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Understanding the impact of cloud-based services adoption on organizational flexibility: An exploratory study

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An exploratory study

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Abstract

Purpose – The purpose of this paper is to explore the factors that drive the adoption of cloud-based services and further understand the impact of this adoption on the organizational flexibility. This study presents information technology executive's perspective and discovers new constructs of organizational flexibility that can be achieved due to the adoption of cloud-based services, which is the main contribution of this paper.

Design/methodology/approach – This study uses in-depth interview approach. Total 21 Indian cases were studied by interacting with respondents having similar profiles (i.e. CIOs, CTOs, technology heads, and systems managers). Based on the literature review a semi-structured questionnaire was prepared and administered through in-depth interviews.

Findings – Analysis of data reveals that cloud-based services provide relative advantage in terms of scalability, accessibility, and on-demand deployment of services within no time. Easy to use interface, experience, and expertise of the cloud service provider as well as support from top management plays important role in the cloud adoption decision. Further the study also identifies that no matter which model of cloud-based services (software-as-a-service (SaaS), platform-as-a-service (PaaS), or infrastructure-as-a-service (IaaS)) is used; cloud-based services' adoption impacts organizational flexibility, which can be divided into four categories, namely, economic flexibility, process flexibility, performance flexibility, and market flexibility.

Research limitations/implications – This is an exploratory study conducted through in-depth interviews hence the results can further be verified through a quantitative research. The study does not explore negative factors that may discourage adoption of cloud-based services. Though two factors vendor lock-in and security emerged as a concern very prominently in the in-depth interviews but this issue can further be explored in detail.

Originality/value – This study bridge the gap in the research by identifying the factors that drive the adoption of cloud-based services in different forms (SaaS, PaaS, and IaaS) as well exploring the impact of cloud adoption on the organizational flexibility in case of Indian organizations.

Keywords Organizational flexibility, Cloud Computing, Adoption, Customer flexibility, Market flexibility, Performance flexibility

Paper type Research paper

1. Introduction

Introduction of web-based technologies and globalization has made current business environment very competitive as well as unpredictable. In order to survive in this business environment organizations need to be flexible in terms of designing strategies and managing business processes in addition to the resources (Palanisamy and

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Sushil, 2003). Organizational flexibility plays a central role in ensuring the survival and prosperity of organizations in an unsettled and unpredictable environment. Flexibility advances firms' capacity to reconfigure as well as improvise their existing systems and be prepared to respond to the environmental challenges within time (Lim *et al.*, 2011; Todorut, 2008). Organizations depend a lot on the information technology (IT) as it enables organizations in achieving this flexibility (McKeen and Smith, 1996). Moreover, the impact of technology on flexibility also depends on the advancement of technology.

In a rapidly changing world, businesses have to evolve and adapt to new techno-social innovations. Organizations need to innovate, specially evolve its technology, if they want to gain a competitive edge over their rivals. Whether it is a new entrant or a market leader, both strive for faster results and adopt new ways of deploying IT from time to time. Cloud computing, latest techno-social innovation in IT, has introduced new ways in which IT services are conceptualized, created, and paid for (Marston *et al.*, 2011). In this, cloud service providers manage IT infrastructure on behalf of customers wherein they don't need to own or manage technology platform and applications (Wu, 2011). Introduction of cloud-based services has turned IT into a utility, which can now be delivered as different models such as: software-as-a-service (SaaS), platform-as-a-service (PaaS), and infrastructure-as-a-service (IaaS) (Mell and Grance, 2011). According to NASSCOM and Deloitte (2012), worldwide cloud computing market is estimated to cross USD 16 billion by 2020. In India, this trend is seen mostly in case of small and medium businesses wherein maintaining IT infrastructure and investing in ever-chaining technology is very costly (NASSCOM, 2014a).

2. Objective of the study

Organizational flexibility reflects the capacity of an organization to respond to various kinds of external changes. This capacity depends upon the presence of dynamic capabilities to affect change and the responsiveness of the organization to facilitate change. The significance of organizational flexibility is well investigated and recognized by the researchers. Organizational flexibility has been studied from the perspective of capabilities and hierarchal nature of flexibility such as operational, structural, and strategic in organizations to be able to facilitate change.

IT helps organizations to be more flexible and be able to respond to customer needs frequently and efficiently (Levy and Powell, 1998). Though some of these research studies have acknowledged the role of IT in achieving flexibility in various dimensions (e.g. Fink and Neumann, 2009; Phillips and Wright, 2009), the role of cloud-based services in achieving organizational flexibility is yet to be explored. Thus studying the impact of cloud-based services on organization may result in exploring new dimensions of flexibility as cloud computing offers a new way of delivering IT infrastructure and services.

Review of cloud computing literature provides evidence of exploring various aspects related to the impact of cloud-based services' adoption on the organizations. For example, aspects like impact of cloud-based services on security and cost have been researched widely. Security is considered a very crucial aspect in case of cloud-based services as organizations are sharing data regarding their processes with the cloud vendor. Researchers have raised issues regarding security such as data security, network security, authentication, and authorization issues, etc., in the cloud environment (Brodkin, 2008; Jensen *et al.*, 2009; Kaufman, 2009; Shaikh and Haider, 2011; Subashini and Kavitha, 2011; Takabi *et al.*, 2010; Zissis and Lekkas, 2012). Costing of cloud-based services has also interested researchers as cloud vendors provide different options for payment of using cloud-based services such as

pay-per-use or monthly subscription. Impact of this differentiated price on the IT cost as well as on the overall budget of the organization has been studied widely (De Assunção and Costanzo, 2009; Biocic *et al.*, 2011; Chaisiri *et al.*, 2012; Kondo *et al.*, 2009; Li *et al.*, 2009; Misra and Mondal, 2011).

Though there are studies related to the identification of cloud-based services' adoption and some have also explored the impact of adoption on factors such as security and cost, but none of them have emphasized on the flexibility aspect of cloud-based services' adoption and its role in achieving overall organizational flexibility. Unlike traditional IT systems, cloud-based services can be available on-demand with low cost of ownership and can be deployed in distinctive ways for different organizations according to their IT needs. Thus, cloud-based services can make technology all the more worthwhile in any organizational process context (IBM, 2011). Further, these cloud-based services are also available in various forms such as specifically for managing software, platform, or IT infrastructure and thus organizations can select as per their requirement. Therefore, the motivation to do this research is to understand what factors drive the adoption of cloud-based services and in what form these services are adopted by Indian organizations. Further this research also aims to explore the impact of cloud adoption on the organizational flexibility in context of Indian organizations. Thus, the research questions are:

RQ1. What factors drive cloud-based services' adoption? In which form (i.e. SaaS, PaaS, or IaaS model) cloud-based services are adopted?

RQ2. In what ways adoption of cloud-based services improves organizational flexibility?

3. Literature review

An extensive review of literature was done to understand two main concepts of the study, i.e. cloud computing and organizational flexibility.

3.1 Cloud computing

Unlike any other field technology changes rapidly and if organizations want to stay competitive they need to embrace this technological change with the same pace or lag behind. This has led adoption of new technology by organizations a well-researched area (Wu, 2011). The latest addition in this is cloud computing. Cloud-based services can be viewed as a set of IT infrastructure components (hardware, network and software) delivered as a service based on the concept of cloud computing. The unique feature of cloud-based services is that customers can use these services on-demand via the internet (Feuerlicht, 2010). Though the concept of cloud computing has been defined in many ways, but the most popular is the one from NIST (Mell and Grance, 2011, p. 2), which defines cloud computing as "technologies that enable ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Cloud-based services can be delivered as different models such as SaaS, PaaS, and IaaS. Organizations have the options to select the desired model and can pay only for that. SaaS gives organizations a flexibility to subscribe to the software on-demand instead of purchasing, maintaining, and upgrading these applications themselves. PaaS helps organizations in managing the entire life cycle of an application from

development to deployment without worrying about underlying IT infrastructure. PaaS service providers deliver cloud-based tools and services for application development, testing, and continuous deployment. On the other hand, IaaS offers automated provisioning of server, storage, and network infrastructure to the customers on-demand. This helps in saving customers from creating the underlying physical IT infrastructure; instead, they can just manage the pool of server, storage, and networking capabilities using a web-based graphical user interface (Loeffler, 2011).

Cloud-based service's literature can be divided into two broad categories, where in first category represents the studies addressing the technological issues and second category represents the studies addressing the business issues (Yang and Tate, 2012). Research related to technical issues involves studies regarding management of cloud data, cloud data centers, cloud performance, service management, etc. On the other hand, business issues-related research cover themes like adoption of cloud services, cost, pricing, security, etc. The focus of this study is on the existing cloud computing adoption literature. The next section details the existing literature on cloud adoption and presents the gap in existing knowledge regarding cloud computing adoption and their impact on organizational flexibility.

3.2 Cloud-based services adoption literature

Studies conducted to understand the drivers of the adoption of cloud-based services spread across different countries and for distinctive industries. Lee *et al.* (2013) have studied the adoption of cloud-based services in Korea and have classified adoption drivers in four categories, namely: suppliers, customers, technological, and environmental. Misra and Mondal (2011) studied adoption of cloud-based services from the viewpoint of cost and developed ROI model taking into account various intangible impacts. Gupta *et al.* (2013) in their study of cloud computing adoption by small and medium businesses identified ease of use and convenience as major factors of adoption. IT executive's perspective of cloud adoption was studied by Benlian and Hess (2011) where cost advantage was identified a major driver of cloud adoption. Review of literature suggests factors like cost, trust, ease of use, reliability, sharing collaboration (Gupta *et al.*, 2013; Johansson and Ruivo, 2013; Wu *et al.*, 2011), support from top management, size of firm, technology readiness, competitive pressure (Low *et al.*, 2011; Oliveira *et al.*, 2014), compatibility, availability (Johansson and Ruivo, 2013) plays an important role in the decision to adopt cloud-based services. However, there are a number of disadvantages; for example, studies conducted by Avram (2014) and Subashini and Kavitha (2011) shows that security is the area of concern for the organizations while adopting cloud-based services. In their study Wu *et al.* (2011) also identified trust as major concern while making decision to adopt cloud services. In addition to this, there are few studies, which talk explicitly about SaaS model of cloud adoption (e.g. Johansson and Ruivo, 2013; Lee *et al.*, 2013; Wu, 2011). Thus, review of literature demonstrates that adoption of cloud has been studied to understand the drivers as well as inhibitors of cloud adoption, but none of the studies have investigated model-specific adoption (i.e. SaaS, PaaS, and IaaS) of cloud-based services and their impact on organizational flexibility.

3.3 Organizational flexibility

Today's hypercompetitive business environment displays sporadic changes where organizations need to redefine their strategies by taking bold decisions and acting aggressively to stay in the competition (Weerdt, 2009). Organizations must cultivate and set up dynamic capabilities to ensure their survival. Organizational flexibility has

emerged as a measure of degree for assessing an organization's ability of managing uncertainty of hypercompetitive business environment (Fredericks, 2005). The notion of organizational flexibility enables organizations to integrate external and well as internal business competencies in order to deploy capabilities. Review of literature highlights the multifaceted perspective of flexibility that has been studied in the past which includes emphasis on achieving manufacturing flexibility (Patel *et al.*, 2012), operational flexibility (Calvo *et al.*, 2008; Fisch and Zschoche, 2012), process flexibility (Chou *et al.*, 2008; Graves and Tomlin, 2003), workforce flexibility (Jules *et al.*, 2011; Matz-Costa and Pitt-Catsouphes, 2009), and strategic flexibility (Javalgi *et al.*, 2005; Nadkarni and Herrmann, 2010). According to Phillips and Wright (2009), nowadays approach of organizations toward flexibility has changed from specific to holistic. This holistic approach stresses on the understanding the significance of sources of organizational flexibility, i.e. IT, management, finance, marketing, human-resource, etc. (Ozer, 2002). IT innovations without any dispute are the main drivers of the current digital business environment and the source of organizational flexibility being studied in this research.

Organizational flexibility can be influenced significantly by adopting IT. The effect of IT on flexibility can be seen in the way it changes the organizational boundaries, nature and pace of business processes, and time taken to respond to changing market conditions (Lucas and Olson, 1994).

Conversely, IT may result in an unintentional decrease in the organizational flexibility in terms of an increase in the time, effort, and cost either to change systems or workflows of the organization. To overcome this challenge organizations need to ensure that their technology infrastructure is up to date (Lucas and Olson, 1994). With the advancement of open systems and web-based technologies, organizations are now able to manage complex technological changes within their organizations easily (McFarlan, 1984). Technological innovations have played an important role in achieving these flexibilities. With the advent of cloud-based solutions causes of IT resulting in the decrease in flexibility can be addressed as it helps in faster implementation of IT and also addresses other issues. Further we argue that cloud computing allows strategic flexibility in decision making. Thus it results in capability-related flexibility and decision-making flexibility.

As no reference of literature was found on exploring the impact of cloud computing on organizational flexibility, this study was undertaken to identify the constituents of organizational flexibility when organizations adopt and implement cloud-based services. Thus the objective of this study is to understand what factors drive the adoption of cloud-based services and how this adoption impacts organizational flexibility as this area is still unexplored by researchers.

4. Theoretical perspective and conceptual model development

In this study a conceptual model is developed by drawing concepts from classical theories like, diffusion of innovation (DOI), technology acceptance model (TAM), and technology-organization-environment (TOE) framework, to investigate the drivers of adoption of cloud-based services. While dynamic capability theory was used as grounding for understanding the impact of cloud-based services' adoption on the organizational flexibility.

4.1 DOI

According to Rogers (2003), if innovation in technology is perceived to provide benefits over the earlier technology, i.e. if there is a relative advantage over earlier technology, then innovation is diffused faster in the organizations. Innovation related to

cloud-based services can be defined not with respect to the IT infrastructure but the way in which cloud-based services are deployed and the cost implications associated with them. Thus ability to deploy IT as service on-demand makes cloud-based services different from traditional IT services. Thus this study aims to find out how IT managers perceive the relative advantage as a construct mentioned in DOI.

Relative advantage in case of cloud-based services can be perceived as providing greater benefits, which include reducing the total cost of ownership (TCO), and reducing the non-productive time which is consumed in deploying the IT services infrastructure. If IT managers perceive this as a relative advantage, as a result of process innovation in procuring and deploying the services, they may take a decision in favor of cloud-based services.

4.2 TOE framework

Tornatzky and Fleischer (1990) suggests technology, organization, and environment are three components, which influence the decision to adopt new technology. Out of these factors, the one which is vital is the organizational factor which is a combination of organization structure, firm size, centralization, or complexity in management structure. Teo and Pian (2003) argue that association of organizational factors with technology adoption is higher than environmental factors. Role of individuals at top management is important as their views regarding innovations and their implementations impact the decision-making process at large.

Hence, support from top management is essential for introducing cloud-based services as they are one who establishes the climate for innovation by making decisions on capital investment and commercialization (Tornatzky and Fleischer, 1990). Therefore, if top management agrees that introduction of cloud-based services will reduce a cost without compromising on service functions and features, then they will have positive attitude toward cloud-based service's adoption. This study aimed to find out whether this is emerging as one of the factors in adoption of cloud-based services.

In addition to relative advantage and support from top management literature suggests that IT service provider or vendor also plays a very important role in the decision to adopt IT services (Bunduchi *et al.*, 2011; Gagnon and Toulouse, 1996; Hong and Zhu, 2006). Vendor credibility in case of cloud-based services is far more crucial because cloud-based IT services from a capable vendor may enhance the internal capabilities of an organization. Vendors provide cloud-based services, which can be dynamically priced and can be scaled up/down as per the requirements. This flexibility enables the client organization to develop and enhance their capabilities. However, only capable and credible service providers will be able to provide these benefits. Vendor's credibility can be assessed on two dimensions, namely, perceived expertise and trustworthiness (Newell and Goldsmith, 2001). In case of cloud-based services expertise of vendor refers to the experience, skill and knowledge one has in carrying out these services. On the other hand, honesty, reliability, sincerity, and dependability reflect the measure of trustworthiness of cloud service vendor (Featherman *et al.*, 2010). Thus, if organizations believe that vendor has the expertise and can be trusted for managing IT infrastructure as per their fluctuating demands they will prefer to adopt cloud-based services rather than investing in in-house IT infrastructure.

4.3 TAM

Success of a new technology depends on its acceptance by organizations in different industries. Davis (1989) proposed TAM, according to which, perceived usefulness (PU)

and perceived ease of use (PEOU) are the two important factors which influence the decision to accept new technology. Though TAM model is used to understand the individual's perspective toward technology adoption, it is relevant in this study as we are trying to understand the perspective of CTOs, CIOs, and IT-heads regarding cloud-based services adoption in their organization as users as well as key decision makers.

PU is the degree to which an individual in the organization believes that using the technology will improve his or her performance (Venkatesh and Davis, 2000). For the end user, it does not matter whether the services are delivered through cloud or otherwise and hence we consider the CIT/IT manager as individual. We further argue that if the performance and productivity of IT managers improve with the implementation of cloud-based services, they are more likely to adopt these services. Thus, PU of cloud-based services is one of the factors, which will influence the decision of new technology adoption as well as new mode of IT delivery through cloud platform. This would result in the improvement in the performance, productivity, job effectiveness, and service usefulness of IT decision makers.

PEOU can be defined as the extent to which a person believes that using the system will be free from effort (Venkatesh and Davis, 2000). Number of studies suggests that there is a strong impact of PEOU on the intention to accept new technology in the organization (López-Nicolás *et al.*, 2008; Yu *et al.*, 2005). Thus it is critical to understand how CIO/IT managers perceive ease of use of cloud computing. Cloud-based services have reliability and graphical user interface characteristics similar to IT products, which can be accessed through the internet. IT managers need to evaluate these services not only from their point of view but also from the point of view of PEOU by the employees who would be using the same. Therefore, PEOU in case of cloud-based services will mean using IT services through clear and easy to understand interfaces. It should further reduce the training time and cost.

4.4 Dynamic capability theory

Dynamic capabilities refer to the ability of an organization to attain new forms of competitive advantage by renewing their competences, i.e. modifying the organizational resources to deal with the change occurring in the business environment in which organization operates (Teece *et al.*, 1997; Eisenhardt and Martin, 2000). This capability is considered dynamic because the firm must be flexible enough to continuously reshape their internal and external competencies to deal with the changing business environment. This becomes extremely essential in today's digital ecosystem where it is very difficult to predict the future competition and markets, thus making time-to-market a product or service very critical (Teece *et al.*, 1997). Web-based technologies like cloud computing can help organizations in being flexible enough to manage changing dynamics of the business environment. Unique features of cloud-based services such as scalability, on-demand implementation of IT services, 24/7 availability of IT services with an ease of accessing these cloud-based services from any device have the potential to help organizations in achieving organizational flexibility.

Figure 1 displays the conceptual model developed based on the literature review for this study. The conceptual model hypothesize the relationship between drivers of cloud-based service's adoption and the impact of this adoption on organizational flexibility. These drivers are, namely: relative advantage, PU, PEOU, support from top management, and vendor credibility.

Further, this adoption can be in one form or may be a combination of SaaS, PaaS, or IaaS. Data from various market surveys reveals the trend is more in favor of SaaS

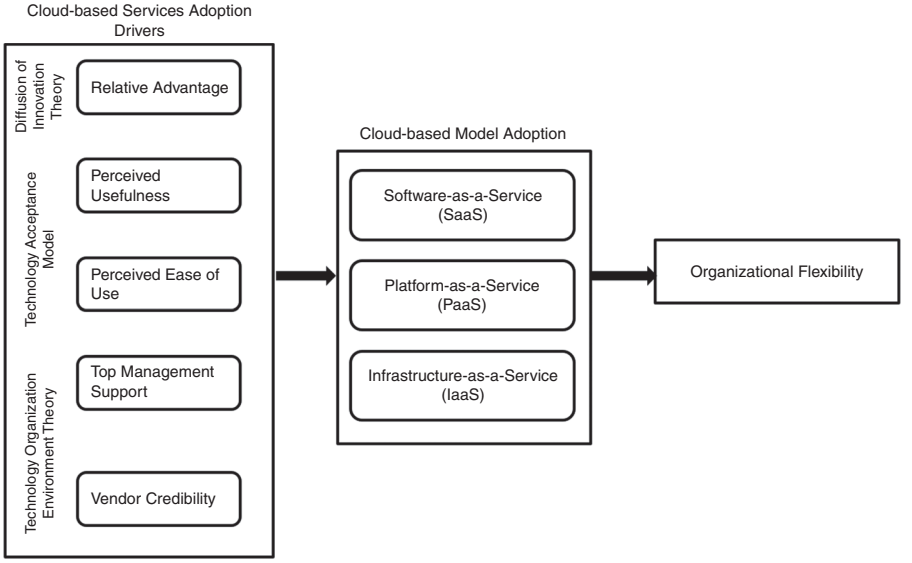

Figure 1.
Conceptual model for cloud-based services adoption to achieve organizational flexibility

model though IaaS and PaaS are still trying to find their place in the market. For example, Northbridge (2014) Venture Partners, in conjunction with Gigaom Research suggest SaaS adoption has increased from 13 percent in 2011 to 74 percent in 2014; 56 percent of businesses are using IaaS model while PaaS is adopted by 41 percent of the organizations. On the other hand, ReportsnReports.com's study of Global Infrastructure market 2015-2019 suggests the IaaS will have CAGR of 42.91 percent from 2015 to 2019 making it one of the fastest growing models of cloud-based services (PRNewswire, 2014). In this view, the second objective of this study is to understand a trend of cloud model's adoption in Indian market.

Finally, this study aims to understand how the adoption of cloud-based services contributes in achieving organizational flexibility as there is a literature gap with respect to the same. IDC suggests the adoption of cloud-based services provides flexibility in terms of accessibility of applications through tablets and smartphones, which is very useful for their mobile workforce (IDC, 2014).

5. Research methodology

In this exploratory study, in-depth interview approach was used to explore factors influencing the decision to adopt cloud-based services by organizations. Reason behind using in-depth interview approach is that we aimed not only to understand the drivers of adoption from the managerial perspective but also the impact of this adoption on organizational flexibility. This approach is particularly suited for this study as deciding to move IT applications on the cloud platform is a critical decision for the organizations, but academic literature lacks a clear and thorough examination of the key drivers as well as their impact on flexibility potential within the organization.

A semi-structured questionnaire was developed using the literature review (see the Appendix). For the study, theoretical sampling was employed and around 45 organizations were contacted who have already adopted cloud-based services and have been using it for last two to three years. Positive response was received from 21 organizations.

Respondent's profile characterizes 21 IT professionals representing the managerial group comprising CIOs, CTOs, IT-heads, and system managers, who played key role in making decision regarding cloud-based service's adoption by the organizations. Average experience of the respondents was 14 years representing substantial experience of IT management. The study fulfills the criteria of sample size suggested for exploratory research (McCracken, 1988, p. 17).

Further semi-structured in-depth interviews were conducted for comprehending the need of adopting cloud-based IT services and benefits achieved in terms of flexibility in the organization. The interviews were conducted during 2013 and 2014. Each interview lasted around 90 minutes and was recorded with prior permission. Responses were then transcribed for advance analysis. This process helped us in understanding and clarifying current issues as well as exploring new ones in case of new technology adoption and its impact on the organizational flexibility (Bryman, 2008).

6. Data analysis

Data analysis for the study was conducted in two steps. In first step data were analyzed to understand the drivers that influence adoption decision of cloud-based services, and second step helped in exploring the impact of cloud adoption on the flexibility aspect of the organizations.

The study included only those organizations that have implemented either one or a combination of cloud-based services models (SaaS, PaaS, or IaaS) for IT applications. In total, 76 percent of the organizations under this study has been using cloud-based services for less than or equal to three years, which is very high in comparison to only 24 percent of organizations who are using these services for more than three years now. Interestingly, we can see that mostly new formed organizations prefer cloud-based services in comparison to old established ones.

6.1 Factors driving the adoption of cloud-based services

In first step, we analyzed the responses to explore factors that enforced organizations to select cloud-based services in comparison to traditional IT infrastructure. Each of these factors are discussed in the following section.

6.1.1 Relative advantage. Detailed analysis of responses reveals organizations identify relative advantage of cloud-based services in terms of availability and easy scalability of IT resources, this was mentioned by number of respondents as follows:

> As a company addressing a niche space, our customer base was expanding at a very quick rate. Managing such growth over a legacy and fairly unwieldy IT infrastructure was hampering customer responsiveness and also scale. Operational costs were a major issue and quite unsustainable. Choosing SaaS proved to be timely and cost-effective. Scale has also been addressed (R9).

> As a lean enterprise, our IT team was never big to begin with. We have kept firm with that philosophy with quick adoption of cloud computing even as the customer base grows. Not having to worry virtualization, data centers, networking, and personnel is a major plus for us (R3).

> Choosing Sales Cloud was the right decision for us as we were growing at an exceptional pace and existing apps were wieldy to an extent. On-demand and anytime characteristics were important for us (R7).

In addition to that organizations responded for this study also preferred cloud-based services because of cost-effectiveness of implementing and managing IT infrastructure

especially those organizations where IT is not their core business but acting as an enabler. For example, a respondent from power-trading company mentioned:

> Adopting the cloud computing solution was almost a no-brainer for us being a power-trading company there was no point investing in expensive and non-responsive IT infrastructure. Consequently, we have remained fit and competitive as always (R12).

6.1.2 PU. Analysis of responses suggest that respondents identified the usefulness of cloud-based services in terms of improvement in the employee productivity as well as job satisfaction. As one of the respondent specified:

> We needed to address the needs of our internal users and external customers too through the cloud computing solution that we chose. Both the constituent audiences are happy with the service and we have derived cost benefits over time after adopting the Cloud (R1).

Further, in some cases respondents revealed how the adoption of cloud-based services has helped them in making their task easy by providing IT resources as and when required. For example, according to one respondent from education sector:

> The system helps users to claim resources as and when they need from the cloud and run their experiments on the VMs (R20).

6.1.3 PEOU. Implementation of new technology poses various challenges, but respondents consider that in case of cloud-based services ease of availability of resources, services, and their deployment with less implementation time are useful to handle those challenges easily. In addition to this, easy GUI and navigation display PEOU of cloud-based services. Some responses specifying ease of use of cloud-based services are given below:

> We had to initially learn how to use the tools to communicate with the cloud and set up our own mechanisms to communicate with the instances and storage on the cloud. The documentation provided by vendor and support helped us build the requisite tools we needed (R2).

> It took time for employees to get used to new system. Users are now quite satisfied with the new user interface and better processing (R7).

> The adoption has been quite seamless and given the modular and flexible nature of the cloud quite amenable for effective employee training too for using the Cloud. Users across hierarchies are satisfied (R16).

Though, these services are considered useful and easy to use, there is one common view that can be identified from the responses is regarding the requirement of training for initial use of cloud-based services.

6.1.4 Vendor credibility. Our study discovered trusted brands in cloud-based service providers like Google, Amazon, Microsoft, Netmagic, etc., are always preferred. This was mentioned by number of respondents as follows:

> We selected Amazon Web Services as it is well known and trusted; moreover in my experience it had provided absolutely good services (R8).

> […] Microsoft and Google as they are trusted brands in the market (R10).

Examination of responses suggests that vendor credibility plays a significant role in the decision to adopt cloud-based services. This is very different as compared to the IT outsourcing decision where transaction cost economies play a greater role. In IT outsourcing organizations makes upfront investment and owns all assets and hence

focus is on cost economies. While according to this study, in case of cloud-based services' adoption, respondents mostly relied on top cloud vendors for their IT need. On the other hand, some respondents mentioned:

> We are using multiple cloud service providers. We went through trade magazines, market survey reports and customers feedback to short list vendors for our organization (R3).

> We have been on AWS since the very beginning. Our familiarity with them led to them being the only vendor we chose (R6).

Hence, other than the brand of cloud vendor, respondents also selected cloud vendors based on industry studies, vendor's expertise, and experience in providing cloud-based services and clients they have.

6.1.5 Support from top management. Majority of the respondents emphasized that decision to adopt cloud-based services was supported by their top management. For example, according to respondents:

> Our management is very supportive and always encourages for trying new technologies which will benefit organization (R17, R21).

Data analysis suggest that management's approach toward using innovative technologies as well as willingness to invest in such technologies play a critical role in the adoption of cloud-based services. This is supported by one of the response as follows:

> Given the nature of our multi-products business and autonomously run business units, we opted for the Cloud and decided to choose multiple service providers. The screening process was rigorous and our internal IT team also enlisted the services of specialized consultants to home in on the right vendors. Our Management has been co-operative and apportioned the requisite budgets for the enterprise (R11).

Though there were two cases wherein CIOs needed to put an extra effort to convince management for the approval. One such respondent specified:

> We are one of the first companies in India to use cloud computing. Three years ago, our key concerns were security and accessibility to our servers. However, AWS was able to address all our concerns well, especially the one on security, as our prime IP resides on the AWS servers. Our concerns once clarified were endorsed by our CEO and CFO fairly rapidly, and over the last 3 years we have not faced any issue so far (R5).

6.2 Models of cloud-based services adopted by Indian organizations

Further, our analysis was focussed on identifying what form of cloud-based services are popular in India. Out of the 21 respondents, SaaS was one of the most popular uses of cloud-based services with 47 percent of respondents selecting SaaS, while IaaS and PaaS was adopted by 31 and 22 percent, respectively. The most common use of SaaS model was for CRM, ERP and online retail. List of SaaS venders included Salesforce.com, Amazon, Concur technologies, Blackboard, etc., on the other hand, applications, which are delivered as service ranges from transactional systems to enterprise systems. For example, salesforce offers sales cloud (sales force automation and CRM), service cloud (fully customizable support and help desk), marketing cloud (digital marketing platform), Desk.com (all-in-one customer support for small businesses), Concur technologies offers travel booking solutions; blackboard offers learning management system as SaaS and SAP offers ERP on the cloud.

Many respondents used AWS for website hosting, i.e. IaaS. Education sector is using cloud-based services mainly for the implementation of e-learning. We can also see that 43 percent of the organizations have implemented only SaaS model, which is followed by IaaS at around 19 percent. There are about 40 percent of the organizations which have opted for a combination of two models, i.e. SaaS and PaaS, SaaS and IaaS or PaaS and IaaS representing 9.5 percent each. Finally, none of the organizations have adopted PaaS model as the only cloud-based service for IT management.

6.3 Impact of cloud-based services' adoption on organizational flexibility

Next step of analysis of data was focussed on finding whether adoption of cloud computing results in organization flexibility. As already mentioned IT act as a crucial course for achieving flexibility. The conceptual model developed in this study also identified that cloud computing adoption will impact organizational flexibility (see Figure 1). Analysis of responses represents a link between cloud adoption drivers and their impact on the organizational flexibility as developed in the conceptual model of this study. For example, according to one of the respondent:

> We were looking for a reliable, scalable and cost-effective solution to meet burgeoning business needs. While we believed in lean IT earlier, but the new business demands dictated a flexible and robust solution. Cloud addressed those needs well and boosted the bandwidth of the organization. We are extremely happy that we chose the Cloud (R11).

The response represents that the factor that influenced the decision to adopt cloud-based services was relative advantage of adoption of cloud-based services as compared to traditional IT services in terms of scalability and reliability while the impact of adoption resulted in achieving flexibility in terms of improvement in the business processes.

The impact of flexibility was found affirmative by 21 cases studied in this research irrespective of the cloud model (SaaS, PaaS, and IaaS) used by the organization. Additionally different categories of flexibility were also discovered with respect to the adoption of different models of cloud-based services. This impact of cloud adoption on organizational flexibility can be categorized into four categories, namely: economic, process, performance, and market. Each of these flexibilities are discussed in detail in the following paragraphs.

6.3.1 Economic flexibility. Introduction of cloud-based services has brought a paradigm shift in the costing of IT resources from Capex to Opex. Organizations outsource their IT infrastructure management to cloud vendors based on a fee. The decision to use cloud-based IT services as opposed to creating an in-house IT infrastructure is critical as both will involve cost. Creating in-house IT infrastructure will require high capital investment while using cloud-based services will incur a cost in terms of payment for using the IT services. Also resources are treated as utility and payment for using these utilities are based on metrics, which are used to bill customers on a pay-per-use basis or monthly subscription, etc. (Shawish and Salama, 2014).

Cloud-based services not only provide flexible pricing option but also payment of services on the basis of usage based on storage, bandwidth, etc. The flexibility of getting IT services as when required on a payment appeals organizations. This payment is not only for using the IT services but also includes the management, updation, and fault resolution thus making it more lucrative. This is clearly evident in the responses as follows:

> Adopting the Cloud has proven to be beneficial to the organization. It has synched with our earmarked needs as much of the upfront costs don't have to be paid to the cloud vendors […] (R11).

> We decided to go in for the cloud-based solution Amazon Web Services based on very specific requirements. Its flexible pricing options fit in with our unique requirements. The cost-effectiveness of the solution becomes evident immediately because we pay for only what we utilize and use (R2).

> Despite having spent majorly over the past decade on large-scale IT projects, we have looked at the Cloud for certain key business lines. We are definitely seeing positive results in simplified networks. Moreover the highly flexible pricing models offered by the vendor enabled us to apportion services as needed and achieve desired total cost of ownership (R18).

> We were always on the cloud, our platform and application design embraced the core fundamentals of SOA and SaaS and hence it made complete sense to be leveraging Cloud Computing for our business, especially as a Product Start up, with limited access to Capex for infrastructure (R2).

Study suggests that cloud-based services have helped organizations in reduction of TCO as they are not paying for a constant bandwidth instead they need to pay only for what they use.

Thus, cloud vendors not only provide various flexible pricing options (e.g. subscription fee, volume-based cost model, or feature-based cost model) they also save organizations from expenses involved in owing servers or operating data centers. This economic flexibility improves cash flow positions as expenditure on IT services can be adjusted based on fluctuating demand within the organization (AWS, 2010).

6.3.2 Process flexibility. IT applications consume resources in terms of hardware, network, software, and people. Hence a business process is defined keeping all four components in mind, and processes may not be complete if there is scarcity or unavailability of any one resource. Process flexibility in terms of scaling up and down of resources served an important factor in cloud-based services adoption. One of our respondents mentioned this as:

> My job as an IT director has become less strenuous and especially keeping in mind the deliverables of the business team and tight budgets. Addressing scale too has become a breeze as I can ramp up scale to 200 0r 300 servers as per needs or even scale down when needed (R11).

Further, availability of more applications and platforms allowed flexibility with respect to applications. It allowed IT Managers to be able to get more computing facilities without investing in capital expenditure and allowed more flexibility along with their existing data centers. The virtualization provided seamless integration with respect to IT infrastructure.

IT is always seen as hindrance in achieving organization objectives by managers. It takes time to get the right solution and then to get it implemented, this process takes consumes a lot of time. IT application on cloud can be made easily available on a trial basis giving confidence to users to know more about the solution:

> The conflicts between rigid, cumbersome IT divisions and the line and business managers are all too well-known and have at times hampered core organizational objectives and long-term visions. In our case, the Cloud has proven to be a flexible, adaptable and scalable solution-attuned to timely enterprise needs. We now build applications and services on multiple platforms comfortable in the fact the cloud will address all specifics. Allocation and control of resources and configuring them for applications reside totally in our hands (R6).

Thus, cloud-based services provide enough flexibility in the organizational processes that they can be changed within no time to face the unanticipated challenges of external environment.

6.3.3 Performance flexibility.

> As the CTO of my multi-location organization, I seek the timely IT solutions and also look for interoperability across platforms and networks. Once we decided to adopt cloud-based computing, integration across locations are not an issue at all. Further, there is seamless access to software and services across geographical locations and time zones and with very little downtime during any integration process (R20).

The above response represents the strong feature of cloud-based services, which are available 24/7, can be accessed from any part of the world and most important from any device be it laptop, tablet, or smart phone.

Further, the disaster recovery plan is inbuilt as part of cloud services, and hence it becomes the least concern of IT managers:

> Opting for Salesforce was a collective decision by the IT team and the management which understood the benefits of opting for a proven industry-standard cloud solution. The Application is always available and can be provisioned for scale needs too. Redundancy is also built in seamlessly in case of downtimes of network faults (R10).

Proper service-level agreements are signed, and the payment is based on achievement of those service-level agreements, hence it helps in performance reliability. In addition various levels of performance SLAs are available giving additional flexibility to managers to adopt the performance as per needs.

It is in the interest of cloud service providers to innovate continuously and provide state of the art technology solution:

> Business continuity, flexibility and redundancy were important attributes for us when we decided to adopt cloud computing. The solution provider offers the flexibility to move data to multiple locations (R4).

Thus performance flexibility of cloud services is judged as flexibility of parameters like availability, trustworthiness, reliability, and speed.

6.3.4 Market flexibility. Cloud-based services so far provided efficiency-related flexibility. Another insight which we could explore through case-based study was related to market flexibility as is evident from one of the respondents:

> We needed to differentiate our business with the emergence of more "me-too" companies. Once we devised an innovative retail model we needed a dynamic, on-demand and scalable IT model to roll out services quickly and the Cloud helped catalyse that. The vendor we chose after a rigorous screening process worked lock-step with us and were equal partners (R21).

Ability to focus on core competence and ability to implement solutions at the fast pace has helped the organization to differentiate themselves and access market faster than the competitors. This is where cloud-based services reduce the time invested in planning and implementation of IT infrastructure. Instead, organizations can start using IT services directly by just selecting the required IT service and payment option and within no time, they can start their business.

Through this research study we have identified the factors leading to adoption of cloud computing and various dimensions of organization flexibility that emerges out of cloud adoption. As a result of our case study research methodology we identified four

component of flexibility resulting out of cloud computing adoption – economic flexibility, process flexibility, performance flexibility, and market flexibility. Thus adoption of cloud computing has resulted in operational-level flexibility through, economic flexibility, process flexibility and IT performance flexibility and flexibility in decision making through market flexibility, i.e. ability to go to market faster than competitors.

Through this study apart from validating the factors leading to the adoption of cloud-based services we were also able to explore various forms of cloud adoption models popular among Indian Organizations. However, this study further explored different kinds of flexibility that can be achieved by the adoption of cloud-based services, which has not been addressed in previous studies. Thus, the research model was modified and four types of flexibilities were added as the outcome of this research as presented in Figure 2.

Also we would like to conclude this research by adding the following propositions related to factors that influence the decision to adopt cloud-based services which need to be further researched:

P1a. Relative advantage will positively affect the likelihood of cloud-based services' adoption.

P1b. PU will positively affect the likelihood of cloud-based services' adoption.

P1c. PEOU will positively affect the likelihood of cloud-based services' adoption.

P1d. Vendor credibility will positively affect the likelihood of cloud-based services' adoption.

P1e. Positive attitude of the top management toward using technology will positively affect the likelihood of cloud-based services' adoption.

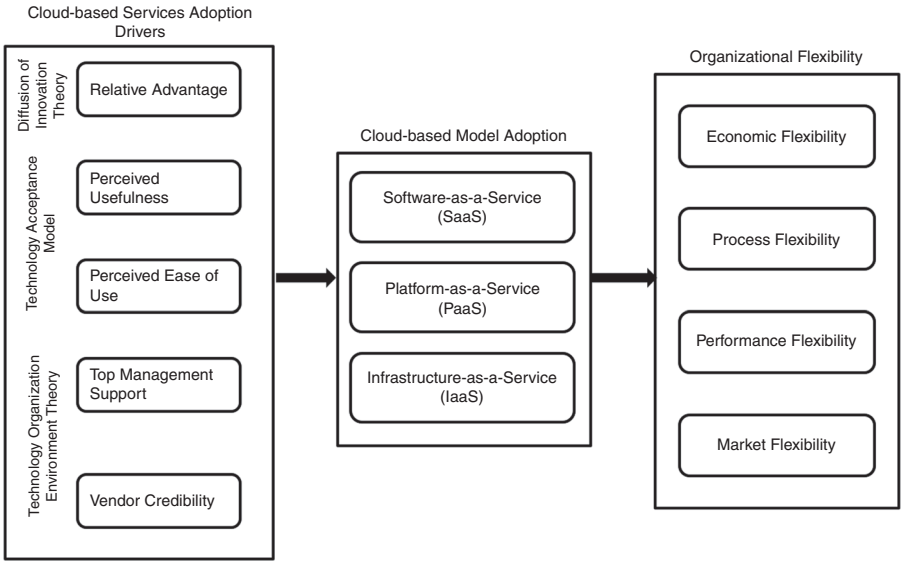

Figure 2.
Modified model for cloud-based services adoption to achieve organizational flexibility

Another set of proposition we would like to add are related to the impact of cloud-based services adoption on the organizational flexibility, which is further classified into four categories: economic, process, performance, and market flexibility. They are:

P2a. Cloud-based services' adoption in any form, i.e. SaaS, IaaS, and PaaS would have high impact on economic flexibility.

P2b. Cloud-based services' adoption in any form, i.e. SaaS, IaaS, and PaaS would have high impact on process flexibility.

P2c. Cloud-based services' adoption in any form, i.e. SaaS, IaaS, and PaaS would have high impact on performance flexibility.

P2d. Cloud-based services' adoption in any form, i.e. SaaS, IaaS, and PaaS would have high impact on market flexibility.

7. Research implications

Besides identifying various factors that influence the decision to adopt cloud-based services the key outcome of this study was the exploration of how Indian organizations have been able to achieve different categories of flexibility by adopting cloud-based services. Results of this study provide a guideline to the managers who are either in the process of making decision regarding the adoption of cloud-based services or have already adopted cloud-based services regarding how to leverage cloud-based services for achieving organizational flexibility. Now a days organizations regardless of their size or industry they operate in, need to be flexible in every aspect of organizational processes to deal with the changing business environment. Indian market study predicts that more and more Indian organizations especially startups are going to adopt cloud platform for their IT infrastructure management (NASSCOM, 2014b). Hence, results of this study can help managers of Indian organizations in understanding and utilizing the potential of cloud-based services in achieving flexibility in their business processes and improving their performance. Further, this study also suggests that organizations can also leverage the flexible IT investment in cloud-based services for tapping new market opportunities faster than ever before. For example, you have an innovative business plan for online retail, what you need is to create Web presence and an e-commerce platform. This is where cloud-based services provide the flexibility as you can just select the kind of features and functions required, select the cloud vendor, select payment option and within a day or two, or even in few hours you may be ready to go online with your business. Not only this, cloud-based services also provide flexibility for managing business growth for example, as and when your business grows with time you can add new IT resources with just one click.

8. Conclusion

In India organizations are undoubtedly at the budding stage of cloud-based services adoption. A lot of big and successful organizations are still in wait-and-watch mode and discerning cloud-based services adoption rates as well as their successes (or failures). Further, there can be lot of resistance from these large organizations regarding shifting to cloud platform as they have already invested billions in hardware, software, IT technologies, data centers, and allied IT infrastructure over the past decade. However, the more flexible among these organizations have experimented with cloud-based services adoption are some of the new start-up entities or certain, high-performance,

profit-making units separate or delinked from the centralized organizational IT networks. Our case-based research has shown that some of the small and medium enterprises with less legacy IT infrastructure have been bolder and quite adventurous in adopting cloud-based services. This is the result of operational-level flexibility they are able to achieve through cloud computing which they would not have been able to achieve in the traditional IT environment where large investments in IT is required upfront. The key contribution of this paper is the identification of how cloud adoption improves organizational flexibility by aligning IT more with business objectives. Thus it has helped to build the classic IT – strategy gap discussed in literature.

8.1 Limitation of the research

The limitation of our study is that we have not looked into negative factors that may deter the adoption of cloud computing services. Some such factors emerged very prominently in our in-depth interviews and published reports.

Cloud-based services also pose few challenges for organizations. According to KPMG's (2014) cloud computing survey data loss and privacy risks are considered major challenge while taking decision to adopt cloud-based services. This is followed by concerns related to the threat to intellectual property also. In our study, this issue was raised by many respondents:

> Every single discussion about cloud-based service implementation involved one concern i.e. security […] (R11).

Apart from security, availability of network is also very critical in case of cloud-based services. Further security and reliability of the network is also a concern for organizations deciding to shift their IT infrastructure to cloud platform (Subashini and Kavitha, 2011; Sultan, 2014).

Cloud computing is still not mature enough as standards are still being formed. This raise a concern regarding vendor lock-in. Lack of standards makes it difficult for organizations to move from one cloud vendor to another as configuration and management of services are handled and controlled by the vendor. Thus, organizations should be very clear about designing exit strategy before planning to adopt cloud-based services (McKendrick, 2011).

8.2 Future research

The findings of this study offer a reasonable ground for further research, aiming thorough investigation of factors driving the adoption of cloud-based services. In addition to that detailed analysis can be done to identify the impact of cloud-based services adoption on the level of improvement in organizational flexibility. This study used in-depth interviews approach and hence a quantitative study is further required to validate the variables thus defined and identified. Further the form of adoption in the cases studied is largely SaaS, but in the process, they also consume IaaS services, rather SaaS along with IaaS is a popular form of adoption of cloud-based services. The reason for the same is all the organizations in the sample are SMEs. However, a study of technology startups or small independent service providers may result in understanding the PaaS model adoption by the organizations. Finally, the cloud, as a reliable IT service paradigm, needs to address issues like security and vendor lock-in that are hindering the adoption of cloud-based services. Thus, studies can be undertaken to further explore the challenges in the adoption of cloud-based services.

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Further reading

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Appendix

Questionnaire

1. For what type of IT service/process you are using cloud-based services in your organization?
2. Since how long you have been using cloud services?
3. Which model of cloud (SaaS, PaaS or IaaS) is adopted by your organization?

Relative advantage

4. What was the reason behind selecting select cloud-based IT services in your organization?/ Why your organization shifted from tradition IT services to cloud-based IT services?

Cloud vendor

5. Are you using multiple vendors for providing cloud-based services in your organization?
6. Who is/are the cloud vendor/s? How you shortlisted cloud vendors and on what basis you selected one over the others?
7. What extra services your cloud vendor provides? Does the vendor provide the facility of service desk?

Top management attitude

8. How supportive was your senior manager/ management towards cloud-based services adoption decision?
9. How it has supported the business objectives of your organization? (list a few)
10. Was your decision influenced due to the fact that supplier side has matured and has more options?

Perceived usefulness and perceived ease of use

11. When you moved to cloud service how easy or difficult was it in terms of time of implementation, training, end user acceptance etc.?

Impact of cloud adoption on organizational flexibility

12. Do you think Flexible payment option of cloud services is one of the reasons for adopting cloud computing services?
13. Has total IT expenditure gone down? If yes, then approximately how much (percent)? In which area?

14. Which cost option you have selected and why?
15. Can you list any three (or five) ways in which adoption of cloud-based services has impacted on existing business processes?
16. Who are your customers? Have you conducted any survey to identify if your customers are happy with the service you provide them using cloud platform?
17. Are you using (/planning to use) cloud computing in (/in introducing) any innovative service/business model for your customer?

Concerns regarding cloud adoption

18. What are your main concerns in your approach to adopt computing services?

About the authors

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