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Cloud Computing

A Social Relations Perspective

Abstract

The second half of the 20th century has been characterized by an explosive development in information technology (Maney et al 2011). Processing power, storage capacity and network bandwidth have increased exponentially, resulting in new possibilities and shifting IT paradigms. In step with technological changes, the paradigmatic pendulum has swung between increased centralization on one side and a focus on distributed computing that pushes IT power out to end users on the other. With the introduction of outsourcing and cloud computing, centralization in large data centers is again dominating the IT scene. In line with the views presented by Nicolas Carr in 2003 (Carr 2003), it is a popular assumption that cloud computing will be the next utility (like water, electricity and gas) (Buyya et al 2009). However, this assumption disregards the fact that most IT production environments, unlike water and power supply, are in a constant state of change driven by new demands from users and the desire to utilize advances in technology. Research in IT outsourcing (ITO) has documented that social relations play a key role in successful ITO (Lacity et al 2009), for instance, in establishing and maintaining trust between the involved parties (Sabherwal 1999). So far, research in cloud computing has neglected this perspective and focused entirely on aspects relating to technology, economy, security and legal questions. While the core technologies of cloud computing (e.g. virtualization and workload balancing) are tried and tested, the consequences for IT professionals in the affected IT departments have not been studied in detail. Similar to Marston et al. (Marston et al 2011), this paper points to the need for studying the social, relational and inter-organizational challenges associated with the widespread introduction of cloud computing. Based on previous studies in ITO and a review of existing articles on cloud computing, the purpose of this paper is to document a gap in the cloud computing research and identify relevant perspectives to be adopted in future studies of cloud computing.

Introduction

In record time, cloud computing has become a dominant paradigm in IT sourcing (Zhang et al 2010). The major driver behind this computing evolution is the exponential development in computing power, as predicted by Gordon Moore (Moore 1965), combined with continuous improvements in software, network technology and IT architecture as such.

Cloud computing is being hailed as the next utility, and there are striking similarities between the current development of cloud computing and the development of traditional utilities during the Industrial Revolution (Carr 2008). In the past, factories had to produce their own power by means of water, coal or wind to ensure a reliable source of power. This changed with the technological leaps that occurred during the Industrialization. It became possible to draw electricity from central power plants, as the technology, including production and transmission of power, matured so much so that remote sources could be trusted.

In a similar fashion, cloud computing technologies have evolved and made it possible to utilize remote data centers, servers and other IT facilities that previously required access to dedicated computers on site.

Due to its significant economic and technological potential (Steve 2008), cloud computing has attracted great attention from businesses, the media and academics in recent years, and the IT industry is fueling the interest by promoting cloud computing as the realization of IT as the next utility.

In 2011, Cisco published a report predicting that by 2015 cloud-based data traffic will increase 15 times (Cisco 2011). Based on improved technology and more efficient utilization of IT, Gartner Research predicts cloud computing to be a USD150 billion business by 2014 (Marston et al 2011). In a 2005 study, Gartner Research also found that 2/3 of the staffing budget in a typical IT department is taken up by routine maintenance and support (Marston et al 2011), which are exactly some of the routine tasks cloud computing is promising to alleviate.

What is Cloud Computing?

Cloud computing is essentially a business and technological model that enables sharing and utilization of a joint pool of IT resources (network, processing power, storage, application and other IT-based services) over the internet (NIST 2011). Compared to previous models for utilization of

IT, cloud computing is characterized by a high degree of scalability and flexibility combined with a minimum of administration.

The major technology and IT service providers all have their own flavors of cloud computing and ways of illustrating the components of cloud computing (Cisco 2012; IBM 2011; Oracle 2010). Differences between providers are typically found in the areas of related services and management offerings, thus essentially reflecting their areas of (financial) interest.

However, despite the differences in emphasis, all models share a common core consisting of a split between Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). These three levels of cloud computing are essentially delineations of responsibility in an overall infrastructure, ranging from the core elements of the physical infrastructure to the applications and data accessible to the end user.

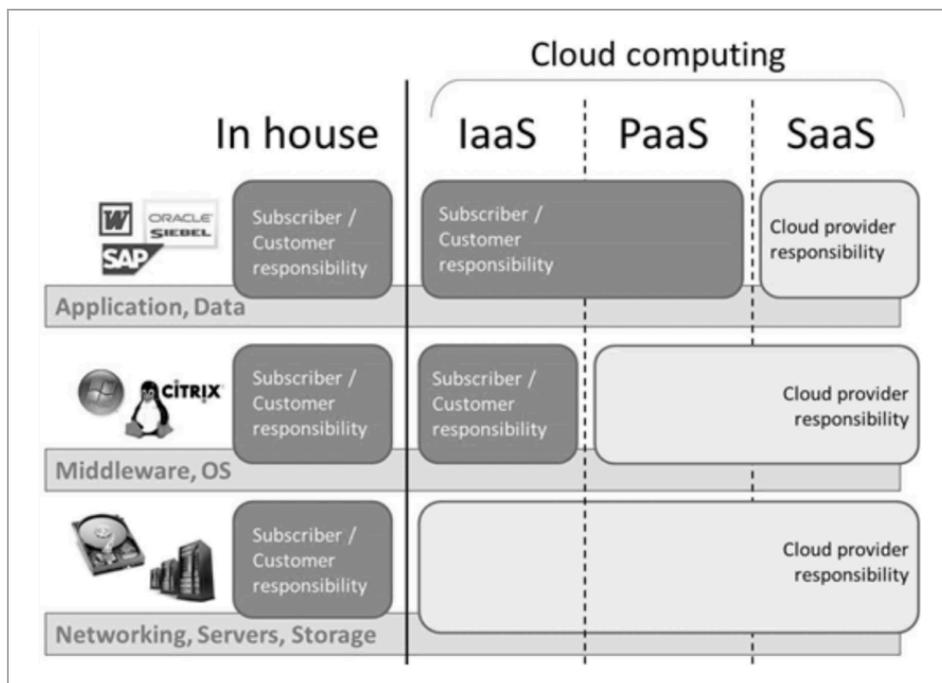


Figure 1

Figure 1 provides an overview of core cloud computing models. In a pure in-house IT infrastructure, the organization has responsibility for the entire technology stack. At the other end of the spectrum is the pure SaaS infrastructure in which the customer has handed over the responsibility of the entire technology stack to a service provider, thus limiting their own access to services through a web interface. In between these two pure scenarios are hybrids combining a variety of setups and separation of responsibilities.

Actual infrastructures, however, are unlikely to be as ‘clean‘ as illustrated in the figure and are often run as a mix of technologies and applications that are both traditional and cloud based.

Studying Cloud through ITO

On the one hand, the separation of responsibilities is what allows the specialized and efficient handling of the various layers of the IT infrastructures, but this division is also largely responsible for the changes in social relations and general working conditions for IT professionals in organizations. Consequently, viewing the movement of in-house IT facilities to cloud providers as a simple transfer of technology is inadequate. The technological advances also influence the social and relational interaction between the involved parties. Thus, the question remains as to what the consequences are. If cloud computing is the future, where is there room for IT professionals in that future? The remainder of the paper will focus on addressing this question.

Technological advances have made it possible to transfer business critical IT infrastructure from internal servers to an external provider, and with cloud computing this development is continuing with added automation and increased efficiency. Cloud computing is, in other words, a continuation of ITO, which makes the previous 20 years of ITO research the natural starting point for studying of cloud computing.

In “A review of the IT outsourcing empirical literature and future research directions” (Lacity et al 2010), the authors presents the results of a comprehensive study of academic literature focusing on IT outsourcing. The aim of the research project was to address the following questions: “What has the empirical academic literature found about information technology outsourcing (ITO) decisions and outcomes? What are the gaps in knowledge to consider in future ITO research?” (Lacity et al 2010, p.35).

To address these questions, Lacity et al. (2010) examined 164 empirically based ITO studies appearing from 12-2010. On the basis of the review, they developed two models in which the identified themes are structured to give an overview of the research. The first model focuses on the ITO decision, which includes motives for entering into outsourcing arrangements and what characterizes organizations that outsource. The second model covers the ITO outcomes, which involves, among other things, relational aspects of the ITO involvement and aspects relating to trust and decision making.

In their review of the literature, Lacity et al. (2010) find that the list of factors

influencing the decision to outsource IT (ITO decision) is dominated by technological and business related aspects. In prioritized order, the primary factors are: reduction of costs, a focus on core competencies and access to expertise.

The other large category of academic studies identified by Lacity et al. (2010) center on the ITO outcome. These studies focus on which factors have had a determining influence on the outcome of an ITO engagement. In prioritized order, the determining factors identified by Lacity et al. (2010) are: knowledge sharing, trust and effective communication. In all three cases, the studies point to more being better. More knowledge sharing, more trust and more effective communication make for a better ITO relationship.

One example of a study focusing on the effect of trust in an ITO relationship is Sabherwal's 1999 article, "The role of trust in outsourced IS development projects" (Sabherwal 1999), in which he defines trust as "a state involving confident positive expectations about another's motives with respect to oneself in situations entailing risk". Sabherwal's study shows that trust in interpersonal as well as inter-organizational relations is essential in connection with ITO.

Interesting in this connection is the linking of trust and risk. The implicit logic is that when customers hand over the operation of their IT infrastructure (or parts of it) to an ITO provider, they also accept the risk associated with letting go of control. The prerequisite for this is that the customer trusts that the ITO provider has the abilities and resources to fulfill their obligations and that the perceived advantages of the arrangement, e.g. financial or operational advantages, are sufficient to outweigh the risks.

In many cases, this is easily achieved since the risks and costs of running an in-house IT infrastructure are in fact often larger than what those in a more professionalized environment run by a service provider who is able to exploit the economies of scale.

Studies of Cloud Computing from a Social Relations Perspective

The focus in this paper is the social relations that exist in connection with cloud computing. These relations are factors that are found under what Lacity et al. (2010) call ITO outcome. As shown above, most of the studies in this field have identified knowledge sharing, trust and effective communication as key success factors in ITO. Moving on to cloud

computing, the question then is whether this is also the case in studies of cloud computing.

To study what has been written about the relevance of social relations in cloud computing, a comprehensive review of EBSCOhost for academic studies conducted in the area was undertaken. Studies were searched that address the consequences of cloud computing in relation to social relations using the concepts and terms used by Lacity et al. (2010) to categorize their review of studies of ITO. This approach made identifying and comparing correspondence between previous studies in ITO and current studies in cloud computing possible.

Initially, a broad search was carried out for ‘cloud computing’ in combination with: trust, knowledge sharing, communication, social and social relations. The results were subsequently narrowed down to those from scientific / peer-reviewed publications to ensure correspondence with the review executed by Lacity et al. (2010).

The literature review in this paper does not cover all available databases in detail. A scan of complementary databases (e.g. JStor, Elsevier), however, shows the same results as the complete review of EBSCOhost. The most significant themes in the papers were cloud computing and communication with a technical focus. Across all search combinations, there is only one result that comes close to addressing the question of the consequences of cloud computing in interpersonal and social relationships in organizations. Table 1, below, presents an overview of the distribution of the articles found.

Table 1: EBSCOhost search results. Search date: February 7 2012

| Primary Search Term | Cloud Computing | Cloud Computing | Cloud Computing | Cloud Computing | Cloud Computing |
|--------------------------------------|-----------------|-------------------|-----------------|-----------------|-----------------|
| Secondary Search Term | Trust | Knowledge Sharing | Communication | Social | Social Relation |
| EBSCOhost (total) | 39 | 0 | 439 | 228 | 0 |
| EBSCOhost (Peer-reviewed publ. only) | 6 | 0 | 119 | 31 | 0 |
| EBSCOhost (social relations only) | 0 | 0 | 0 | 1 (Marston) | 0 |

Marston et al.’s (2011) study stands out as the only one that identifies the relevance of looking into the subject being studied here. They state, for example, that,

The effect of cloud computing on corporate culture will play an important role in its eventual success or failure. Researchers in this topic will find several points of contact with the IT outsourcing literature (Marston et al 2011, p. 187).

One example of a typical result of a search combining ‘cloud computing’ and ‘trust’ deals, in contrast, with the question of whether or not users can trust the availability of the cloud-based services and whether or not users can trust the providers of cloud based services. In other words, it does not deal with relational trust as studied by Sabherwal or by Six and Skinner, who focus on trust in interpersonal work relationships:

(Trust is a) psychological state comprising the expectation that another will perform a particular action which is important to you, coupled with a willingness to accept vulnerability which may arise from the actions of that other party (Six & Skinner 2010, p.110).

The conclusion of this review is that despite the fact that previous ITO studies show that interpersonal relations and social relations are critical to ensuring successful ITO, the topic has been neglected in the cloud computing literature.

The IT industry has apparently been successful in convincing the market and academics that the social relations that have been essential in the past are no longer relevant to study. A typical sales pitch tells the story that IT is becoming a utility like water, gas and electricity, a claim supported by the fact that a company like Salesforce.com is successful and that we already use the cloud through Gmail, Picasa, iCloud and Microsoft Live.

This assumption, however, is based on a fundamental misconception of the characteristics of IT and cloud computing compared to the characteristics of traditional utilities. The product/service of water, electricity and gas utilities are characterized by stability and predictability. Consumers of all sizes demand the same product (110/220 volt and clean water) yesterday, today and next year. This is in stark contrast to the ever-changing demands for new IT capabilities from end users and an IT infrastructure exposed to a constant stream of updates, patches and improvements.

In IT, flux is the order of the day, which means that there will never be a flawless, and invulnerable IT infrastructure. Despite the best efforts of vendors to increase the dependability of IT systems, even the data centers housing the cloud infrastructure fail. This means that the need for trust is as relevant as ever, but also means that the foundation of trust changes in step with the move towards cloud computing where social relationships between customer and cloud provider are being replaced with systems allowing to draw IT from a ‘plug in the wall’.

The Relevance of Social Relations

This initial review of social relations in cloud computing prompts the question as to why the topic has not been studied previously.

A possible explanation is found in Jackson's article "Should emerging technologies change business communication scholarship?" (Jackson 2007), which points to the need to analyze and understand the effect of technologies on two different levels. The level 1 effects are the intended effects of the implemented technology, e.g. improvements in a process. The level 2 effects are the non-intended effects, e.g. the effects on the social system in which the technologies are implemented. Jackson explains that, "They are indirect and affect organizational processes at a deeper level" (Jackson 2007, p.4)

Even though Jackson's paper focuses on the consequences of computer-mediated communication, the parallel to the implementation in cloud computing is evident. The technical and economic changes in cloud computing are found on level 1 as the intended changes. It is the pursuit of benefits in these areas that has driven the development of cloud computing, which is why these areas have attracted the interest of academics and the business world. Level 2 comprises the non-intended effects of cloud computing, in other words, the effects on organizational processes at a deeper level.

In their review of the ITO literature, Lacity et al. (2009) find that in the early years of ITO research, efforts mainly focused on the ITO decision (Lacity et al 2009). If research in cloud computing follows the same trend as the ITO research, we are likely see a flourishing in studies which focus on the social and relational consequences of cloud computing.

Conclusions

This paper has shown that until now studies in cloud computing has neglected the social and relational consequences of cloud computing even though other studies consistently have shown that they are critical to ensuring successful ITO. The promises of cloud computing are attractive, but it appears that shifting from simple infrastructure solutions to the more complex ones that may be business critical is difficult. Hence, it is important to shed light on whether or not the absence of human / social relations, as a trust-building and maintaining factor, is in fact holding back the business critical implementation of cloud computing. This would in effect prevent the realization of the full potential of cloud computing.

This paper identifies two obvious starting points for future studies in cloud computing and how it affects social relations. These are the same factors identified as essential to ITO by Lacity et al. (2010). The first issue involves knowledge sharing and should address what happens to the sharing of knowledge between vendor and customer if cloud computing indeed moves on to become a utility. Will it cease to exist, and where does that leave the customer? Or will it take on new forms, e.g. in the form of online communities of customers and vendors?

The second issue involves trust and must address what happens to the relationship between customer and vendor if trust is essential in a good working relationship but there is no one to trust. Will new kinds of trust emerge as technology dictates new kinds of working relationships with limited or no interpersonal interaction? These questions and more must be examined in future research.

A possible way to investigate these two aspect would be through studies of narratives associated with the change in vendor/customer relations. Through interviews with the involved parties, focused on their experience and their stories of cloud computing, it would be possible to identify deeper patterns in the change in thrust and social relations.

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