researches outcomes.

4. OUTCOMES OF CLOUD COMPUTING

The area of cloud computing outcomes is the area that studies the impacts of cloud computing on industry, organizations, and businesses. Most of the investigated studies expressed an optimism vision of the cloud computing on users. These visions were based on personal views but not on empirical observations. At a macroeconomic level, Etro (2011) used a macroeconomic simulation model to study the impact of cloud computing on the European economy in the next few years. Etro found that diffusion of cloud computing can provide a positive annual growth rate, and can help create new jobs every year through the development of new Small and Medium Enterprises (SMEs). There would also be savings in public sector. On the other hand, Truong (2010) developed a research model of cloud computing on an organizational level from a managerial perspective that focused on small businesses. Truong discussed how to use cloud computing to enhance competitive advantage for small businesses, and used the resource-based view of the firm to suggest customizable cloud computing offerings and inter-connectivity. That is, public cloud computing may offer an opportunity to better interconnect and collaborate with partners and customers. Also, the alignment in the strategic use of cloud computing resources within the company and between partners can help organizations achieve a competitive by affecting the innovation and collaboration at the organization. This relation is moderated by Security, intellectual property, and reliability of cloud services. According to the authors this would lead to a rare and un-substitutable competitive advantage.

On a business sector level Sharif (2011) suggested that the promise of cloud computing is not a hype. It can actually revolutionize businesses if it is used and adopted properly, and can create whole new business sectors and industries similar to the Internet revolution by allowing an exponential growth of businesses almost instantly which is facilitated by the scalability of cloud computing and by the flexibility. This can occur by allowing organizations to select software components, hardware, and services based on their requirements. Bajenaru (2010) notes that cloud computing can have an important role in narrowing what he calls the "digital divide" between large enterprises and SMEs.

Study	Theories used	Method	Enablers	Barriers
Heinle and Strebel (2010)	Agency, DOI, IT governance theories	Experts interview	• **Innovation champions** • **Cost transparency** • **Provider characteristics**	• **Unclear definition** • **Difficult cost-benefit evaluation** • **Unknown organizational impact** • **Difficulty in assessing provider risk** • **Service availability risks** • **Lack of standards** • **Legal risks** • **Security** • **Lack of monitoring tools**
Low et al. (2011)	Technology-Organization-Environment Framework	Questionnaire-based survey	• **Relative advantage** • Compatibility • **Top management support** • **Firm size** • Technology readiness • **Competitive pressure** • **Trading partner pressure**	• Complexity
Yang and Hsu (2011)	Organization Vision	Secondary analysis	• **Community discourse, structure, and commerce.** • IS practitioner subculture. • Adoption of core technology. Adoption and diffusion.	
Vaezi (2012)	Developed own model	Grounded Theory	• **Infrastructural Expenses** • **Unpredictable demand** • **Fluctuating demand** • **Ubiquitous demand**	• **Security/Privacy** • **Service Availability** • **Pricing Models** • **Legal Considerations**

Table 4: Empirical Studies on Determinants for Adoption of Cloud Computing.
*note: bold font refer to variables that were found to be significant

With the emergence of cloud computing, SaaS (Software as a Service) SMEs are able to use large-scale systems such as Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) systems, which are too expensive and are exclusively used by large enterprises. Shen (2011) argues that cloud computing can transform Business intelligence (BI) applications to a self-service process, and can improve BI in the areas of information agility, data accessibility, process transformation, cost reduction, scalability, efficiency and performance. This can also help enterprises concentrate on their core competencies. Han (2011) presented his experience in migrating an existing library system to the cloud. The author noted that using cloud computing brought significant cost savings that reached up to 90% as well as to flexibility to the system. The author also believed that the system's availability and security, in general, were better than the system running in-house. Table 5 summarizes the articles on the area of outcomes of cloud computing.

5. STUDIES ON CURRENT STATE OF CLOUD COMPUTING RESEARCH

Many recent studies still present the basic concepts of cloud computing and attempt to identify the current state and possible research areas in cloud computing (Marston et al. 2011, Zhang et al. 2011, Hosseini et al. 2010, Wang et al. 2011). Research agendas suggested in these studies are summarized in Table 6. Marston et al. (2011) introduced cloud computing and studied its strengths, weaknesses, opportunities, and threats. They offered recommendations for business professionals on which applications (e.g. CRMs at salesforce.com) to move to the cloud and which kind of organizations should adopt cloud computing. However it may be early for legacy systems or internally developed applications to be migrated to the cloud. They also suggest that SMEs can benefit from migrating to the cloud more than large organizations due to the cost-benefits. This is due to

the fact that larger organizations may already have cost efficiency in their ICT systems, however they may benefit from virtualization technologies. The authors highlighted some areas of research such as economic benefits, strategy research such as impact of cloud computing on corporate culture, information systems policy, technology adoption and implementation research, and government policy/regulation research. Zhang et al. (2011) surveyed the state-of-the-art of cloud computing. They covered the cloud essential concepts and architectural designs. They also presented a survey of commercial cloud products available, technologies, and some computer science research directions. Other research areas were discussed by Hosseini et al. (2010) as well. They noted that there are many dimensions that need further investigations in the context of cloud computing such as organizational changes (the new role of IT department, the political power change, and the economic and organizational implication of cloud). Additionally, security, legal, and privacy issues, related to the cloud computing, raise the need for more research investigation. Wang et al. (2011) presented a brief summary on the analysis of current gaps and new trends in cloud computing research. They suggest that the cloud computing is one of the most important technological shifts within last decade, and as technology the growth rate is increasing rapidly, it poses huge challenges for companies to stay up-to-date with current state of technology trends. The study categorizes research in cloud computing into technical and organizational research. The authors argues that there are several research issues like socio-technical impact of cloud computing and reliability that has not been addressed much in the literature. Also, there has not been enough attention in research on exploring the managerial processes of cloud computing development. They also call for studying the value of adopting cloud computing services in contrast to using traditional model. They also call for studying the impact of this transformation on productivity and on the organization level as a whole.

Study	Level/Context	Outcomes/Impact
Etro (2011)	Macroeconomic	• Positive annual growth rate, • Help create new jobs every year through the development of new SMEs. • There would also be savings in public sector.
Truong (2010)	Organization	• Offers a prescription for getting an un-substitutable competitive advantage
Sharif (2011)	Business Sector	• Revolutionize businesses • Create whole new business sectors and industries similar to the Internet revolution
Bajenaru (2010)	Business Sector	• Cloud computing can narrow the "digital divide" between large organizations and SMEs
Shen (2011)	BI Applications	• Transform (BI) apps to a self-service process • Improve BI in the areas of information agility, data accessibility, process transformation, cost reduction, scalability, efficiency and performance.
Han (2011)	Library System	• Cost savings up to 90% • More flexibility • Better availability and Security

Table 5: Outcomes/Impact of Cloud Computing Studies.

Although no studies were found that fully applies a design science method (Hevner et al., 2004) to study the cloud, Limbasan (2011) created a CRM prototype. They used several approaches of e-marketing and SaaS features and architectures to create a model for a CRM solution using SaaS Level 2 architecture and distributed database. They developed a modular solution for solving CRM and e-marketing targets in real estate companies. Finally Hoberg et al. (2012) reviewed the literature in cloud computing from a business perspective. They identified four dimensions of research cloud computing: characteristics, adoption determinants, governance mechanisms, and business impact. It was found that although there has been a shift from the technical research dimension of cloud computing that was the main focus of research, there is still not enough empirical research from a business perspective.

6. CONCLUSION AND IDENTIFIED GAPS

The review conducted in this paper shows that a significant part of the research in cloud computing is related to the studies discussing the risks and benefits of cloud computing. Examples of identified risks were: service availability, privacy, security threats, service reliability, lack of regulations, and lack of standards. On the other hand, cost savings, scalability, focus on core competencies, elasticity of service, facilitation of online collaboration, and reusability were identified examples of the research efforts need to be theoretically and empirically supported with statistical evidences for opening new venues for researchers and practitioners. The second area of research is related to the adoption of cloud computing at the organizational level. Our review indicated that no studies were found that deal with adoption at different levels such as individual or industrial. This can be considered a research gap since cloud computing may also impact individuals as well. For instance, SaaS service is widely used as office suits and file storage. What is the extent to which this transformation will change the individuals' activities? Additionally, the factors (or constructs), which may cause successful adoption of cloud computing, are still vague. Moreover, what would be the reasons for failed adoption of the cloud? The outcomes of implementing the cloud computing are another research area identified in this paper. While introduced many optimistic outcomes, existing studies in this arena are still considered personal views that lack empirical observations based on theoretical models. This would bring an opportunity to investigate the possible impacts on the organization adopting the cloud, on the workforce, and on the level of expertise in that organization. Last, several design-science research opportunities

exist for possible investigations. Of course, interesting research problems are those that are derived from practical experiences. While there are many, the obstacle of migrating a legacy system to the cloud can be mitigated if a trusted model exists to guide the process of migrating legacy software into a SaaS model, which may be a problem that organizations may face eventually if SaaS becomes the main platform trend. To conclude, our review study on cloud computing identified a number of research gaps for future research studies. We introduce a number of research questions that need to be empirically and theoretically investigated.

- What factors contribute to the successful adoption of cloud computing in an organization?
- What factors contribute to the adoption of cloud computing services at a personal level?
- What are the effects (outcomes) of adopting cloud computing in organizations, how does it change the organization, and how is that perceived?
- How can an organization build a cloud strategy to achieve a competitive advantage over competitors?
- How can an organization choose a cloud provider or cloud offerings? Which services to migrate to cloud computing? (Model building from design science).

7. REFERENCES

[1] Abdulaziz Aljabre. (2012). **Cloud Computing for Increased Business Value**. International Journal of Business and Social Science, 3(1) Retrieved February 1, 2012, from ABI/INFORM Global. (Document ID: 2550052461).
[2] Alexandru, B. (2010). **Software as a Service and Cloud Computing, a solution for small and medium-sized companies.** Bulletin of the Trasilvania University of BRsov, 3(52).
[3] Amir M Sharif. (2010). **It's written in the cloud: the hype and promise of cloud computing.** Journal of Enterprise Information Management, 23(2), 131-134.
[4] Armbrust, M., A. Fox , R. Griffith, A. Joseph , R. Katz ,A. Konwinski, G. Lee, D. Patterson, A. Rabkin, I. Stoica, M. Zaharia (1977). **Above the Clouds: A Berkeley View of Cloud Computing,** Technical Report No. UCB/EECS-2009-28.
[5] Barnes, F. R. (2010). **Putting a lock on Cloud-Based** Information. Information Management Journal, 44(4), 26-30. ARMA International.
[6] Berman, S. J., Kesterson-Townes, L., Marshall, A., & Srivathsa, R. (2012). **How cloud computing enables process and business model innovation.** Strategy & Leadership, 40(4), 27-35 Chicago.
[7] Blumenthal, M.. (2011). **Is Security Lost in the Clouds?** Communications and Strategies,(81), 69-86.

Study	Research Gaps
Marston et al. (2011)	• Economic benefits of cloud computing • Impact of cloud computing on corporate culture • Information systems policy • Technology adoption and implementation research • Government policy/regulation research.
Hosseini et al. (2010)	• Organizational changes caused by the migrating to the cloud • Political changes in power • Economic and organizational implication of cloud • Security, legal and privacy issues that cloud computing raises
Wang et al. (2011)	• Socio-technical impact of cloud computing • Reliability of cloud computing. • Exploring the managerial processes of cloud computing • Value of adopting cloud computing services in contrast to using traditional model • Impact of adoption on productivity and on the organization as a whole.
Hoberg et al. (2012)	• Customer-perspective of cloud computing • Empirically studying Factors driving or inhibiting the adoption of cloud services • Business impact • Research on structures, processes and employee qualification to govern cloud services from a customer's perspective

Table 6: Areas of Research suggested by studies

[8] Chinyao Low, Yahsueh Chen, Mingchang Wu, (2011), **Understanding the determinants of cloud computing adoption**, Industrial Management and Data Systems, Vol. 111 Iss: 7, pp.1006 – 1023.
[9] Durowoju, O., Chan, H., and Wang, X.. (2011). **The impact of security and scalability of cloud service on supply chain performance.** Journal of Electronic Commerce Research, 12(4), 243-256. Retrieved February 1, 2012, from ABI/INFORM Global.
[10] Dwivedi, Y. K., and Mustafee, N. (2010). **It's unwritten in the Cloud: the technology enablers for realizing the promise of Cloud Computing.** Journal of Enterprise Information Management, 23(6), 673-679.
[11] Etro, F. (2011). **The Economics of Cloud Computing.** Computing, 7(6), 1-12.
[12] G Shen (2010). **Cloud Computing—The Catalyst for Self-Service BI-Cloud,** Information Management New York:Sep 1, 2011. Vol 21, Iss 5 pg20.
[13] Han, Y.. (2010). **On the Clouds: A New Way of Computing.** Information Technology and Libraries, 29(2),87-92.
[14] Heinle, C., and Strebel, J. (2010). **IaaS Adoption Determinants in Enterprises.** (R. Altmann J Rana O F Buyya, Ed.) Computing, 6296 LNCS, 93-104. Springer.
[15] Hevner, A.R., S.T. March, J Park, and S. Ram (2004), **Design science in information systems research**. MIS Quarterly, 28, 75-105.
[16] Katzan, H.. (2010). **On The Privacy Of Cloud Computing**. International Journal of Management and Information Systems, 14(2), 1-12.
[17] Khajeh-hosseini, A., and Greenwood, D. (2010). **Cloud Migration : A Case Study of Migrating an Enterprise IT System**. Information Systems Journal, abs/1002.3, 450–457.
[18] Khajeh-Hosseini, A., Sommerville, I., and Sriram, I. (2010). **Research Challenges for Enterprise Cloud Computing.** Information Security, Retrieved from http://arxiv.org/abs/1001.3257.
[19] Klems, M., Nimis, J., and Tai, S. (2009). **Do Clouds Compute? A Framework for Estimating the Value of Cloud Computing.** (C. Weinhardt, S. Luckner, and J. Stößer, Eds.) Computing, 22, 1-13.
[20] Limbasan, A., and Rusu, L.. (2011). **Implementing SaaS Solution for CRM.** Informatica Economica, 15(2), 175-183. Retrieved February 9, 2012, from ABI/INFORM Global.
[21] Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., and Ghalsasi, A. (2011). **Cloud computing — The business perspective.** Decision Support Systems, 51(1), 176-189. Elsevier B.V.
[22] Mei, L., Chan, W. K., and Tse, T. H. (2008). **A Tale of Clouds: Paradigm Comparisons and Some Thoughts on Research Issues.** 2008 IEEE AsiaPacific Services Computing Conference, 0(i), 464-469. IEEE.
[23] Morar, G., Muntean, C., and Silaghi, G.. (2011). **Implementing and Running a Workflow Application on Cloud Resources.** Informatica Economica, 15(3), 15-27. Retrieved February 1, 2012, from ABI/INFORM Global.
[24] Mustafee, N. (2010). **Exploiting grid computing, desktop grids and cloud computing for e-science: Future directions.** Transforming Government People Process and Policy, 4(4), 288-298. Emerald Group Publishing Limited.
[25] Patrick Hoberg, Jan Wollersheim, and Helmut Krcmar, **The Business Perspective on Cloud Computing - A Literature Review of Research on Cloud Computing** (July 29, 2012). AMCIS 2012 Proceedings. Paper 5.
[26] Rahman, M. and Bisong, A., Syed. (2011). **An Overview of the Security Concerns in Enterprise Cloud Computing.** Network Security, 3(1), 30-46.
[27] Reza Vaezi, **Cloud Computing: A Qualitative Study and Conceptual Model,** (July 29, 2012). AMCIS 2012 Proceedings.Paper 3.
[28] Rose, C.. (2011). **A Break In The Cloud? The Reality Of Cloud Computing.** International Journal of Management and Information Systems, 15(4), 59-63.
[29] Russell, S., Yoon, V., and Forgionne, G.. (2010). **Cloud-based decision support systems and availability context: the probability of successful decision outcomes.** Information Systems and eBusiness Management, 8(3), 189-205.
[30] Truong, D. (2010). **How Cloud Computing Enhances Competitive Advantages: A Research Model for Small Businesses.** The Business Review, Cambridge, 15(1), 59-65.
[31] Truong, H., and Dustdar, S. (2011). **Cloud computing for small research groups in computational science and engineering: current status and outlook.** Computing, 91(1), 75-91. doi:10.1007/s00607-010-0120-1.
[32] Vaezi, R. (2012). **Cloud Computing: A qualitative study and conceptual model,** AMCIS2012 Proceedings, Paper 3.
[33] Vouk, M. A. (2008). **Cloud computing — Issues, research and implementations.** ITI 2008 30th International Conference on Information Technology Interfaces, 16(4), 31-40. IEEE.
[34] Wang, H.. (2010). **Privacy-Preserving Data Sharing in Cloud Computing.** Journal of Computer Science and Technology, 25(3), 401-414.
[35] Wang, W., Rashid, A., and Chuang, H.. (2011). TOWARD **The Trend Of Cloud Computing**.Journal of Electronic Commerce Research, 12(4), 238-242. Retrieved February 14, 2012, from ABI/INFORM Global. [36] Yang, S., and Hsu, C (2011). **The Organizing Vision For Cloud Computing In Taiwan**. Journal of Electronic Commerce Research, 12(4), 257-271. Retrieved February 1, 2012, from ABI/INFORM Global. (Document ID: 2546687231).
[37] Zhang, Q., Cheng, L., and Boutaba, R. (2010). **Cloud computing: state-of-the-art and research challenges.** Journal of Internet Services and Applications, 1(1), 7-18. Springer London.