

# Cloud Computing Adoption Assessment Model (CAAM)

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## ABSTRACT

Cloud Computing (Clouds) is a new trend in IT, not yet widely adopted by large-scale organisations extensive IT infrastructure and complex IT processes as they find it difficult to adopt Clouds. There are technical and socio-technical challenges that need to be addressed before adoption. There is a need for an assessment framework that would assist adoption by evaluating the organisation, its key capabilities and processes affected by Clouds. The objective of this research study is to develop a model that helps organisations in assessing and improving their readiness for Cloud Computing. Primary data in this research are user concerns and issues that are barrier in the adoption of Clouds.

The primary data will be collected using Systematic Literature Review (SLR) methodology. Interviews with senior executives and IT Managers are planned to validate the findings of the SLR. The anticipated outcome of this project will be Cloud Computing Adoption Assessment Model (CAAM) that will help organisations to adopt and integrate Clouds with Enterprise IT, define new capabilities, identify their organisational readiness and provide strategies for successful adoption. The case study method will be used for evaluating CAAM in conjunction with organisations willing to adopt cloud computing. Three case studies are planned to evaluate the effectiveness of CAAM in assessing organisation's readiness for the adoption of Cloud Computing.

## Categories and Subject Descriptors

D. Software D.2 Software Engineering D.2.0 General

H. Information Systems H.4 Information Systems Applications  
H.4.0 General

## General Terms

Management

## Keywords

Cloud Computing, Enterprise Cloud, Cloud Adoption

## 1. BACKGROUND

Information Technology (IT) departments within an organisation provide innovative technological solutions, enabling globalisation. IT managers are on a constant look out for new and

innovative solution that copes up with changing business environment giving competitive advantage. Information Technology solutions such as enterprise resource planning, data mining and the last decade's biggest trend offshore outsourcing, brought numerous benefits to organisations making them leaner and fitter as a global enterprise. These shifts are global phenomena, adopted by organisations across the world.

Cloud Computing (Clouds) emerged as a paradigm in 2007 offering services on-demand. The on-demand service is prevalent in public utilities like gas and electricity, which are available, billed according to usage, and can cater for surge in demand. Cloud Computing enables an organisation to reduce capital expenditure on IT and focuses on delivering support application rather than developing and maintaining large-scale IT systems [Feuerlicht et al. 2010].

Cloud Computing is defined as "the applications delivered as services over the Internet; the hardware and systems software in the data centers that provide those services" [Armbrust et al. 2010]. U.S National Institute of Standards and Technology defines Cloud computing as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" [NIST 2009]. Although Clouds is a new trend in IT offering immense benefits but unfortunately they are not widely adopted.

Small and medium scale firms and start-ups adopt Clouds as it provides access to best available IT resources in low capital expenditure. Technological adoption issues of a large scale organisation with Enterprise IT are different from small-scale organisation [Kim et al. 2009]. Several significant barriers exist for an enterprise once it plans the adoption of the Cloud Computing. The challenges are multi-dimensional as they are financial, technical, operational and organisational in nature [McKinsey & Co. 2009].

The adoption of new technological solution is means of creating change within organisation with an intention to maintain or improve its level of performance [Damanpour and Schneider 2006]. The adoption of the Clouds brings multiple changes in IT practices, staff and organisational capabilities. Organisational capabilities are set of processes used to take advantage of internal and external resources [Ranganathan and Balaji 2007]. These processes are important for adoption of any technology, as an organisation requires technological capabilities to design or use new technology [Chen 1996]. Capabilities and practices that can help in the adoption of the cloud computing are not yet defined. Researchers are skeptical of the fact that all IT operations can or will be migrated to Cloud Computing; however practitioners look at it as a start of new way for IT organisation and department's operations [Creeger 2009].

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The overarching objective of this research project is to develop a Cloud Adoption Assessment Model (CAAM) to help organisations in assessment and improvement of their readiness for Clouds. In accordance to above following research questions are proposed for investigation:

*RQ1: What are the challenges in the adoption of Cloud Computing within enterprises?*

*RQ2: How can an enterprise identify the challenges they face in the adoption of Clouds?*

*RQ3: What are the key organisational capabilities and practices that facilitate successful adoption of Cloud Computing?*

*RQ4: How can a Cloud Computing Adoption Assessment Model be developed, such that it is theoretically and practically robust?*

*RQ5: Is the Cloud Computing Adoption Assessment Model practically vigorous in terms of measuring organisational readiness for Clouds?*

## 2. SIGNIFICANCE

Neal reported technological shortcomings such as control issues, clouds' performance issues, latency, reliability, vendor lock-in and lack of standards which are barriers in the adoption of Clouds [Leavitt 2009]. Kim has reported user concerns as availability (outage), security, privacy issues, support and interoperability [Kim 2009]. Several challenges such as technological uncertainty, demand uncertainty for (software) functionality, institutional influence, strategic importance of the IT application, application integration are reported in the adoption of the Cloud services [Xin and Levina 2008]. Legal compliance, absence or presence of innovation champions within the IT departments, difficulties in cost benefit evaluation of Cloud services, fear of organisational change and issues in Cloud vendor selection are reported in literature [Heinle and Strebel 2010]. Besides technological issues several socio-technical factors such as concerns about cost, confidentiality, control, impact on work practice and limitation of business models pose challenges when considering adoption of the Clouds [Khajeh-Hosseini et al. 2010]. Many feel that even a lack of an understanding of Cloud Computing itself is a barrier in its enterprise-wide adoption [Misra and Mondal 2010]. These challenges and issues are more of viewpoints and lack empirical evidence.

Technology adoption has always been considered as a social issue putting user's acceptance as a significant issue. Technology Acceptance Model (TAM), proposed by Davis, has been widely used for investigating user adoption of technology, information systems and Enterprise Resource Planning systems. The original TAM measures impact of four variables, perceived ease of use (PEU), perceived usefulness (PU), attitude towards use and behavioral intention to use (BI) upon actual usage of the technology [Davis 1989]. It has been reported that PEU & PU are worse predictors of actual usage than BI [Turner et al. 2010]. However due to TAM's limitations, researchers have extended TAM for evaluating Enterprise Resource Planning (ERP) application adoption, reporting their model ability to assess user but not organisation as a whole [Amoako-Gyampah and Salam 2004]. It is difficult to carry out an organisational assessment using the existing technology adoption models; as they specifically do not address Clouds or its services.

The adoption of the Clouds will have an impact on accounting, security, compliance, project management, system support, work of end users, authority of the IT department, IT governance, IT provisioning, IT procurement, and IT policies [Khajeh-Hosseini, Greenwood and Sommerville 2010; Yanosky 2008]. There exists a need to identify capabilities and practices that will have an effect before the adoption of the Clouds within existing Enterprise IT. Therefore, there is a need for a comprehensive adoption assessment framework that would assess an organisation, its key capabilities, identify levels of organisational readiness, and provide strategies for successful adoption.

## 3. RESEARCH METHODOLOGY

The proposed study design combines multiple techniques for data collection, validation, and framework development for answering the research questions presented in section 1. The study will empirically investigate the perceptions and viewpoints of organisational stakeholders regarding challenges, hurdles/barriers of adoption of the Clouds. The study design has been divided in three distinct phases.

### 3.1 Primary data collection

Primary data in this research includes the challenges, user concerns and issues that are barrier in the adoption of Cloud Computing. Systematic Literature Review (SLR) methodology will be used to collect primary data. SLR is a mean of evaluating and interpreting all available research relevant to a particular research question, topic area, or phenomenon of interest [Kitchenham and Charters 2007]. SLR has three main phases: planning, conducting and reporting data analysis of the review, making them different from ordinary literature surveys [Brereton et al. 2007]. The SLR will extract the challenges in the adoption of the Cloud Computing within enterprise, from existing literature. The choice to carry out SLR is based on the premise that SLR provides greater level of validity of its findings than any other studies [Mulrow 1994].

Interviews with C-level Executives (CIOs, CTOs etc) and IT Managers are planned for validation of the adoption challenges extracted by the SLR. Interviewees will be provided with a comprehensive list of challenges identified through the SLR and will be briefed on importance of their opinion as contribution in overcoming the challenges of the adoption of Clouds in an enterprise. To avoid selection bias, IT Manager/C-Level Executives will be selected thru a criterion of experience with enterprise IT and Clouds' implementation.

The interview questionnaire will be designed to elicit enterprise demographics (companies' capital, employees etc), respondents experience, challenges/ barriers faced by them in the adoption of Cloud Computing and their views on the practices, which could help in overcoming the challenges of the adoption of Clouds. Thus, an expert-opinion on the capabilities and practices for assessment framework will be available. Pilot study will be conducted to validate questionnaire.

### 3.2 Development of CAAM

The Cloud Computing Adoption Assessment Model (CAAM) shall be developed using top-down approach. Firstly, the CAAM will assist in the identification of the challenges within an organisation that is seeking integration of Clouds within enterprise IT and secondly it would define capabilities and practices that will help to overcome the identified challenges.

CAAM will define higher-order capabilities, sub-capabilities and operational routines that are required to integrate Cloud Computing within Enterprise IT for an organisation. This approach is an adaptation from Feeny and Willcocks [1998] and Ranganathan and Balaji [2007] approaches for developing and defining IT capabilities within organisation.

### 3.3 CAAM's evaluation

The case study method is a powerful evaluation tool that provides useful real world information [Yin 2002]. The CAAM will be evaluated using case study approach carried out in conjunction with organisations willing to adopt Cloud Computing for their IT needs. Three case studies are planned to validate higher-order capabilities and the implementation of operational routines developed under CAAM. Case studies will help to evaluate the effectiveness of CAAM in the adoption of Cloud Computing.

To reflect on CAAM's shortcomings and further improvement, focus group sessions with case study participants will be conducted. The evaluation criteria will be ease of use and user satisfaction of CAAM to keep focus group sessions structured. Conducting focus groups is a choice because it helps in openness in interaction with group members [Morgan and Spanish 1984]. The case study research method will illustrate CAAM's suitability in the real world environment and point out room for improvements.

## 4. EXPECTED OUCOME

The anticipated outcome of this project will be Cloud Computing Adoption Assessment Model (CAAM) to assist enterprises in the adoption of Cloud Computing. This work aims to develop a well-understood and rational adoption assessment model, grounded on expert views, supported by case studies generalized to real world companies. This will help companies to avoid unsuccessful adoption of Clouds rather than integrating it with existing IT. The newly promised framework will help this transition via publication in magazines and industry newsletters.

Organisations will benefit by having access to the CAAM that defines capabilities and measures their readiness for cloud computing. This will provide IT Managers with the ability to understand the strengths and weaknesses of current Cloud service offering, implement Clouds and to address areas that require attention. The CAAM will assist organisations in gaining business benefits improving their international competitiveness. Ultimately, this work will put enterprises in a better position to deliver what customer wants.

Theoretically and practically robust framework that helps in defining capabilities and process is non-existent, as it will be an advancement of existing knowledge seeding Clouds growth. "Everything as a Service" is not far from becoming a reality as Cloud Computing and its services are increasing [Henry 2009]. Thus the development of CAAM is indeed timely to support adoption of this beneficial technology paradigm.

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