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CLOUD COMPUTING: HOW IT DIFFERS FROM IT-OUTSOURCING AND THE IMPLICATIONS FOR PRACTICE AND RESEARCH?

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KeyWords

Information Technology, Outsourcing, Risk Mitigation, Cloud Computing, Legal Framework, Contractual Governance.

ABSTRACT

This work furnishes researchers with a concise view of cloud computing (CC) through the integration of two distinct works of literature, that is; cloud computing (CC) and information technology outsourcing (ITO). The attainments of CC in enterprises, then as a trending computational technology in summation is due to: (i) the outsourcing decision and supplier selection, (ii) contractual and relational governance, and (iii) industry standards and legal framework. Although, CC clients have limited control over standards and legal framework but are able to influence other factors to maximise the benefits while at the same time minimising risks. This project renders ground rules for the (potential) users in cloud computing with respect to; vendor selection, outsourcing decisions, service-level agreements etc. In conclusion, this work proffers a number of research directions for prospective researchers.

1. INTRODUCTION

In this contemporary period, Cloud computing (CC) has gained popularity in areas like media and business. Furthermore, governments globally have endorsed CC, for example, in Australia (The Australian Government Cloud Implementation Initiative) has provided fresh impetus for this emerging technology and in the U.S. (The Federal CC Strategy). On the merits of CC; Vivek Kundra, the former U.S. Chief Information Officer asserted that CC can save the US Government U$20 billion annually which made up a quarter of its 2011 IT budget (Kundra, 2011). With all the prospects of CC, failure is not excluded like, Harris Corporation, a U$6 billion US communications company shut its CC complex outside in 2012 within a year of operation. This was because both its government and commercial customers chose hosting "critical information" in their own vicinity instead of the cloud (Garling, 2012).

The estimation by Gartner Research in the CC sector will get to a $150 billion in 2014. Also, Forrester Research made a forecast of moderate growth from U$40.7 billion in 2011 to $159.3 billion in 2020. Furthermore, IBM undertook a survey of more than 3,000 global CIOs to come up that; 60% of organisations will leverage on CC in five years for businesses growth (IBM, 2011).

Up to this moment, most researches on CC would rather concentrate on the technical part of CC (Youseff et al., 2008) while some recent studies have also discussed the business implications of CC in terms of organizational benefits and risks (e.g. Leimeister et al., 2010, Benlian and Hess, 2011). On the other hand, recent studies and textbooks on ITO failed to take notice of CC as a concept overall (Desai, 2009, Aubert et al., 2012, Fitoussi and Gurbaxani, 2012). It suffices to say that, just a few studies differentiate CC from ITO (e.g., Katzan and Dowling, 2010, Leimeister et al., 2010). This project is targeted to integrate two previously disconnected literatures then provide an evolutionary and holistic idea of CC. This work will concentrate on potential benefits, risks, and mitigation strategies to increase the likelihood of ITO success.

2. CLOUD COMPUTING DEFINED

The concept of CC is a convolution of infotech related capabilities that have metamorphosed to major area of computing. Defining CC is complex, Leimeister et al., (2010) defined CC as "an IT deployment model, based on virtualization, where resources, in terms of infrastructure, applications and data are deployed via the internet as a distributed service by one or several service providers. These services are scalable on demand and can be priced on a pay-per-use basis".

There are three delivery layers of the CC technology; (i) Software as a Service (SAAS), (ii) Platform as a Service (PAAS), and (iii) Infrastructure as a Service (IAAS). The layers are in old and new computing principles which include: Service Oriented Architectures (SOA), distributed and grid computing, then, virtualization (Youseff et al., 2008). The CC users employ one or more of the services provided. On the SAAS model, clients run applications like Facebook and Twitter on the cloud as contrary to on local computers (Marston et al., 2011). A PAAS model enables the development and deployment of applications, foregoing to manage and maintain costly hardware and software layers (Marston et al., 2011). Examples of PAAS are Azure Services (Microsoft) Platform and Salesforce's Force.com.

3. CLOUD COMPUTING AS AN EVOLUTION OF (ITO)

The cloud computing is a form of outsourcing decision as it gives businesses privileges to substantiate the acquisition of IT resources and capabilities in a different establishment as a service. Transaction cost economics (TCE) and the resource-based view of enterprises render valuable but outstanding theoretical frameworks concerning the outsourcing decision of the organisation. ITO makes business vulnerable to different risks that have a direct effect on transaction costs. Numerous studies have employed TCE as the base theory for analysing ITO (e.g Aubert et al., 2012). Some highly possibly outsourced IT functions include telecommunication management, systems integration, and systems operation (Beaumont and Costa, 2002, Teng et al., 2007).

Outsourcing includes short or long-distance procurement of services, through electronic mediums such as the telephone, fax and the Internet (Bhagwati et al., 2004). Outsourcing isn't limited to a particular business process or capability and may involve accounting (e.g., bookkeeping and investment advice) and IT. IT is outsourced when part or all of the IT function is subcontracted to a vendor. Outsourcing is a legal agreement between firms, administered by a contract (Goles and Chin, 2005). Thus, the success of ITO depends on the terms of the contract (price, flexibility etc.) but also how well the relationship with the vendor is managed, which becomes critical given the notion of incomplete contracts (Hart and Moore, 1988).

We define success as the perceived effectiveness of the outsourcing relationship and the overall satisfaction with the contract (Saunders et al., 1997). Satisfaction is also a good predictor of the intention to continue with the contract, as well as the likelihood to repurchase the service in the future (Koh et al., 2004, Poppo and Lacity, 2006). This essential work suggests reasons why IT is outsourced: (i) business process improvement initiatives, (ii) the need to access expertise, skills, and technology, (iii) cost cutting, (iv) political factors, (v) focus on core competencies, (vi) scalability and even (vii) flexibility, (Lacity et al., 2009).

Even with the above stated reasons, ITO fails since businesses rarely consider all the costs involved with the outsourcing process (Barthelemy, 2001). Mostly, "hidden costs" do consume expected benefits of ITO. Four of such hidden costs are: (i) post-IT transition costs, (ii) costs associated with managing the outsourcing effort, and finally, (iii) initial transition costs, (iv) vendor search and contracting costs. Cloud computing contracts have shorter life-cycles compared to traditional ITO contracts, which can be monthly, weekly, daily or even hourly.

Finally, with CC, users can (near) instantly scale up or down the level of services or request new services since computing resources are managed through software (Marston et al., 2011). This is further explored in Section 3 which discusses the benefits and risks of CC from the accounting and performance perspectives.

3.1 CLOUD COMPUTING BENEFITS AND RISKS

Cloud computing offers multiple advantages that exceed the capabilities of traditional ITO. These are; easy scalability (Marston et al., 2011), access to new software (Marston et al., 2011), and reliability (Yoo, 2011). Given that servers and desktop computers have an average capacity utilization of less than 30% and 5% respectively, a service model for IT might lead to significant cost savings. Apart from the case of saving cost, CC business model emphasises on the relation to IT hardware, software, and IT related personnel expenditure. There are several CC risks which are directly applicable from the ITO, the number of risks identified in the (IT) outsourcing literature is enormous, up 40 risks (Lacity et al., 2009).

Like the risks of business continuity, that is; non-interrupted availability of CC services and reliability core hallmark of CC. As CC functions with the Internet, connectivity issues can induce service setbacks. Risks such as; connectivity problems on the cloud service provider end, the Internet third party (ISP) vendor's end service downtime. To mention, in March 2009, Microsoft Windows Azure was down for 22 hours (Hoover, 2009). Also, in in April 2011, a major outage struck Amazon, that period in time Amazon's Web Services' Elastic Compute Cloud (EC2).

Another profound risk is interoperability, here clients may experience being locked to a certain cloud provider and unable to migrate (Martin, 2011, Soma et al., 2011). Data auditability is another form of difficulty experienced in CC, it is a grave concern for enterprises holding data and need by law to provide assurances for their computing environments. (Soma et al., 2011). For the fact that, data is with the cloud service provider and requires performing backups and maintenance, the user has no control (Murdoch, 2010, Soma et al., 2011). In addition, integrity is another concern in migrating to the cloud where the privacy and, security of data outsourced to the cloud of utmost importance (e.g., Lanois, 2010, Martin, 2011, Soma et al., 2011, Vincent and Hart, 2011). Furthermore, privacy and security breaches could result in traditional subcontracting and outsourcing. One particular difference is that;

when data is stored servers of the client, the client has full access control over the security of the servers.

However, when client data is with the cloud provider to store, it is stored by the cloud provider in multiple data centres across multiple jurisdictions (Griffith, 2012). It is important to know that storage across multiple locations will likely spread the risk of a single point of failure and ensures multiple possible spots to meddle. The likely eventuality of intrusion is made known that cloud providers may not accurately report to their clients about the data stored on the cloud, that cloud service providers can hide data breaches or loss of data stored on the cloud in defence of its reputation (Wang et al., 2010). A serious concern with CC is its uncertainty with which cloud providers will ascertain the confidentiality, security, privacy, and integrity of data stored in the cloud (Martin, 2011). More emphasis of concerns on data security, privacy and integrity are additionally amplified by inconsistent regulatory framework (Soma et al., 2011). According to Griffith (2012), in certain nations laws/ regulations authorise government agencies the powers to monitor the data.

Due to pertinence of security in cloud services, the service providers are adopting stringent measures to encourage business confidence and trust to secure the systems against insider intrusion through access control techniques. The restriction and protection of the physical resources can be achieved by "stringent accountability and auditing procedures" (Gurav and Shaikh, 2010, p. 227). In whichever way, inside users still has the capacity to access customer information and for the absence of technical solutions which guarantee "confidentiality and integrity of computation" (Gurav and Shaikh, 2010, p. 227).

In the bit to achieve a win-win situation, contractual agreements guiding the parties involved such as; the cloud provider, subcontractors and the cloud user could make matters complex (Martin, 2011).

4. LEGAL IMPLICATIONS FOR PRACTITIONERS

It is clear that there are many benefits of CC which are classified along four dimensions: (i) legal/transaction, (ii) technical, (iii) strategic, and (iv) Financial. It is important to note that, some benefits come with some risks so it is vital that CC users properly handle them. Table 1. shows a summary of the corresponding risk mitigation strategies that are gotten from the ITO literature.

Cloud Computing Financial Dimension		
Benefits	**Risks**	**Mitigation**
-Cost cutting (savings on in-house hardware, software and IT personnel) and minimal upfront IT investment (Lacity et al., 2009; Hugh, 2006; Cooper, 2006; Marston et al., 2011 etc.) -Low cost of entry, advantage to small business (Marston et al., 2011) Pay on demand Op-ex model (Marston et al., 2011)	-Vendor lock in and increased supplier power -Loss of control over data (Aubert et al., 1996; Earl, 1989; Lacity et al., 2009 etc.) -Hidden transaction and transition costs (Barthelemy, 2001; Earl, 1996) -Costs related to data breaches, loss and/or service interruption (Paquette et al., 2010)	-Adoption/Use of data standards (Vincent and Hart, 2011; Bernstein et al., 2009) -Multiple vendors (Currie, 1998; Aubert et al., 2003) -Selective outsourcing (Beaumont and Costa, 2002; Teng et al., 2007) -Sound cost-benefit analysis and sensitivity analysis -Selecting mature providers (Soma et al., 2011) -Addressed in service level
Cloud Computing Strategic Dimension		

Benefits	Risks	Mitigation
-Access to advanced software, hardware, and strategic capabilities -Business process improvement (DiRomauldo and Gurbaxani, 1998) -Enables focus on core competencies (Smith et al., 1998) -Increased flexibility (Leimeister et al., 2010	-Auditability -Reliability/quality of service -Transition failure (Barthelemy, 2001; Earl, 1996) -Competitors are also likely to have access to the same technology	-Development of auditing standards and auditability terms in the contract -Selecting mature providers (Soma et al., 2011) -Short term contracts (Lacity and Willcocks, 1998) -Non-disclosure agreements with cloud computing providers

Table 1: Cloud computing Risks and Mitigation Strategies

Cloud Computing Technical Dimension		
Benefits	**Risks**	**Mitigation**
-Access to expertise and technical capability (DiRomauldo and Gurbaxani, 1998) -Delivered through the Internet (Leimeister et al., 2010) -Increased reliability as accessing best expertise in field -Transition from legacy systems -Instant scalability (Leimeister et al., 2010; Marston et al., 2011)	-Poor supplier capability/service -Auditability Inability to examine quality of vendor services (Soma et al., 2011; - Murdoch 2010; Soma et al., 2011) -Security/privacy breach -Data theft, integrity, privacy and confidentiality (Aubert et al., 2003) -Internet risks -Non reporting of data security breaches (Vincent and Hart, 2010; Martin, 2011;	-Addressed in service level agreements (Vincent and Hart, 2011) -Liabilities of other parties in the cloud computing stack (Martin, 2011) -Compliance with security standards, security seals, identification of protocols to be followed in the event of breach in contract -Disaster recovery plan (Soma et al., 2011) -Data to be kept in agreed locations/legislations (Marston et al., 2011) -Addressed in service level agreements (Vincent and Hart, 2011)
Cloud Computing Legal Dimension		
Benefits	**Risks**	**Mitigation**
-Short term contracts (hourly, weekly, monthly): flexibility -Geographically independent of device and location	-Inflexible contracts -Breach of contract (Aubert et al., 1996) (Aubert et al., 2003) Gurav and Shaikh 2010) -Insolvency, End of contract -Inconsistent regulatory frameworks and privacy laws -Jurisdiction of data storage and server location issues -Third party access to data (Vicent	-Treatment of data on termination/insolvency -Addressed in contract terms

Table 1: Cloud computing Risks and Mitigation Strategies (continued).

It is beneficial to jettison vendor lock-in as it increases the bargaining power of the vendor and can lead to higher service costs. To prevent lock-ins, businesses should be concerned with questions like; does the service level agreement of the cloud service provider pre cloud providers, is it possible for data to be 1). The security risks are particularly cer lity to detect and prevent acts of fraudu- len ations that migrate operational and data ma untability legal requirements (Marston et al., ns for CC clients. CSFs relate to the effec- tive ional governance (Lacity et al., 2009). In cor ng (Lacity et al, 1998). This would suggest tha on to more critical applications if the level of illustrates the concepts discussed in this stu sk mitigation techniques. The framework car

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empirical approach. Hence, CC as a field pre ly be valuable. We identified a number of res e also highlight and group three risk miti- gat standards and legal framework" as a third din er its development.

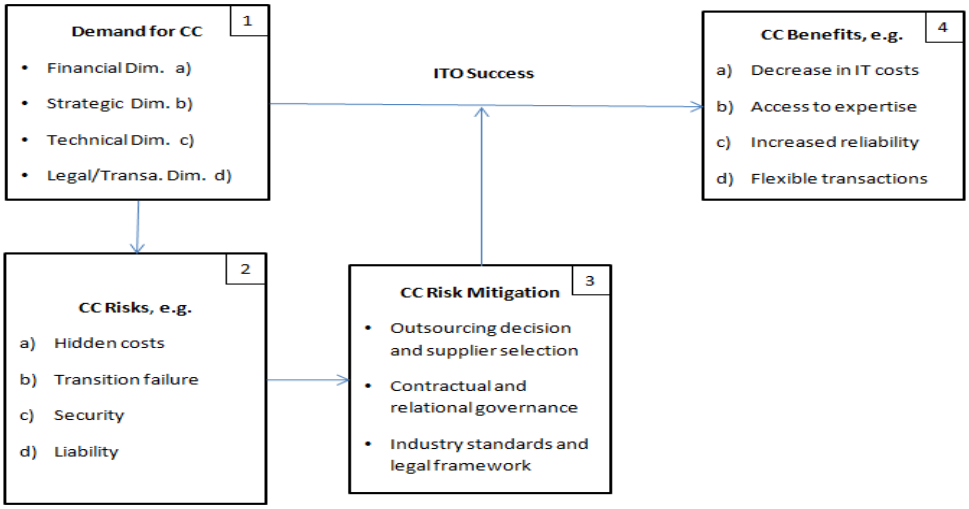

Figure 1: Framework for the success of IT Outsourcing through CC

5.1 Demand for Cloud Computing

The first direction of the research is concerned with the demand for CC services (Box 1). Arguably, there is the notion that; ITO is motivated by the intention to save cost rather than some decisive factors (Lacity et al., 2009). Adopting CC, several businesses harness the expertise of innovative IT companies like SAP. There are indications that some German industries which adopt SAAS are in same view of this assertion but some cost benefits appear to be stronger (Benlian and Hess, 2011), as such benefits could depend on the type of applications that are outsourced. Many software applications superbly designed to solve very specific business processes for the client/ user. For this reason and as observed, new start-ups leverage on CC applications greatly.

5.2 Benefits of Cloud Computing

Some research could focus on the benefits of CC, for example, the financial impact on the adopting Establishment/ firm (Box 4). The stock market is a path taken by researchers in the technology adoption, such as the stock market reaction to technology adoption announcement is closely followed (Hunton et al., 2002, Jeong and Stylianou, 2010). Another direction would be the connection between CC adoption and financial performance measures. This particular aspect was studied by several technology- focused re-

searchers on ERPs (e.g. Poston and Grabski, 2000, Hunton et al., 2003, Nicolaou, 2004, Nicolaou and Bhattacharya, 2006) and ITO (Mojsilovic et al., 2007). However, even if a large portion of IT is outsourced, given the small proportion of IT spending in relation to other costs, its effect on firm-level financial measures such as profitability will be difficult to detect (Aubert et al., 2008). Thus, process-based measures such as improved cycle times and quality in reporting as followed in subsequent ERPS (e.g. Velcu, 2007) or ITO (e.g. Wang et al., 2008) studies may be a better way to go forward.

5.3 Cloud Computing Risks and Risk Mitigation

Research could also be directed at the risks and risk mitigation strategies/techniques associated with CC (Boxes 2 and 3), specifically analysing the risks concerning security and privacy of information on the cloud repository. In addition, projects can be carried out on the impact of cloud providers' contractual provisions on security and privacy. As noted in the section above on benefits and risks, complicated contractual agreements between the cloud provider and the client are difficult to resolve. For instance, cloud service providers may embed some ambiguities in the contract documents unknown to the client by granting the cloud provider the right to access private files as in the case of Google Drive (Griffith, 2012). Hence, such challenges as; how do these contracts impact on businesses in cloud migration? Is it possible to identify common pitfalls that businesses should be wary in their contracts?

Conclusion

Commonly, ITO accentuates the relationship part with the service vendor, that is; the relationship management equated to its success. However, the review about CC is more concentrated on the technology angle of the service. It furthermore, shifts the idea of cloud services as human-centred activity as in traditional ITO services and deviates to remotely connected network that have highly valued business opportunities. It can be considered that, financial savings is a key driver of cloud services, though, the high capabilities provided by current software tools combined with some other innovative efficiencies entice clients in cloud services.

The development of the Internet over the past two decades has dramatically increased the ability to provide quality flexible IT services online in a myriad of complex combinations. As the rapid advancement of the internet brings tremendous benefits, so is the necessity for adequate controls. A considerable number of the risks are handled through the adoption of good contracting practices, but with issues such as governance, pending contracts and more remain relevant. The body of the work expounded on strategies of risk mitigation accessible to organisations and future research areas.

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