Cloud Assimilation: An Organizational Learning Approach

Research-in-Progress

Abhijit Chaudhury
Bryant University
achaudhu@bryant.edu

Pratyush Bharati
University of Massachusetts Boston
pratyush.bharati@umb.edu

Introduction

Cloud computing is a popular term for hosted services delivered over the Internet. The term *cloud services* refers to software, platforms, and infrastructure that are sold "as a service," i.e., remotely through the Internet. The cloud service seller has actual energy-consuming servers that host products and services from a remote location, and end users just log into the system. A cloud service has some distinct characteristics that differentiate it from traditional hosting. It is sold on demand, typically by the minute or the hour; it is elastic—a user can have as much or as little of a service as they want at any given time; and the service is fully managed by the provider (the consumer needs nothing but a personal computer and Internet access)[1].

These services are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). The name *cloud computing* was inspired by the cloud symbol that is often used to represent the Internet. Infrastructure as a Service is a provision model in which an organization outsources the equipment used to support operations, including storage, hardware, servers, and networking components. The service provider owns the equipment and is responsible for housing, running, and maintaining it. The client typically pays on a per-use basis. Platform as a Service (PaaS) is a way to rent operating systems, databases, web services, and development environments over the Internet. Software as a Service (SaaS) is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet. Services such as email, CRM and ERP are examples of SaaS[2].

According to McKinsey International (Bughim *et al*, 2007), cloud technology is one of ten technologies that will be having a major impact on the economy. Investment in cloud technology is going strong. Cloud adoption continued to rise in 2013, with 75 percent of those surveyed reporting the use of some sort of cloud platform—up from 67 percent last year. That growth is consistent "with forecasts from GigaOM Research, which expects the total worldwide addressable market for cloud computing to reach $158.8B by 2014, an increase of 126.5 percent from 2011"[3].

This paper is one of the earliest to study cloud technology assimilation. While studies on technology adoption at the user level are many, adoption at the firm level constitutes only around 30% of adoption studies (Williams et al 2009). Our paper studies assimilation at the firm level. Themes from organizational literature that are of interest to us: a firm's ability to learn from environment, knowledge sharing among firms and the enabling role of technology. We included constructs such as absorptive

---

[1] Accessed on 02-20-2014: http://searchcloudcomputing.techtarget.com/definition/cloud-computing

[2] Accessed on 02-20-2014: http://en.wikipedia.org/wiki/Cloud_Service

[3] Accessed on 02-20-2014: http://www.businesswire.com/news/home/20130619005581/en/2013-Future-Cloud-Computing-Survey-Reveals-Business#.Uv1DUM7p_zJ

capacity, adopted from Cohen & Levinthal's (1990) theory of learning; relational capital from Nahapiet & Ghoshal's (1998) social capital theory, and social media usage.

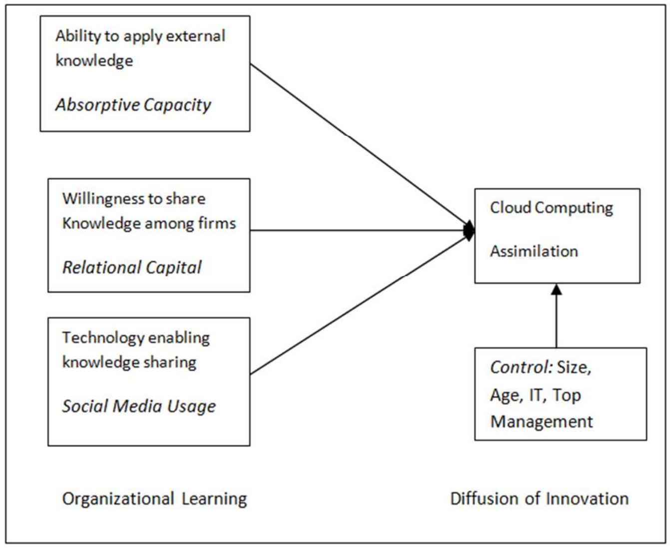

Figure 1: Overall Research Framework

Figure 1 depicts our overall research framework. The rest of the paper is organized as follows: in the next section we provide the theoretical development of our research model and subsequently present the hypotheses. We then describe the survey study. Results from the study are presented next, along with a discussion of the findings. We conclude the paper with future research.

Theoretical Development

Technology Assimilation

Rogers (2003) described the adoption process as an innovation-decision process having five steps: knowledge, persuasion, decision, implementation, and confirmation. For IT software systems, Fichman (1995) listed six assimilation stages: not aware, aware, interest, evaluation/trial, commitment, limited deployment, and general deployment. A similar scale was adopted for this research, which included the following stages: no current activity, aware, interested, evaluated, committed, limited use, and general use.

Diffusion of Innovation

Rogers (1995; 2003) provided the popular framework for diffusion that led to several thousand studies of innovation diffusion spread over different domains, from the technology sector to health care to agriculture. DOI has been applied to study IT adoption at the firm level; for instance, Li and Zhu. Rogers's (2003) diffusion theory is developed around four elements that constitute the process: (1) an innovation, (2) a channel through which the idea of innovation diffuses, (3) time, and (4) a social system in which the diffusion takes place. The focus of researchers has not been uniform over the four elements: they have been primarily concerned with "product perspective" and "people perspective" (Gourville, 2005). The former is concerned with product features that promote rapid diffusion and the latter with features of the social system. In this model we have focused on the "people perspective," that is, the nature of organizations and the social context in which the organization resides.

Based on DOI theory at the firm level (Rogers, 1995), innovativeness is related to such independent variables as individual (leader) characteristics, internal organizational structural characteristics, and external characteristics of the organization. The following organizational features were considered in our model: top management attitude, firm size, firm age and IT size, and industry type.

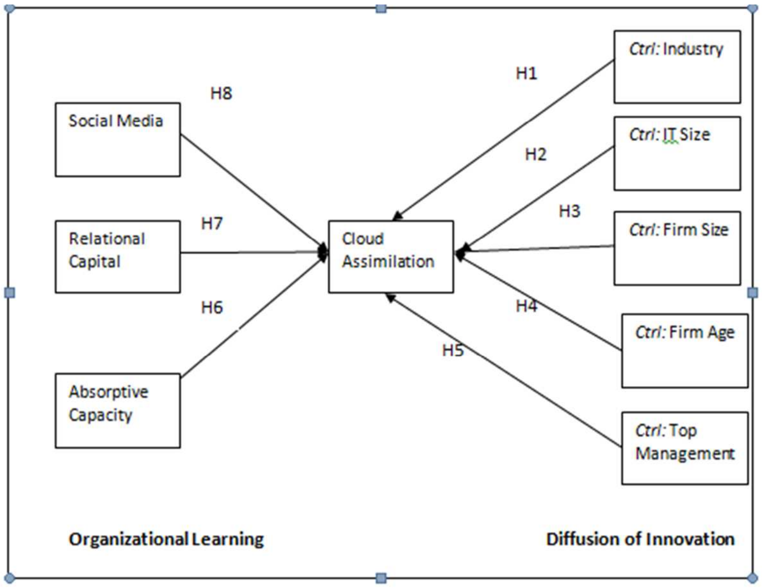

Figure 2: Research Model with Hypotheses

Environmental context is the social and economic arena in which a firm conducts its business—its industry, competitors, and dealings with the public sector (Tornatzky & Fleischer, 1990). The impact of industry characteristics and market structure on IT adoption has been established in several studies including Oliveira and Martins (2010).

Hypothesis 1: Different industries have different impacts on assimilation of cloud technologies.

According to Rogers (2003), size is one of the most critical determinants of innovator profile. It has been well established in the innovation diffusion literature that firm size is often a proxy for resource slack and infrastructure that promote innovativeness (Mohr & Morse, 1977). Mahler and Rogers (1999) found that organizational size, revenue, and people employed are positively correlated with telecommunications technology adoption. Fichman (1995, 2001) used firm's organizational features such as IT size and firm age as antecedents to technology assimilation.

We therefore propose these hypotheses:

Hypothesis 2: Greater IT size leads to higher assimilation of cloud technologies.

Hypothesis 3: Greater firm size leads to higher assimilation of cloud technologies.

Hypothesis 4: Greater firm age leads to higher assimilation of cloud technologies.

The IS research literature is replete with evidence that top management's support is crucial for technology adoption. Jarvenpaa and Ives (1991) and Chatterjee et al. (2002) have established the role of senior management.

Hypothesis 5: Greater top management support leads to higher assimilation of cloud technologies.

Organizational Learning

According to Taylor *et al* (2010), the subject of organizational learning (OL) came into vogue with the seminal work of Cyert & March (1963). It has since blossomed into a broad discipline that has many frameworks and approaches that has roots in different subjects (Crossan, Maurer and White, 2011). Bates (1980) introduced the knowledge-based perspective to OL. Huber (1991) described in details four learning constructs that describe these knowledge related activities that lead to OL. Cohen & Levinthal (1990) introduced the concept of absorptive capacity as the ability of a firm to identify, assimilate and apply external knowledge. Alavi & Leidner (2001) in their survey of the field of knowledge management identified the critical and enabling role played by information technology.

Cohen & Levinthal's concept of absorptive capacity has been used in IT adoption research by Fichman (1995, 2001) and by Liang *et al* (2007). Nahapiet & Ghoshal (1998) and Tsai & Ghoshal (1998) introduced the notion of social capital that allows firms to exchange, transform and apply knowledge available. Relational capital, a dimension of social capital, allows organizations to share knowledge willingly and openly without concern for opportunistic behavior by their counterparts (Tsai & Ghoshal, 1998). The Social Capital theory has been used in IT adoption by Wasko & Faraj (2005). As in Hsu & Sabherwal (2010), we integrate elements from thematically similar theories in OL, all based on knowledge-based view of the firm. Three themes have been of interest to us: a firm's ability to gather and apply knowledge from outside (absorptive capacity), willingness of firms to share knowledge (relational capital) and an enabling technology that promotes this knowledge sharing (social media).

Absorptive Capacity

There is a rich vein of literature examining firms' absorptive capacity and innovativeness. Absorptive capacity is a firm's learning ability. Different variants of this concept have been used in IT research literature on IT-related innovation (Roberts et al., 2012). Cohen and Levinthal (1990) were first to define absorptive capacity as a firm's ability to identify, assimilate, and transform knowledge; they highlighted the critical role it played in firm-level innovation. Ettlie and Pavlou (2006) adopted the ability view in IS research, emphasizing a firm's ability to identify, integrate, and exploit external knowledge. Fichman (1995) and Liang *et al* (2007) establish the relationship between absorptive capacity and IT adoption.

Hypothesis 6: Greater absorptive capacity leads to higher assimilation of cloud technologies.

Relational Capital

Relational capital allows firms to share information willingly and openly without concern for opportunistic behavior by their counterparts (Tsai & Ghoshal, 1998). Relational capital is concerned with the nature of relationships between organizations. It describes the trust between organizations and their commitment to each other (Wasko & Faraj, 2005) and which in turn promotes available knowledge among firms to be shared freely. Y-li Renko *et al* (2001) show that relational capital of a firm promotes innovation.

Hypothesis 7: Greater relational capital leads to higher assimilation of Cloud technologies

Social Media

Social media allows people to maintain large numbers of electronic connections. These connections foster trust, common value, and deep understanding, thus facilitating information sharing (Baehr & Alex-Brown, 2010). Research has shown that social media promotes collaboration (Ransbotham & Kane, 2011), and innovation (Meyer, 2010).

Hypothesis 8: Greater social media assimilation leads to higher assimilation of cloud technologies.

Research Method

We have chosen to test our theoretically derived research model with survey data collected from company employees who are familiar with their organizations' social networks and with assimilation initiatives relating to cloud technologies and social media.

Measures

We developed instruments by adopting and adapting existing measures from previous research (see Appendix I for details). Absorptive capacity, social media, and cloud computing were formative constructs, and relational capital and top management support were reflective. Other factors such as firm size and age were single items. Assimilation of technology items were measured with the Guttman scale (Fichman, 2001).

Our measure for Absorptive capacity is based on Ettlie & Pavlou (2006). We developed our own formative scale based on items from the literature. Our items are based on both the stock and process views of absorptive capacity (Roberts et al., 2012). Two items were chosen from each view so that both the views were equally represented. Prior related knowledge is essential for a firm to accurately determine the potential value of external knowledge to absorb (Roberts et al., 2012). To measure stock of related technology, we chose the firm's previous assimilation of Lotus Notes and web services as both are related information technologies. Prior to the advent of social media technologies, Lotus Notes allowed employees in an organization to exchange user generated content, a key aspect of social media technologies. Our measure for relational capital is based on Leana & Pil (2001) and Yli-Renko *et al* (2001). Top Management Support measure is based on Liang *et al* (2007).

Data Collection

We used a professional market research company based in the United States to administer a web-based survey questionnaire to test the proposed model (Figure 2). The company had over a million members across various industry verticals and professions in the US. The identities of participants were kept confidential by the research company. The population selected for this study was information systems professionals. After rejection of invalid and incomplete answers, we ended up with a final sample size of 300.

TABLE 1: SAMPLE DEMOGRAPHICS

Position of Respondent in Organization	Percentage	Respondent Management Experience (Year)	Percentage
CEO/Senior Manager	26.5		
IT Professional	71.7		
Other	1.8	Less than 10 years	86
		10 Years+	14
		Firm Size	
Industry		Less than 100	27
IT, telecommunications, and professional services	42.8	101-1,000	25.4
Manufacturing and transportation	12.0	1,001-10,000	23
Utilities and other	39.2	10,000+	24.6

Table 1 provides sample demographics in an abridged form. The sample covered a broad range of industries. Most respondents were from the private sector, with around 75 percent from organizations with more than 100 employees.

Results

Assessment of Measurement Model

Reflective Constructs: We tested for reliability and convergent and discriminant validity. Table 2 shows the mean and standard deviation for the indicators of both formative and reflective constructs.

Formative constructs are treated differently from reflective constructs. We assessed the reliability of reflective constructs with Cronbach's alpha coefficient, composite reliability, and significance of item loading (see Tables 3 and 4). The two reflective constructs of top management support and relational capital achieved a score above the recommended value of 0.7 for Cronbach's alpha (Nunally & Bernstein, 1994) and composite reliability (Nunally & Bernstein, 1994) (see Table 4). The cross loadings are shown in Table 3. The values ensure the scale reliability and the internal consistency of the construct in our research model.

For convergent validity of the reflective construct, we examined the factor loadings of the individual measure and the average variance extracted (AVE) (see Table 4). The AVE values for the reflective constructs were above the minimum recommended value of 0.50 (Fornell & Larcker, 1981). For discriminant validity, we have Table 4, which shows that the AVEs for the reflective constructs of top management and relational capital are much greater than their highest squared correlation with any other latent variable, thus ensuring discriminant validity.

Formative Constructs: The formative measurement model is assessed differently. The validity of formative constructs is assessed at two levels: the indicator level and the construct level. The indicator validity is assessed by indicator weights being significant at the 0.05 level (Chin, 1998) and also by the variance inflation factors (VIF) being below 10 (Gujarati, 2003), which is true in this case. Even otherwise, Henseler et al. (2009) strongly recommended that items in formative constructs should not be deleted as long as they are conceptually justified.

Validity at the construct level in terms of inter-construct correlations is assessed by having the correlations be less than 0.7, which is the case (Table 4) (Henseler et al., 2009). At the construct level, nomological validity is ensured by having a relationship among formative constructs as justified in terms of prior literature, which is also the case here (Henseler et al., 2009).

Table 2: Psychometric Properties of Reflective and Formative Constructs

Construct	CA	CR	AVE	Indicator	Mean	SD	Loading(reflective)/ Weight(formative)	VIF
Social Media (formative)	n/a	n/a	n/a	SocMed1	3.8	2.25	.38	1.30
				SocMed2	2.5	2.26	.51	1.40
				SocMed3	5.3	2.09	.46	1.35
Relational Capital(reflective)	0.70	0.87	0.76	Rel1	4.9	1.28	.91	1.57
				Rel2	4.8	1.19	.83	1.40
Absorptive Capacity (formative)	n/a	n/a	n/a	ACap1	5.1	1.28	.55	2.12
				ACap2	4.9	1.35	.13	2.24
				ACap3	5.1	1.21	-.03	2.72
				ACap4	4.9	1.24	.45	1.89
Top Management (reflective)	0.95	0.97	0.94	Mgmt1	4.9	1.56	.97	4.96
				Mgmt2	4.8	1.53	.97	4.96
Cloud Assimilation (formative)	n/a	n/a	n/a	Cloud1	3.7	2.03	.61	1.72
				Cloud2	2.8	1.96	.55	2.02
				Cloud3	2.7	1.83	-.09	1.34
				Cloud4	3.1	1.97	.01	1.67

Our application of the Harmon one-factor test prescribed by Podsakoff and Organ (1986) resulted in six extracted factors from the survey data. Data relating to three formative constructs and two reflective construct were used for factor analysis. The highest variance captured was 33 percent. Thus, no single factor accounts for the bulk of the covariance, leading to the conclusion that common method bias is not an issue.

Table 3 : Loadings & Cross Loadings

Reln	SocMed	FrmAge	Cloud	Itsze	Indust	Reln	SocMed	TPMgm	frmSiz
Acap1	**0.9008**	0.004	0.2484	0.1806	0.0601	0.1966	0.1192	0.3054	0.2206
Acap2	**0.7782**	0.0154	0.2146	0.1664	0.0535	0.2914	0.1234	0.3484	0.1638
Acap3	**0.7755**	-0.0557	0.2139	0.1008	0.0604	0.3205	0.1518	0.2868	0.0987
Acap4	**0.8306**	0.0279	0.2291	0.1861	0.0975	0.259	0.143	0.3692	0.2032
SocMed1	0.1181	0.0593	0.3254	0.2546	0.0573	0.1143	**0.7472**	0.2045	0.2314
SocMed2	0.0594	-0.0606	0.2773	0.0513	0.0909	0.1654	**0.6367**	0.1479	0.0199
SocMed3	0.1421	0.0771	0.3336	0.2589	0.1144	0.086	**0.766**	0.1829	0.2214
Cloud1	0.0778	-0.0608	**0.4965**	-0.0695	0.1473	0.1935	0.2978	0.0958	-0.1081
Cloud2	0.243	-0.1036	**0.8774**	0.1994	0.2743	0.2869	0.3463	0.2394	0.1181
Cloud3	0.1724	-0.107	**0.6617**	0.1173	0.2024	0.1511	0.2145	0.1084	0.0365
cloud4	0.2517	-0.0382	**0.9063**	0.2727	0.1637	0.2137	0.4233	0.2647	0.1924
Indust	0.0863	-0.3014	0.2379	0.0448	1	0.1293	0.1251	0.1275	-0.0963
FrmAge	0.0187	1	-0.0732	0.3369	-0.3014	-0.0427	0.0355	0.0607	0.5309
ITSze	0.2123	0.3369	0.2677	1	0.0448	0.0619	0.2618	0.278	0.8494
frmSze	0.243	0.5309	0.1796	0.8494	-0.0963	0.0394	0.2183	0.2555	1
REL1	0.2174	-0.0457	0.2752	0.0788	0.1204	**0.9115**	0.1549	0.3001	0.0375
REL2	0.2599	-0.0268	0.2063	0.0218	0.1047	**0.8359**	0.1398	0.3645	0.0309
TPMgm1	0.3745	0.0605	0.2855	0.2529	0.1019	0.353	0.2533	**0.9743**	0.2398
TPMgm2	0.3868	0.0576	0.2723	0.289	0.1474	0.3728	0.2279	**0.9717**	0.2579

Taken together the results suggest that the instrument has acceptable measurement properties.

Table 4 : Square Root of AVE & Latent Variable Correlations

	AbsCap	frmAge	Cloud	ITsze	Indust	Reln	SocMed	TPMgm	frmSiz
AbsCap	na								
frmAge	0.0178	na							
Cloud	0.2747	-0.0795	na						
ITsze	0.2114	0.3369	0.2577	na					
Indust	0.0866	-0.3014	0.2443	0.0448	na				
Reln	0.3437	-0.0301	0.2983	0.0608	0.1191	0.75			
SocMed	0.1972	0.053	0.4618	0.2602	0.1298	0.1736	na		
TPMgm	0.3902	0.0607	0.2801	0.2778	0.1273	0.4225	0.2426	0.97	

frmSiz	0.2423	0.5309	0.1674	0.8494	-0.096	0.0256	0.2334	0.2554	na

Notes: Diagonal elements (bold) are the square roots of average variance extracted (AVE) by latent constructs from their indicators, except NA = Not Applicable (for formative construct).

Assessment of Structural Model

PLS structural model results are shown in Figure 3. The structural model was analyzed in several steps. First, the R-square of the endogenous latent variable of cloud assimilation was determined along with the most essential criteria. Chin (1988) considers R-square values of 0.19 and below to be weak and greater values to be medium or substantial. Second, path coefficients were evaluated. The path coefficients needed to be significant at the 0.05 level and the path weights to be more than 0.10 (Urbach & Ahlemann, 1975). Finally, the non-parametric Stone-Geisser test was used to measure the predictive relevance of the model. Positive Q-square values confirmed the model's predictive relevance (Urbach & Ahlemann, 1975).

The model accounts for 31 percent of the variance in cloud technology assimilation. The summary of the PLS analysis is presented in Figure 3 and Table 5. Some of the control variables were shown to have no influence; these included firm size, firm age, and top management. Two control variables, IT size and industry type, came out to be significant at the 5 percent level.

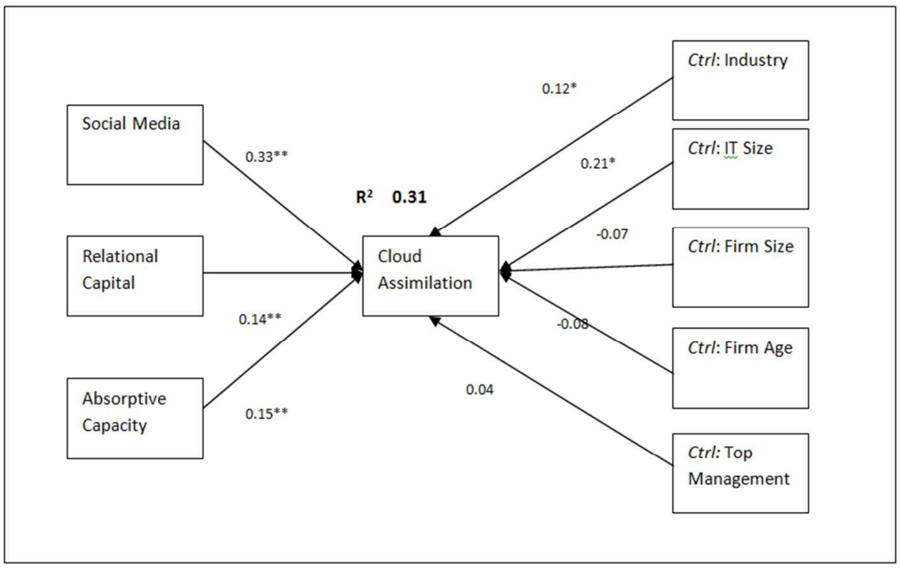

Figure 3: PLS test of the proposed structural model

Hypotheses H6, H7, and H8, which concern the impact of organization learning elements, all came out to be significant. The path coefficient from absorptive capacity of a firm to cloud technology assimilation is positive and significant (β = 0.15, p < 0.01), in support of H6. The path coefficient from relational capital to cloud technology assimilation is positive and significant (β = 0.14, p < 0.01), in support of H7. The path coefficient from organizational social media assimilation to cloud technology assimilation is positive and significant (β = 0.33, p < 0.01), in support of H8. Table 5 summarizes the results from the structural model testing.

Table 5 : Test of Hypotheses			
Hypothesis	**Path Coefficient**	**T Value**	**Result**
Full Model R^2=0.31 **Control Model R^2=0.20** **Cohen's** f^2 = 0.16			
H1: Industry-> Cloud	.121	1.99	Significant Supported at (p<0.05)
H2: IT Size-> Cloud	.209	2.09	Significant Supported at (p<0.05)
H3: Firm Size-> Cloud	-.07	.64	Not Significant
H4: Firm Age-> Cloud	-.08	1.42	Not Significant
H5: Top Mgmt-> Cloud	.04	1.07	Not Significant
H6: Absorptive Capacity-> Cloud	.15	2.69	Significant Supported at (p<0.01)
H7: Relational Capital-> Cloud	.14	2.85	Significant Supported at (p<0.01)
H8: Social Media Use-> Cloud	.33	5.45	Significant Supported at (p<0.001)

Predictive Relevance: The predictive relevance of the structural model was evaluated using the Stone and Geiser Q^2 test for cv-redundancy measure, which estimates the capacity of the model to predict manifest variables. The blindfolding test with omission distance equal to 7 showed that Q^2 values were all greater than zero (Top_Mgmt: 0.855, Abs_Cap: 0.482, Cloud: 0.155, Reln: 0.766; and SocMed: 0.375). Positive Q values provide evidence of the model having achieved predictive relevance, which is the case here.

Conclusion

Goal of our research was to investigate antecedents to cloud technology assimilation in firms. We began with a base model using factors from diffusion of innovation literature (DOI) such as firm size, age, top management support and others. The model was enhanced with factors from organizational learning area. Themes from organizational literature that was of interest to us were: a firm's ability to learn, knowledge sharing among firms and the enabling role of technology. We included constructs such as absorptive capacity, relational capital, and social media usage. Preliminary analysis show that the enhanced model has significantly more explanatory power than the base model based on DOI and the three organizational learning factors have statistically significant impact on the extent of cloud technology assimilation.

As part of future research we intend to study the interaction between the three factors of absorptive capacity, relational capital and social media use. We will investigate if one of these acts as a mediator or moderator for the other. We will also enhance our model with other dimensions of social capital.

REFERENCES

Alavi, M., and Leidner, D. E. (2001) Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues, MIS Quarterly, (25:1), 107-136.

Baehr, C., and Alex-Brown, K. (2010) Assessing the Value of Corporate Blogs: A Social Capital Perspective. *IEEE Transactions on Professional Communication* 53(4), 358-369.

Bates, W. (1998) Organizational Learning and Knowledge Technologies in a Dynamic Environment, Dordrecht: Kluwer Academic Publishers.

Bradford, M. and Florin, J. (2003) Examining the role of innovation diffusion factors on the implementation success of enterprise resource planning systems, "International Journal of Accounting Information Systems", Vol. 4, No. 3, p p205-225.

Bughim, J., Chui, M. and Manyika, J. (2007) Clouds, big data and smart assets: Ten tech-enabled business trends to watch, McKinsey Quarterly, December 2007.

Jacques Bughin, Michael Chui, and James Manyika, (2010), Clouds, big data, and smart assets: Ten tech-enabled business trends to watch, McKinsey Quarterly, 2010.

Chatterjee, Debabroto, Grewal, Rajdeep and Sambhamurthy, V. 2002. "Shaping up for E-Commerce: Institution Enablers of the Organizational Assimilation of Web Technologies," MIS Quarterly, (26:2), pp. 65-89.

Chin, W. W. (1998) The Partial Least Squares Approach to Structural Equation Modeling. In: *Modern Methods for Business Research*. G.A. Marcoulides (ed.). Mahwah, N.J.: Lawrence Erlbaum Associates, Inc. Publishers, 295-336.

Crossman, Mary, Naurer, Cara, White, Roderick (2011) Reflections on the 2009 AMR Decade Award: Do we have a theory of Learning? Academy of Management Review, (36:3), 446-460.

Cohen, W. M. and Levinthal, D. A. (1990) Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly* 35, 128–152.

Cyert, R. M., and March, J. G. (1963) A Behavioral Theory of the Firm, Englewood Cliffs, NJ: Prentice Hall.

DiMaggio, P. and Powell, W. W. (1983) The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. American Sociological Review 8(2), 147-160.

Ettlie, J. E. and Pavlou, P. A. (2006) Technology-based new product development partnerships. *Decision Sciences* 37(2), 117-147.

Fornell, C. and Larcker, D. F. (1981) Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of marketing research*, 39-50.

Fichman, Robert. 1995. "The Assimilation and Diffusion of Software Process Initiative," PhD Dissertation, MIT, Sloan School of Management.

Fichman, R. G. (2001) The Role of Aggregation in the Measurement of IT-Related Organizational Innovation. *MIS Quarterly* 25(4), 427-455.

Garud, R. and Nayyar, P. R. (1994) Transformative Capacity: Continual structuring by intertemporal technology transfer. *Strategic Management Journal* 15, 365–385.

Gourville, John. 2005. "Note on Innovation Diffusion: Rogers' Five Factors," Harvard Business School Press.

Gujrati, D. N. (2003) Basic Econometrics, New York: McGraw-Hill

Henseler, J., Ringle, C. and Sinkovics, R. (2009) The Use of Partial Least Squares Path Modeling in International Marketing. *Advances in International Marketing (AIM)* 20, 277-320.

Hsu, I. C. and Sabherwal, R. (2012) Relationship between Intellectual Capital and Knowledge Management: An Empirical Investigation. Decision Sciences 43(3), 489-524

Huber, G. P. (1991) Organizational Learning: The Contributing Process and the Literatures, Organization Science, (2:1), 88-115.

Inkpen, A.C. and Tsang, E. W. (2005) Social Capital, Networks, and Knowledge Transfer. Academy of Management Review 30(1), 146-165.

Jarvenpaa, S. L. and Ives, B. 1991. "Executive Involvement and Participation in the Management of Information Technology," MIS Quarterly, (15:2), pp. 205-227.

Jeyaraj, A., Rottman, J. W., and Lacity, M. C. (2006) A review of the predictors, linkages and biases in IT innovation research. *Journal of Information Technology* 21, 1-23.

Leana, C. R. and Pil, P. K. (2006) Social Capital and Organizational Performance: Evidence from Urban Public Schools. *Organization Science* 17(3), 353-366.

Liang, H., Saraf, N., Hu, Q. and Xue, Y. (2007) Assimilation of Enterprise Systems: The Effect of Institutional Pressures and the Mediating Role of Top Management. *MIS Quarterly* 31(1), 59-87.

Lichtenthaler, U. (2009) Absorptive Capacity, Environmental Turbulence, and the Complementarity of Organizational Processes. *Academy of Management Journal* 52(4), 822-846.

Levin, D. Z. and Cross, R. (2004) The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer. *Management Science* 50(11), 1477-1490.

Mahler, Alwin, and Rogers, Everett, M. 1999. "The Diffusion of Interactive Communication Innovation and the Critical Mass : The Adoption of Telecommunication Services by German Banks," Telecommunication Policy, (23), pp. 719-740.

Meyer, J. (2010) Does Social Software Support Service Innovation? *International Journal of the Economics of Business* 17(3), 289-311.

Mohr, M. K., and Morse, E. V. 1977. "Size, Centralization and Organizational Adoption of Innovations," American Sociological Review, (42:5), pp. 716-725.

Oliveira, T. and Martins M.F. (2010) Understanding e-business adoption across industries in European countries, ,"Industrial Management & Data System", Vol. 110, No. 9, pp. 1337-1354.

Nahapiet, J. and Ghoshal, S. (1998) Social Capital, Intellectual Capital, and the Organizational Advantage. *Academy of Management Review* 23(2), 242-266.

Nunnally, J. C. & Berstein, I. H. (1994). *Psychometric Theory*, New York: McGraw-Hill

Roberts, N., Galluch, P. S., Dinger, M., & Grover, V. (2012). Absorptive Capacity and Information Systems Research: Review, Synthesis and Directions for Future Research. MIS Quarterly, 35(4), 1-24.

Rogers, E. M. (1995, 2003, 2005). *Diffusion of Innovations*. New York, NY: Free Press.

Tornatzky, L. and Fleischer, M. (1990) The process of technology innovation, Lexington, MA, Lexington Books.

Taylor, G. Stephen, Templeton, Gary, F., and Baker, LaKami, T. (2010) Factors Influencing the Success of Organizational Learning Implementation: A Policy Facet Perspective, International Journal of Management Review, 12, 353-364.

Tsai, W. and Ghoshal, S. (1998) Social Capital and Value Creation: The Role of Intrafirm Networks. *Academy of Management Journal* 41(4), 464-476.

Urbach, N. & Ahlemann, F. (2010). Structural Equation Modeling in Information Systems Research Using Partial Least Squares. Journal of Information Technology Theory and Application, 11(2) 5-40.

Wasko, M. M. and Faraj, S. (2005) Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice. MIS Quarterly 29(1), 35-57

Williams, Michael D., Dwivedi, Yogesh K., Banita Lal, Schwarz, Andrew (2009) Contemporary trends and issues in IT adoption and diffusion research Journal of Information Technology (2009) 24, 1–10.

Yli-Renko, H., Autio, E. and Sapienza, H. J. (2001) Social Capital, Knowledge Acquisition, and Knowledge Exploitation in Young Technology-Based Firms. *Strategic Management Journal* 22(6/7), 587.

Zahra, S. A. & George, G. (2002) Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review,* 27, 185–203.

Zhu, K., Kraemer, K.L. and Xu, S. (2006), The process of innovation assimilation by firms in different countries: A technology diffusion perspective on e-business, "Management Science", Vol. 52, No. 10, pp 1557- 1576.

Appendix 1 : Survey Measures & Sources		
Item	**Dimensions/Questions**	**Source**
SocMed1	What is the status of use and implementation of Blogs?	Guttman Scale-Fichman (2001)
SocMed2	What is the status of use and implementation of Wikis?	
SocMed3	What is the status of use and implementation of social media tools such as LinkedIn and Facebook?	
Acap1	We are able to identify, value, and import external knowledge from our business partners.	Ettlie & Pavlou (2006)
Acap2	We can successfully integrate existing knowledge with new knowledge acquired from our business partners.	
Acap3	What is the status of use and implementation of Lotus Notes?	
Acap4	What is the status of use and implementation of Web services?	
TPMgm1	The senior management of our firm actively articulates a vision for the organizational use of new technologies.	Liang et al. (2007)
TPMgm2	The senior management of our firm actively formulated a strategy for the organizational use of new technologies.	
REL1	We know our suppliers on a personal level.	Leana & Pil (2006);
REL2	In our relationship with suppliers neither side takes any advantage	Autio, Yli-Renko et al. (2001).
Cloud1	What is the status of implementation of Cloud-based IT infrastructure such as servers and storage	Guttman scale-Fichman (2001)
Cloud2	What is the status of implementation of Cloud-based platform such as databases	
Cloud3	What is the status of implementation of Cloud-based office applications	
Cloud4	What is the status of implementation of cloud-based CRM/ERP	
Firm Size (control variable)	What is the total number of people (full time equivalents) employed in your firm?	Fichman (2001), Rogers (2005)
IT Size (control variable)	What is the total number of people (full time equivalents) employed in your information systems department in your firm?	
Age (control variable)	What is the age of your firm in years?	