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CLOUD COMPUTING ADOPTION: A MULTIPLE CASE STUDY

ADOÇÃO DE COMPUTAÇÃO EM NUVEM: ESTUDO DE CASOS MÚLTIPLOS

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ABSTRACT

Cloud computing is considered a new computational paradigm by many researchers and practitioners. While the number of organizations that have adopted this technology has risen in recent years, it is still just emerging in Brazil. Being an innovative technology, the adoption of cloud computing has attracted the attention of both scholars and organizations. The present study intends to use a multiple case study method to analyze the factors influencing the adoption of cloud computing. The case studies were conducted among Brazilian organizations from different categories: a large retail corporation, a medium-sized mobile marketing company and a small IT services business. The results indicate that the decisive factors influencing the decision to adopt cloud computing are reliability, scalability and cost savings, while the factors security and privacy were also considered relevant. However, interoperability, network access and sustainability were found to be irrelevant in its adoption.

Key words: IT adoption, cloud computing, SaaS, IaaS, public cloud, private cloud.

RESUMO

A computação em nuvem é considerada um novo paradigma computacional da atualidade. Sua adoção vem crescendo nos últimos anos, contudo ainda é incipiente nas organizações brasileiras. Por se tratar de uma tecnologia inovadora, a adoção de computação em nuvem vem recebendo maior atenção da academia e das organizações. A presente pesquisa tem por objetivo analisar os fatores de adoção da tecnologia nas organizações por meio de estudo de casos múltiplos. Os casos foram realizados em diferentes tipos de organizações: uma grande corporação de varejo, uma média empresa de *mobile marketing* e uma pequena empresa de serviços de Tecnologia da Informação. Os resultados do estudo apresentaram como fatores primordiais de adoção de computação em nuvem confiabilidade, escalabilidade e economia. Os fatores privacidade e segurança foram considerados relevantes. Já interoperabilidade, acesso pela rede e sustentabilidade foram considerados fatores indiferentes na adoção da tecnologia.

Palavras-chave: adoção de TI, computação em nuvem, *cloud computing*, SaaS, IaaS, nuvem pública, nuvem privada.

INTRODUCTION

Cloud computing (CC) is in the early stages of adoption and represents an interesting opportunity for users, organizations and the market in different countries (Weber and Kauffman, 2011). In a survey conducted by Coleman Parkes Research among executives from several countries, over 80% of the respondents believe that the impact of CC on the technology scene will be at least as important as virtualization, or the Internet have been (Computerworld, 2012).

According to Mell and Grance (2009), CC includes three types of IT service that can be adopted by organizations: Software as a Service (SaaS), Infrastructure as a Service (IaaS) and the Platform as a Service (PaaS). In Brazil, even with the increase in its adoption, only 18% of medium and large companies are using some CC application (IDC Brasil, 2011). While there is still a notable room for the growth of this technology in the country, in research conducted by the Gartner Group among Brazilian executives 80% of the respondents said they did not use or have plans to adopt CC technology in the coming months (Convergência Digital, 2011). Nevertheless, an increase of 60% over the current base is forecast among large and medium-sized firms (IDC Brasil, 2011).

Weber and Kauffmann (2011) highlight CC as a topic for future research. In research conducted in national and international databases, few papers were found to adopt an academic approach directed towards business management, with the majority being concerned with computer science. This favors the development of research into CC in the area of Information Systems (IS). Marston *et al.* (2011) suggested studying the factors related to the adoption and implementation of CC, since organizations are constantly searching for 'roadmaps' for the adoption of new technologies.

This study aims to answer the following question: What factors are considered by organizations when deciding to adopt cloud computing? Therefore, the study aims to analyze the factors considered by organizations adopting CC. To achieve this, three case studies were undertaken.

CHARACTERISTICS AND FACTORS OF CC ADOPTION

This section presents the characteristics of CC (The characteristics of cloud computing) that may influence the factors determining CC adoption. After that, the factors identified in the literature as influencing CC adoption are discussed (Theories and factors relating to CC adoption).

THE CHARACTERISTICS OF CLOUD COMPUTING

Historically, the term 'cloud' has been used as a metaphor for the Internet (Ransome and Rittinghouse, 2010). Chellappa (1997) presented the first academic definition of CC as a computational paradigm where the boundaries of computing will be determined by economic reasons rather than technical limits. Nevertheless, for some researchers, there is not yet a precise definition of CC that is widely accepted in the scientific community (Wang *et al.*, 2008; Weinhardt *et al.*, 2009). According to Wang *et al.* (2008), there are three reasons for the lack of a solid definition of the term. The first is that CC involves researchers from varying academic backgrounds, which leads them to have differing views on the subject. The second is that the technologies that enable the use of CC are still evolving (e.g. Web 2.0). The third is that the existing clouds still require greater use in terms of both scale and distribution to justify a concept.

Although there is no firm consensus among scholars, the work of Vaquero *et al.* (2009) proposes a definition of CC. For those authors, cloud computing has the advantage of being easy to use and accessible through virtualized resources (hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust to a variable demand, thus allowing for optimum use (Vaquero *et al.*, 2009). This set of resources is typically based on a model in which one pays according to use and where guarantees are offered by the providers through customized service levels.

Mell and Grance (2009) offer the National Institute of Standards and Technology (NIST) definition, according to which CC refers to a model that enables access through the network, according to demand, to a shared pool of computing resources (e.g. networks, servers, applications, and services) that can be quickly requested or released with minimal administrative effort or interaction with the service provider. The authors also note that, in accordance with the NIST, the structure of CC is comprised of five essential characteristics, three types of service and four forms of distribution. According to the authors, the essential characteristics of CC are: *self-service* **–** the consumer can unilaterally supplement their capacity (e.g. storage) automatically through the service provider; *access through the Internet* **–** capacities are available over the network and accessed via computational platforms (thin or thick client); *rapid scalability* – resources can be rapidly and elastically obtained, in some cases automatically, with both rapid inbound and outbound scalability. The capacities are available and unlimited, and can be purchased in any amount and at any time; *associated resources* – the service providers are grouped to serve multiple customers using a 'multi-tenant' model, with varying physical and virtual resources, which are dynamically assigned and reassigned according to demand. There is a sense of independence in relation to the location, and the customer usually has no control over or knowledge of the exact location of the resources; *service use measuring* – CC has automatically controlled and optimizable resources, allowing capability to be measured at the level appropriate to the type of service (e.g. storage, processing, bandwidth, and number of active accounts of users).

The types of service that can be obtained via the cloud are: *Software as a Service (SaaS*), which, according to Wang *et al.* (2008), is an application that is hosted as a service on the Internet, eliminating the need for installation on the

user's computer and reducing maintenance time and costs because it is paid for according to demand; *Platform as a Service (PaaS)* refers to the development of applications according to the size of the hardware resources offered in the execution of the services, which is performed in a transparent manner, i.e., a platform is provided for the execution of software (Vaquero *et al.*, 2009) – a familiar example would be the Google Apps Engine; *Infrastructure as a Service (IaaS)* refers to a large group of computing resources capable of storing and processing. Virtualization allows such resources to be split/shared, assigned and dynamically resized in order to constitute customized systems as demanded by customers (Vaquero *et al.*, 2009).

There are four means to distribute cloud computing (Marston *et al.*, 2011; Rath, 2012; Taurion, 2009). With the *Private Cloud*, the infrastructure is operated by a single organization, being managed by the organization itself or an outsource company, and it may be located within or outside the organization. In the *Community Cloud* the infrastructure is shared by several organizations, supports a specific community with shared concerns (e.g. mission, security requirements), and may be located within the space of the organizations or outside. With the *Public Cloud*, the infrastructure is available to the general public or large industrial groups and belongs to an organization that provides CC. In the *Hybrid Cloud*, the cloud infrastructure comprises one or more clouds (private, public or community) that, while remaining unique, are standardized and linked by technologies that allow data and application portability.

THEORIES AND FACTORS RELATING TO CC ADOPTION

The factors involved in the adoption of cloud computing identified in the literature were: network access, reliability, savings, scalability, interoperability, privacy, security, sustainability.

Network access: as mentioned by Mell and Grance (2009), this is one of the characteristics of the CC, as the capacities are accessed by computing platforms and made available through the network over heterogeneous platforms such as mobile phones and laptop computers (Zissis and Lekas, 2012). Clarke and Svantesson (2010) see CC as a new paradigm, which turns the Internet into a large repository in which resources are available to everyone in the form of services. One advantage of this adoption factor is ubiquity, which, according to Marks and Lozano (2010), allows access to capabilities from anywhere using different devices or applications.

Reliability, according to Katzan (2010), refers to the fact that the service is available when the user needs it. Reese (2009) extends this concept by relating reliability to the degree to which a system can be relied on to protect the integrity of data and execute transactions. As regards CC, Wyld (2010) points out that the cloud can operate at various levels in order to improve the previously used systems. CC, through the use of multiple redundant sites, is suitable for business continuity and recovery from disaster (Zissis and Lekas, 2012).

Cost savings, according to Reese (2009), means that the greatest benefit of CC is a financial one, since the pay-for-use model is significantly cheaper for an organization than the prepay model. Durkee (2010) states that CC saves energy, since the number of data centers used is the minimum required to maintain service levels. As regards entry costs, Marston *et al.* (2011) state that they are dramatically lowered with CC, thus allowing small organizations to have access to the benefits of technologies that previously used to be available only to large corporations. For Reese (2009), the cost savings in the cloud are significant and may even reach extraordinary levels, when there is big difference between the peak and average capacity of infrastructure use and between the average and low capacity of use.

Scalability is considered one of the main reasons for an organization to adopt CC (Buttel, 2010; Durkee, 2010). It refers to the ability of a computer, product or system to expand to serve a larger number of users without crashing (Laudon and Laudon, 2003). This factor can be exemplified by the increasing number of users and changes in storage capacity and processing power (Slabeva *et al.*, 2010). The ability to automatically scale an infrastructure vertically or horizontally with little or no impact on the applications that are running (Reese, 2009) is shown to be one of the most useful features of CC. Scalability allows customers to pay only when they use the resources (Reese, 2009), without having to pay additional administrative costs to maintain service levels in the cloud (Durkee, 2010).

Interoperability, according Chituc *et al.* (2008), refers to the use of computational tools that facilitate the flow of work and coordination between organizations. According to these authors, interoperability arose from the need to operationally harmonize environments with heterogeneous networks, thus facilitating information sharing and improving task coordination. This factor preserves these characteristics in CC. For Dikaiakos *et al.* (2009), cloud interoperability refers to the ability to use the same objects, such as management tools, servers, virtual images, among others, from a variety of CC providers and platforms. Thus, interoperability allows users to move between CC platforms (Wyld, 2010).

Privacy on CC, according to Wyld (2010), is associated with the rights of users in relation to the protection of their data. For Ransome and Rittinghouse (2010), CC has significant implications for the privacy of personal information and the confidentiality of organizational information. For Reese (2009), one very important factor for privacy in the cloud, or in any other environment, is the separation of confidential data from non- confidential data. Ransome and Rittinghouse (2010) emphasize that the risks regarding privacy and confidentiality of the users vary significantly depending on the terms of service and the privacy policy established with the CC provider.

Security is one of the items that scholars of CC repeatedly raise (Reese, 2009). Wyld (2010) relates the security in CC with the security of the users' data. For Laudon and Laudon (2003), the term security involves the policies, procedures and technical measures used to prevent unauthorized access, alteration, theft or physical damage to IS. According to Reese (2009), there are some points related to security in the cloud, such as disaster recovery, data security, data control, network security, server security and data segmentation.

Sustainability, for Wyld (2010), refers to the cloud's ability to be energy efficient and reduce the ecological impact. CC is a good solution for any organization seeking to improve its institutional image and to be seen as green, because it facilitates the reduction of the carbon levels of large IT infrastructures (Marston *et al.*, 2011). Chart 1 presents the relevant factors in CC adoption identified in the literature.

The CC adoption factors are supported by the following theories: Transaction Cost Theory (Alchian and Demsetz, 1972; Fianni, 2002; Grove and Malhotra, 2003; Furubotn and Richter, 2000; Liu *et al.*, 2008; Liang and Huang, 1998; Williamson, 1975; Simon, 1947), Diffusion of Innovations Theory (Moore and Benbasat, 1991; Rogers, 1995), and Resource Dependency

Chart 1 – *Relevant factors in cloud computing adoption.*

CC adoption factors	Mell and Grance (2009)	Marks and Lozano (2010)	Zissis and Lekas (2011)	Katzan (2010)	Reese (2009)	Wyld (2010)	Durkee (2010)	Marston *et al.* (2011)	Buttel (2010)	Slabeva *et al.* (2010)	Ransome and Rittinghouse (2010)	Chituc *et al.* (2008)	Dikaiakos *et al.* (2009)
Network Access	X	X	X										
Reliabilty			X	X	X	X							
Costs savings					X		X	X					
Scalability					X		X		X	X			
Interoperability						X						X	X
Privacy					X	X					X		
Security					X	X							
Sustainability						X		X					

Chart 2 – *Associations between theories and factors in cloud computing adoption.*

Theory	Element	CC adoption factor
Transaction Cost Theory	Asset specificity	Reliability
	Frequency of occurrence	Scalability, costs savings
	Transaction costs	Costs savings
	Uncertainty	Costs savings, privacy
	Contractual costs	Privacy, security
Diffusion of Innovations Theory	Image	Sustainability
	Compatibility	Sustainability, security, privacy, scalability, reliability, network access
	Perceived advantage	Interoperability, scalability, reliability
	Income statement	Costs savings
	Experimentation	Scalability, reliability
	Visibility	Scalability, network access
Resource Dependence Theory	Resource control	Security, privacy, interoperability, network access
	Interdependence	Interoperability
	Importance of resource	Reliability

Theory (Pfeffer and Salancick, 1978). The relationship between the factors and the theories is detailed in Sobragi (2012). Chart 2 shows the associations identified between the theories and the CC adoption factors.

RESEARCH METHOD

Given that the focus of the research project is to analyze factors related to the adoption of a technology, we conducted an exploratory, qualitative multiple case study. This method was chosen because, besides being widely used by the academic IS community (Hoppen and Meirelles, 2005), CC adoption is a growing phenomenon in Brazil. In the field of IS, successful case studies require the selection of research areas that are relevant to the industry (Darke *et al.*, 1998).

In exploratory studies, the unit of analysis assists in defining the limits of the theory (Dubé and Paré, 2003). In this study, it is composed of organizations that have adopted CC in non-sporadic activities and in which different areas of the organization participate in the process. The research protocol was developed based on a literature review and validated via email by three experts. In order to obtain a comprehensive analysis of the script, a heterogeneous range of experts was contacted, including an academic, the owner of a CC services supply company and a user of the technology. Once the protocol was validated, the three cases were selected based on convenience according to the following requirements. The organization must: (i) have already adopted some type of CC; (ii) use technology non-sporadic way and in different areas of the organization; (iii) provide access to professionals who participated in the adoption of the technology and can explain the reasons for the adoption; besides, (iv) the cases must include organizations that use public clouds and private clouds, given that the adoption factors may be different for each cloud type. The interview script, which was prepared based on the factors relevant for CC adoption identified in the literature (presented in Chart 2), is presented in Appendix A. Seven professionals whose profiles corresponded to those contained in item (iii) (Chart 3) responded to the survey. For reasons of confidentiality, the organizations participating in the survey requested their names be kept confidential, and so they have been assigned fictitious names.

The data sources for the research project are the face-to-face, semi-structured interviews and consultations on corporate websites, as well as reports associated with the adoption of CC in the studied organizations. The content analysis technique was used in the data analysis. For Bardin (1977), content analysis is a set of techniques for the analysis of communication, which aims, through objective measures and a systematic description of the messages, to obtain indicators that allow the inference of knowledge. The data analysis was conducted with the aid of MAXQDA 10 software. To better understand the importance of each factor in the adoption of cloud computing, the factors were categorized as being decisive, relevant or indifferent. The *decisive* factors are essential for the adoption of the technology. The *relevant* factors have some importance in the adoption of cloud computing, although they are not necessary for the adoption of the technology. The irrelevant factors are those that the organizations do not judge to be important for the adoption of the technology.

In order to increase the construct validity, different data sources were considered. The research report was also reviewed by key informants, represented by IT executives. A key-informant review is an aspect that contributes to the construct validity (Riege, 2003). Regarding internal validity, a comparative analysis of the cases was performed after the individual analysis, in order to find common evidence and standards in situations concerning the multiple case studies (Eisenhardt, 1989). These comparisons were useful because they converged regarding the factors considered relevant by the organizations as they adopted the technology. To add to the external validity, consolidated companies with considerable experience in IT management

Chart 3 – *Respondents.*

Company	Graduation	Occupation	Experience in the area	Working in the company
Alpha Mobile	Information Systems Degree	IT Manager	12 years	5 years
Alpha Mobile	Computer Science Degree	Infrastructure Analyst	9 years	4 years
Beta TI	Information Systems Degree	IT Infrastructure Director	9 years	9 years
Beta TI	Ms Information Systems	IT Manager	3 years	1,5 years
Delta Inc	Computer Science Degree and Post-Graduation in Datacenter Manager	CIO	23 years	2,5 years
Delta Inc	Post-Graduation in Information Systems	IT Service Manager	21 years	2 years
Delta Inc	Post-Graduation in Information Security	Information Security Coordinator	16 years	16 years

were analyzed together with selected respondents with sound knowledge about the adoption of CC.

RESULTS

The presentation of the study's results is divided into the three case studies and finalized with a comparative analysis.

PILOT CASE STUDY: ALPHA MOBILE

Founded in 2003, Alpha Mobile develops communication services focused on the integration of corporative SMS (short message service). The organization leads the ranking of the fastest growing Small and Medium Enterprises in Rio Grande do Sul and is the sixth largest company in the Southern Region and the seventeenth in Brazil, according to one study (Deloitte, 2011). Between 2008 and 2010, the company's net income grew by 244.8% and was consolidated at approximately R$ 19 million last year. Alpha Mobile has adopted both public and private clouds, which together amount to approximately 40% of its infrastructure and services.

DECISIVE FACTORS IN THE ADOPTION OF CLOUD COMPUTING

For Alpha Mobile, the factors considered decisive in the adoption of cloud computing, both in the public and private clouds, were cost savings, scalability and reliability.

Cost savings was considered a decisive factor in the adoption of public clouds due to the lower maintenance, operation and entry costs as well as to the pay-per-use model. In the case of private clouds, the shortened operationalization time achieved with the adoption of the technology represented savings in technical hours. The low entry cost was also valued in the adoption of public clouds, as was the lower infrastructure maintenance and personnel costs.

The factor 'scalability' was also found to be very important for the adoption of the technology. Both in public and private clouds, the high-speed scalability and usability of the IT resources for temporary services were valued. Regarding the public cloud, the fact that resources are automatically scalable also influenced the adoption of the technology. According to the Infrastructure Analyst, "the business requires scalability gains, since it is growing very rapidly". Regarding the private cloud, elasticity is mentioned, because the organization's previous infrastructure had little flexibility. Scalability was also important in the adoption of private clouds, as other acquisition, equipment and budget studies are unnecessary. The organization considers the factor a driver of business growth.

The scalability of CC seems to be an answer to the company's demand spikes, discarding idle capacity in data centers and showing itself to be a good option for temporary services, as reported by the IT Manager:

> *[...] For a temporary service, one, two, months, we can use what we want and then you can discard everything without guilt or without having to worry about the reallocation of other resources. There is no spare capacity.*

The reliability of CC was also found to be a decisive factor in the adoption of the technology, both in public and private clouds. In both cases, the best level of service in relation to previous services was considered, as well as the ability to focus the IT resources on the company's core business by outsourcing the service. Specifically in relation to the public cloud, the high level of service standardization and customization proved to be an advantage because it provides greater robustness than services performed internally. As far as the private cloud is concerned, the guarantee of greater availability with CC was taken into account, as the company keeps the critical data there, as reported by the IT Manager: "[...] regarding the most sensitive data, let's say, availability is a prerequisite that, regardless of cost, must be met". The option to perform testing and the reputation of the potential service providers were also analyzed by the company prior to the adoption because, according to the IT Manager, "[...] many suppliers were similar, so we decided to adopt something that was already well known."

RELEVANT FACTORS IN THE ADOPTION OF CLOUD COMPUTING

The factors considered relevant for the adoption of CC were network access, security and privacy.

Network access was considered relevant in the adoption of both public and private clouds. Regarding public clouds, the main point was mobility and compatibility with other devices (smartphones, tablets, etc.). In the adoption of private clouds, the network access is relevant because of the greater accessibility of the allocated data and because, although the infrastructure is hosted in data centers beyond the national borders, its quality is similar to that of an internal infrastructure. According to the IT Manager, the data "need to be accessible from anywhere and anytime." The services offered to customers are allocated in private clouds, a factor that enhances the value of network access in the company.

The safety factor was also considered relevant by the organization, and the causes for the adoption of public and private clouds were similar because security is one of the business prerequisites. Therefore, in the adoption of the two cloud types, the reputation of the service providers, the control of access to data, server security, data security and storage in data centers with redundancy were analyzed. The analysis made for the adoption of private clouds is more thorough because the company allocates customer data in them. In the words of the IT Manager:

> *[...] We host customer services, so it is very important. If the suppliers offer some security, security of this service, authentication, certificates, SSL for communication, among others, it is important.*

Thus, the organization tries to carry out audits to achieve a greater degree of security. As regards public clouds, the organization seeks to analyze how long service providers have been in the market, as they are unable to carry out a more detailed assessment or audit.

According to the respondents, privacy was also considered in the organization's adoption of CC. The main difference was found in the adoption of a public or private cloud, since the private ones have a greater degree of privacy. Moreover, when adopting private clouds, the company sought to examine the legal aspects, especially in relation to agreements regarding the level of privacy and clauses on the data and backup guarantees. According to the Infrastructure Analyst, "the company participates in some business processes with which it must be aligned in legal terms." With the adoption of a public cloud, there is a greater concern with service agreements and guarantees provided by the suppliers, as well as with data control.

IRRELEVANT FACTORS IN THE ADOPTION OF CLOUD COMPUTING

The factors 'Interoperability' and 'Sustainability' were considered irrelevant by the organization in the adoption of the technology.

The reasons for the company to not consider interoperability relevant were the same for both public and private clouds. The factor was not taken into account because many clouds are totally incompatible or compatible with each other, according to the company's IT Manager. It was also mentioned that there is no single tool for managing these cases in the company. Interoperability did not represent a need or an imminent risk for the organization, so it was not considered in the CC adoption. The artifacts used by suppliers are standard and can be relocated, regardless of supplier. In this case, dependence on the suppliers is taken into account, to a certain extent, as independence from suppliers is part of the organization's culture. According to the company's IT Manager, "basically, it was not considered because some of the changes (infrastructure) are easy", and he mentioned that, in the case of private cloud, the services would be easily transferable.

In relation to sustainability, for the adoption of both public and private clouds, the company believes this is the responsibility of the service providers. In the words of the IT manager:

> *It was not a criterion. I believe they (the service providers) are concerned with their sustainability issues, in terms of cost, in this respect. Low power consumption, heat generation ... It was not a criterion and we prefer to transfer it. We do not think about the philosophy of sustainability/green, no.*

As far as energy saving is concerned, the organization said it had no information about its gains as a result of the adoption of the technology.

A SUMMARY OF THE FACTORS IN THE ADOPTION OF CLOUD COMPUTING AT ALPHA MOBILE

Chart 4 summarizes the main results of the pilot case.

CASE 1: BETA IT

Beta IT, founded in 2002, focuses on outsourcing solutions for network infrastructure. In 2004, it started manufacturing a software for information management and monitoring, Control IT, an intelligence system that seeks to ensure high availability of IT resources in companies whose business depends on the continuity and accuracy of their hardware and software. In 2007, Beta IT received recognition for its excellence in innovation from the São Paulo Institute of Software (ITS) and was awarded the prize for "Best Innovative Product" at the Latin American IT event for the financial area (CIAB/FEBRABAN). The organization monitors more than 100,000 services for its customers. Its clients include private and public organizations of various sizes and business sectors. The company has had an average growth of 35% per year and in 2010 it had a sales revenue of R$ 650,000. Approximately 80% of the company's infrastructure and services are allocated in public or private clouds.

DECISIVE FACTORS IN THE ADOPTION OF CLOUD COMPUTING

Like the pilot case, the decisive factors for this organization were costs savings, scalability and reliability.

Costs savings, according to the respondents, was considered one of the most important criteria for the company when adopting CC. However, there were some specific points related to savings in the comparison between the adoption of public and private clouds. Regarding the public cloud, the cost of adoption was the major factor, since it is lower than the cost of a private cloud, according to the Director of Infrastructure. The company adopted the public cloud due to cost-related factors, as the Director of Infrastructure reports: "Basically, we adopted it because of two advantages: the fact we would not have to maintain an internal infrastructure or keep a professional inside the company dedicated to the service." The cost of the technology was also seen as decisive for choosing among suppliers in adopting a private cloud, together with the operating cost. The company is concerned with its growth and the costs associated with this strategy, as reported by the IT Manager:

> *[...] We did a study of how much infrastructure we would have to acquire to maintain operations and how much we would need to acquire in order to grow over a certain time period [...] It would be very expensive to buy now [...]. So the question of outsourcing part of our infrastructure is related to that.*

Chart 4 - *Factors in the adoption of cloud computing at Alpha Mobile.*

	Factor	Public cloud	Justification	Private cloud	Justification
Decisive	Costs savings	X	Maintenance costs, operating costs, cost of personnel, entry cost and payment according to use	X	Operation time, cost of entry, cost-benefit, cost of infrastructure maintenance and personnel costs
	Scalability	X	Automatically scalable resources, speed, temporary services	X	Elasticity, boost to business growth, flexibility, speed, temporary services and discards acquisition studies
	Reliability	X	Service level, high standardization, ease of use, focus on the core business of the company and robustness	X	Availability, testing, service level, focusing on the core business of the company, maintaining critical data and reputation of the service provider
Relevant	Network access	X	Mobility and compatibility with other devices	X	Services customers are allocated in private clouds, similar quality internal infrastructure
	Security	X	Providers' reputation and time in the market, access control, server security, data security, storage in data centers with redundancy	X	Providers' reputation, access control, auditing, testing, server security, data security, storage in data centers with redundancy
	Privacy	X	Level agreement, privacy, contractual issues, by providers	X	Storage of critical data, contractual issues, legal agreements, privacy levels, warranties and data backup
Irrelevant	Interoperability	X	Easy migration between platforms or mismatch between infrastructure providers, low dependence on provider	X	Easy migration between platforms or mismatch between infrastructure providers, provider dependency
	Sustainability	X	Responsibility of providers, no information about energy savings	X	Responsibility of providers, without information about energy savings

It was also mentioned that the maintenance cost of private clouds is lower than that of having an internal data center, since the contracts signed with the CC providers guarantee maintenance and hardware replacement, which are costs that the company would have to bear if it had its own IT infrastructure. The operating cost was also cited as a reason for adopting the technology, since the company "shared the risk with a third party to reduce the operating cost," according to the IT Manager. The reduction in personnel costs was also considered, since adopting the technology reduces the number of people working in the company. The low entry cost was also considered important by respondents for the adoption of both public and private clouds, besides the fact that you pay for the technology according to the use you make of it.

The scalability factor was considered one of the main motives for the company to adopt the technology, in terms of both public and private clouds. The speed of scalability in the public cloud was considered, since, according to the contractual rules, infrastructure can be quickly requested. However, it was also mentioned that the private cloud's scalability speed is lower than that of the public cloud for service providers. Tests were conducted to measure the scalability speed of the service providers, which was also taken into account when deciding whether it would adopt the technology. As the company is expanding, the scalability of CC is an important part of its growth strategy and is considered necessary for the business. It should be pointed out that the company's IT infrastructure could support the current demands. However, focusing on its growth, the organization adopted CC, as reported by the IT Manager.

Respondents indicated that reliability was also a decisive factor in the adoption of CC in the organization. As regards the public cloud, since the company provides IT services, a high level of reliability is needed to ensure the provision of quality services. Thus, this risk is transferred to a supplier that ensures a better quality service than if it were performed internally, according to the IT Manager. One criterion for choosing the cloud service was the service level and availability agreement. The company trusts that the service availability will be in accordance with the contract terms. However, prior to contracting the service, research was conducted regarding the reputation and credibility of potential suppliers. In the interviews, it was

mentioned that the company also held free testing with suppliers before adopting the technology in order to analyze if they met its needs. The importance of these free trials became evident in the company's decision to adopt the technology. In relation to the private cloud, the reputation of the suppliers was also considered when deciding to adopt the technology. This analysis was carried out through Internet research among potential customers and free trials of the environment. A factor related to reliability that was considered by the company, as regards both the public and private cloud, is availability. According to the IT Manager, "it was very much taken into account [...] if any service goes down, an area of the company stops. Depending on the service, perhaps the entire company stops." In the company it is assumed that suppliers, because they are more specialized, have greater technical capacity to provide services that are not the focus of the company. In short, the adoption of CC services by Beta IT is linked to the belief that outsourcing can provide a greater level of reliability than if the services were performed internally.

RELEVANT FACTORS IN THE ADOPTION OF CLOUD COMPUTING

The factors that were considered by the organization in the adoption of CC were security, privacy and interoperability.

Security was considered a factor in the adoption of the technology. However, there were distinctions in relation to the adoption of public or private clouds. In the adoption of the public cloud, security was not considered as much as in case of the private cloud, due to contractual issues. In this case, a relationship of trust is established with the supplier, which is also grounded in the contractual and service level agreements. By contrast, in the private cloud security was taken into account by carrying out studies on the environments of the access providers. Data security was also assessed, since Beta IT uses its own security controls. While aware of the security in the public cloud, the fact that the company could have higher levels of security in the private cloud became a selection criterion between the two kinds of cloud. This is one reason the company used the private cloud for critical data. Control over the data was taken into consideration in the adoption of the technology in both types of cloud with backups being made. The environments are controlled and managed by the company itself, a factor that is considered a requirement by Beta TI regarding the adoption of technologies and the choice of service providers. Security in the service network providers was also taken into consideration in the adoption of CC. However, this is a relationship based on trust in what was offered and contracted.

Privacy was another relevant factor for the adoption of the technology that also showed differences between the public and private clouds. Regarding the public cloud, the criterion was given little consideration, as this is a relationship based on the contract and confidence in the supplier. In the case of private clouds, by contrast, where contracts can be negotiated on the basis of greater privacy control, the factor was considered significant. It should be noted that the organization keeps its critical data in private clouds. In both types of cloud, contracts help ensure the level of privacy and control of access to the data. In the public cloud, privacy was not taken into account by the company to the same extent as in the private cloud, because there are fewer options relating to privacy, resulting in greater reliance on the CC providers. Privacy, in this case, is associated with the contract and trust in the providers, as mentioned by the Director of Infrastructure, "in fact it's all in the contract [...] there is information there and we have to believe in them. You believe that the provider will keep your data confidential."

Interoperability was a factor taken into account by the respondents when adopting CC, as regards both the public and private clouds. One of the main reasons is that the company uses different types of platforms. Because the organization is a provider of IT services and has a specialized team, the services and platforms are all interconnected. Dependence on the suppliers was mentioned as a factor that played a role in the adoption of the technology, together with the supplier's reputation in the market.

IRRELEVANT FACTORS IN THE ADOPTION OF CLOUD COMPUTING

Network access is considered irrelevant by the respondents when adopting CC, as regards both the public and private clouds. A major reason for this is that the internal services, which are not in the cloud, can also be made available remotely. Ubiquity, a factor arising from access via the network, was also not taken into account, since use on other mobile devices, such as smartphones, is not important for the organization, while access through the company's machines is.

Sustainability was not considered an adoption criterion by the company, although the respondents were aware of the environmental benefits of CC. The main reason, according to the company's Director of Infrastructure, is that it represents a concern of the service providers and not the organization itself. This is not yet a concern of the company, which has other priorities such as economic and reliability issues. According to the respondents, there is no way to check the sustainability of providers.

A SUMMARY OF THE FACTORS IN THE ADOPTION OF CLOUD COMPUTING AT BETA IT

Chart 5 summarizes the CC adoption factors at Beta IT. It is noteworthy that in this company a different attitude was identified regarding the factor of security in the comparison between the public and private clouds.

CASE STUDY 2: DELTA INC.

Delta Inc. is the second largest clothing department store in Brazil. The company is in the process of expanding, currently having over 100 stores in several Brazilian states. In 2010, it

Chart 5 – *Factors in the adoption of cloud computing at Beta IT.*

	Factor	Public cloud	Justification	Private cloud	Justification
Decisive	Costs savings	X	Cost of adoption, maintenance cost, pay-per-use entry cost	X	Cost of maintenance, cost of adoption, operating costs, cost of personnel and entry cost payment according to use
	Scalability	X	Speed scalability, testing, utilization of IT resources, the company's growth strategy	X	Utilization of IT resources, the company's growth strategy
	Reliability	X	Level of service, availability, testing, greater specialization of providers	X	Provider1s reputation, availability, greater specialization of providers
Relevant	Interoperability	X	Services interconnected by using different platforms, dependence on providers, provider's reputation	X	Interconnected services, use of different platforms, dependence on providers, provider's reputation
	Security		Relationship of trust with provider, based on contractual clauses and service level agreements	X	Studies of the provider's environment, data security, better security than public, data control, network security and infrastructure providers
	Privacy		Few options for privacy, dependence on providers, contractual issue, low access to data	X	Level of privacy can be controlled, maintenance of critical data, contract negotiation and data administration
Irrelevant	Network access	X	Internal services were already available remotely, use of mobile devices is not considered	X	Internal services were already available remotely, use of mobile devices is not considered
	Sustainability	X	Responsibility of providers, future concern	X	Responsibility of providers, future concern

was elected the tenth most valuable brand in Brazil. It was one of the first major companies in Brazil to adopt CC, which is important to the strategy adopted in the process of expansion. Approximately 40% of the infrastructure and services are allocated to public and private clouds.

DECISIVE FACTORS IN THE ADOPTION OF CLOUD COMPUTING

The decisive factors for the company's adoption of CC were reliability, scalability and cost savings.

Reliability was considered the main criterion for the adoption of the technology, for both the public and private clouds. Specifically in relation to the public cloud, reliability was analyzed because it offered better services than those that could be provided by an internal team due to commoditization, which represented low risk, ease of adoption and usability for the organization. In the words of the IT Manager:

> *[...] Going to a cloud tool, which has a commodity function, allowed users to adapt easily. I do not need to train people extensively, because the fact of being in the cloud brought features that are already known by everyone.*

In the case of the private cloud, a greater ability to carry out transactions, determined by means of contracts with the providers, was noticed. In relation to the two types of cloud, it was found that the adoption of CC guarantees best market experts, a more robust service and an analysis of the reputation of the service providers.

Em relação aos dois tipos de nuvem foi observado que na adoção de CN a garantia dos melhores especialistas do mercado, maior robustez dos serviços e analisada a reputação dos provedores de serviço

Scalability was considered important in the adoption of both cloud types as it aids in the organization's growth, flexibility and speed of adoption. According to the company's Coordinator of Corporate Architecture, Delta Inc. has a bold expansion policy and must administer its structure, given that IT (due to lack of scalability) can often be an interference. The seasonality of the business was also mentioned by the respondents as an factor of adoption provided by scalability, since the organization needs different IT capabilities over the year, as reported by the CIO:

> *We are very seasonal, retail is very seasonal [...] I need scalability. At the same time, at Christmas, I need a lot of*

capacity and in the middle of the year, January or February I might fall. So having this flexibility is important.

Specifically in relation to the adoption of public clouds, the fact that services are commoditized enables higher scalability speeds since the service is standardized for the service providers and can be switched between different clients.

In both types of cloud, costs savings was considered a very important factor in the adoption due to the payment according to the demand model, lower maintenance costs and a good cost-benefit ratio for the organization. Therefore, the costs savings criterion is one of the important areas analyzed in order to enable the technology adoption project, as reported by the company's IT Manager, "[...] basically reliability, costs savings and scalability were the main criteria that we used." When analyzing new technology projects in the, company economic-financial feasibility studies are carried out in conjunction with quality criteria. In this sense, another point that influenced the adoption of the technology, according to the IT Manager, is the organization's financial guidelines, specifically those related to capital expenditure (CAPEX) and operating expenditure (OPEX). For the CIO, the cost of the public cloud in comparison to the private cloud or internal infrastructure is more advantageous due to commoditization: "We understand that the public cloud is only feasible for extremely commoditized systems and there is no strategy linked to it."

RELEVANT FACTORS IN THE ADOPTION OF CLOUD COMPUTING

Security and privacy were considered relevant for similar reasons in the adoption of the technology by Delta Inc.

As regards the public cloud, security was considered in terms of the contractual guarantees and because there is confidence in the agreements with the service providers. In relation to the private cloud, factors such as server security and network providers were analyzed. It was also emphasized that in the case of the private clouds there is the possibility of negotiating security clauses, especially in relation to the control of the data, which is not possible in the case of the public clouds because of the existence of standard contracts. Another difference is that because the data allocated to the private clouds are critical, audits were carried out at the providers to analyze the security of the server and network.

Privacy was a relevant factor for the company in the adoption of the technology, although only in relation to private clouds. One reason is that as the data allocated to the public cloud are not critical, the company only analyzed privacy in terms of the contract (which tends to be standard in the market) and looked for references in the market before adopting the technology. In the case of the private cloud, according to the IT Manager, a more rigorous analysis of the contract is made (conducted by a company specializing in IT contracts), and there are also other criteria related to the adoption, such as a detailed analysis of contracts and market references, finding out who would manage the infrastructure, the location, the existence of dedicated infrastructure, interoperability and internal provider certifications.

IRRELEVANT FACTORS IN THE ADOPTION OF CLOUD COMPUTING

Delta Inc. considered the following factors irrelevant when adopting CC: network access, interoperability and sustainability.

Network access was considered irrelevant because the organization has used this kind of access before adopting CC and due to security restrictions, both in the public and private clouds. Regarding public clouds, network access is related to performance and the standardization of services. The mobility provided by ubiquity is seen as an issue that is still under discussion in the company.

For Delta Inc., when adopting the technology, interoperability is irrelevant for different reasons in the public and private clouds. Regarding public clouds, the factor was not considered due to the ease of migration between providers and the fact that the services are contracted in packages. In relation to private clouds, interoperability is irrelevant when adopting CC, because there is little compatibility between the service providers due to customization and because there is a tendency towards loyalty to a provider, which results in high migration costs.

As in the previous cases, sustainability was not examined by the company, as there were more pressing factors to be considered (mainly scalability and reliability). The company also did not consider energy efficiency and the reduction of carbon dioxide resulting from the adoption of the technology.

A SUMMARY OF THE FACTORS IN THE ADOPTION OF CLOUD COMPUTING AT DELTA INC.

Chart 6 shows the factors in CC adoption at Delta Inc.

COMPARATIVE ANALYSIS AND DISCUSSION OF THE CASE STUDIES

The factors reliability, scalability and costs savings were considered decisive for the adoption of cloud computing in all the studied cases. Security and privacy were analyzed by the respondents in the CC adoption process, but to a lesser degree. The factors interoperability and network access were only considered in isolated cases and, therefore, require further confirmation to be included as factors in CC adoption. Sustainability was not considered in the adoption of cloud computing in any of the cases studied.

Reliability was seen as a decisive factor for the adoption of CC in all three cases, and was listed as the most important one by Delta Inc. This may be related to the size of the organization, supporting the view put forward by Sultan (2011). According to that author, for large companies, loss of service due to a failure in the cloud could be considered a major concern, especially if it impacts the consumers and results in

Chart 6 –*Factors in the adoption of cloud computing at Delta Inc.*

	Factor	Public cloud	Justification	Private cloud	Justification
Decisive	Costs savings	X	Higher cost-benefit, maintenance cost and environmental management, payment according to demand	X	Payment according to demand, cost of adoption, maintenance cost, cost-benefit, CAPEX x OPEX
Decisive	Scalability	X	Helps organizational growth, adoption speed, flexibility, commoditized services, business seasonality	X	Helps organizational growth, adoption speed, flexibility, business seasonality
Decisive	Reliability	X	Commoditized services, best quality, low risk, ease of adoption, usability, availability, robustness, guaranteed best experts, reputation of the service providers	X	Increased ability to perform transactions, best experts guaranteed, robustness, better level of service, availability, reputation of the service providers
Relevant	Security	X	Contractual guarantees, trust in providers, control over data	X	Greater ability to negotiate contract terms, control over data, server security, network security
Relevant	Privacy		Storage of non-critical data leads only to contractual analysis, search for references in the market	X	Rigorous analysis of the contract, search for references in the market, certifications, visits to the provider's data center, the right to data protection
Irrelevant	Network access	X	Already had access to the network, security restrictions, depends on the performance and standardization	X	Security restrictions, had previous access, mobility is still being discussed in the company
Irrelevant	Interoperability	X	Easy migration between providers, services contracted in packages	X	Low compatibility between providers, low cost-benefit ratio, with a tendency to retain provider
Irrelevant	Sustainability	X	Factors existing prior to adoption such as availability and reliability, energy efficiency and reduction of carbon dioxide were not analyzed	X	Factors existing prior to adoption such as availability and reliability, energy efficiency and reduction of carbon dioxide were not analyzed

substantial loss of sales opportunities and dissatisfaction. In order to increase reliability, Delta Inc. adopted the technology, depending largely on the private cloud. For small and medium businesses, a loss of service for a few hours may not be considered catastrophic, but the possibility of using high-performance applications for such companies may offer them an advantage (Ransome and Rittinghouse, 2010), which influenced the decision of Alpha Mobile and Beta IT to adopt CC.

Regarding scalability, the study presents a similar picture to that presented by Buttel (2010) and Durkee (2010), indicating it is a major factor for the adoption of CC, because it is able to meet the needs of growing organizations (Marston *et al*., 2011). The present study also confirmed that scalability alters the relationships of IT managers with infrastructure and of financial managers with IT spending (Reese, 2009).

Costs savings was also identified by the respondents as an important factor for CC adoption, mainly because of the opportunity to reduce maintenance and implementation costs (Ransome and Rittinghouse, 2010) and the pay-per-use model (Ransome and Rittinghouse, 2010). The costs savings factor is considered the greatest benefit of CC (Reese, 2009), which is shown in the cases involving small and medium enterprises. It is noteworthy that in the case of Delta Inc. costs savings was not the primary driver for adoption. Another point that was given greater value in the cases of Alpha Mobile and Beta IT were the low entry costs.

Security was evaluated as a factor in the adoption of CC by organizations. This differs from the findings of Katz (2010), who considers this factor of greater concern among executives. The findings in the present study corroborate the view held by Reese (2009), for whom the cloud is considered as secure as or more secure than a traditional data center, especially when it comes to private clouds, as exemplified in the three analyzed cases.

The findings regarding the factor 'privacy' corroborate those of Clarke and Svantesson (2010) that indicate that CC consumers need to be attentive to this factor. In the studied cases, the three organizations were cautious, as shown by the

adoption of private clouds. The study also showed that the risks related to privacy varies according to the terms of service and privacy policies of the providers (Ransome and Rittinghouse, 2010), and may be different in public and private clouds.

Network access only appeared as a factor in the adoption of the technology in the pilot case. One explanation for this would be that because the company's business is related to mobility, network access is more valued by the members of the organization as it addresses concepts of ubiquity. The findings of the present study differ from those proposed by Zissis and Lekas (2012), which highlight the value of ubiquity and the usage of heterogeneous platforms, since the factor was considered irrelevant.

The business type may also explain why Beta IT considered the factor 'interoperability' relevant in the adoption of the technology while the other companies did not. Beta IT is an IT services provider and, thus, may attribute more value to technical criteria such as interoperability when adopting new technologies. The study's findings suggest that this factor is a challenge for providers (Brodkin, 2009), especially in relation to public clouds. However, it is also a barrier to the adoption of the technology, in the case of private CC.

Sustainability was not judged by the organizations to be a relevant factor in adopting the technology because the companies mentioned do not measure their carbon emission levels (Marston *et al.*, 2011; Sultan, 2011) and their primary purpose is not related to efficiency in terms of the processing and use of infrastructure in order to minimize energy consumption, as recommended by Beloglazov *et al.* (2012). Chart 7 summarizes the study's main results.

CONCLUSION

This study aimed to analyze the factors influencing the adoption of private and public CC. The decisive factors for the adoption of this technology were scalability, reliability and costs savings, while security and privacy were considered relevant factors in it. The results indicate that further studies are required in order to confirm the relevance of network access and interoperability as factors in the adoption of CC. Unanimously, sustainability was considered irrelevant in the adoption of the technology.

Of particular note among the elements that can define the degree of adoption of CC is the size of the organization, while the cloud type and business type also exert influence on it. In the research project, it was found that small and medium-sized enterprises (Alpha Mobile and Beta IT) tend to adopt CC primarily due to economic factors arising from scalability. This observation is supported by the arguments of Gupta *et al.* (2013), who studied the CC adoption in small and medium businesses. By contrast, in the case of the large corporation, Delta Inc., the primary adoption factor was reliability. Regarding the cloud type, the main difference was seen in terms of security and privacy. The research findings show that these factors were relevant in the adoption of private clouds, which were preferred due to the restricted flexibility of the contracts in public clouds.

The type of business can also influence the CC adoption factors, since the results presented by companies working with mobility or IT tend to show that greater relevance is attributed to factors such as network access and interoperability, respectively. Besides, CC adoption depends on the strategic goals of the organization and doesn't occur without IT risks (Henderson, 2012).

Academically, the research project has sought to further studies on the topic of IT adoption in the IS area in Brazil. By dealing with a technology that has been little studied in the IS area in the country, the study has presented a theoretical basis for future research. The use of qualitative studies about CC adoption factors may also help to develop quantitative models for further research. For organizations, one of the main

Chart 7 - *Research results.*

Factor	Alpha Mobile		Beta TI		Delta Inc.		Final	
	Public cloud	Private cloud	Public cloud	Private cloud	Public cloud	Private cloud	Public cloud	Private cloud
Costs savings	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive
Scalability	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive
Reliability	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive	Decisive
Security	Relevant	Relevant	Irrelevant	Relevant	Relevant	Relevant	Relevant	Relevant
Privacy	Relevant	Relevant	Irrelevant	Relevant	Irrelevant	Relevant	Irrelevant	Relevant
Network Access	Relevant	Relevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant
Interoperability	Irrelevant	Irrelevant	Relevant	Relevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant
Sustainability	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant

contributions of this study is that it provides information that will be of use to decision-makers when considering whether to adopt CC, since according to Marston *et al*. (2011) organizations are constantly searching for adoption roadmaps and identifying the factors related to adoption contributes to the elaboration of such roadmaps.

The inclusion of two companies that work directly with IT may have resulted in the attribution of greater value to some factors, for example, interoperability and network access. This may be considered a limitation.

Because the research project was exploratory in nature, other research themes and goals emerged that may be of value in the future. Among them are three proposals, namely to: develop a CC adoption roadmap for organizations; confirm the CC adoption factors by means of quantitative studies; and analyze CC adoption in relation to the end users.

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APPENDIX A

INTERVIEW SCRIPT QUESTIONS

General characteristics of the company: Company name, company address, year of foundation; turnover (annual); built area; branch, number of employees, organizational structure, departments or sectors, branches or production units; market share (if possible); annual IT spending (last 3 years and forecast for 2011).

Respondent's characteristics: Respondent's name; respondent's position; training; time working in the field; time in the area while working in the current company.

CC:

1. Knowing that we have three types of CC service, which one (s) has your company adopted? Why? What percentage of services and infrastructure is currently located in the cloud?
2. What was taken into consideration when deciding to adopt/not to adopt SaaS? Why?
3. What was taken into consideration when deciding to adopt/not to adopt IaaS?
4. Knowing that there are two types of cloud (public and private), which one does your organization have? What was taken into consideration when deciding to adopt a public/private cloud? Why?
5. What was taken into consideration when deciding to adopt a public/private cloud? Explore reasons.
6. Who is/are your SaaS/IaaS provider (s)? What criteria were adopted when choosing this/these provider (s)?

Network access:

7. Was network access taken into consideration when deciding to adopt CC? Why?
8. Was ubiquity taken into consideration when deciding to adopt CC? Why?

Reliability:

9. Was reliability taken into consideration when deciding to adopt CC? Why?
10. Was the ability to protect the integrity of the data taken into consideration when deciding to adopt CC? Why?
11. Was the ability to perform transactions taken into consideration when deciding to adopt CC? Why?

Costs savings:

12. Was the cost-benefit ratio taken into consideration when deciding to adopt CC? Why?
13. Were energy saving and cooling taken into consideration when deciding to adopt CC? Why?
14. Was the payment model taken into consideration when deciding to adopt CC? Why?
15. Were entry costs taken into consideration when deciding to adopt CC? Why?

Scalability:

16. Was scalability taken into consideration when deciding to adopt CC? Why?
17. Was the flexibility to quickly increase or decrease the infrastructure taken into consideration when deciding to adopt CC? Why?

Interoperability:

18. Was the ability to allow users to move between platforms taken into consideration when deciding to adopt CC? Why?
19. Was the ability to use the same artifacts (e.g. management tools, servers, etc.) among suppliers taken into consideration when deciding to adopt CC? Why?
20. Was vendor lock-in taken into consideration when deciding to adopt CC? Why?

Privacy:

21. Was privacy taken into consideration when deciding to adopt CC? Why?
22. Were data protection rights been taken into consideration when deciding to adopt CC? Why?
23. Were legal aspects taken into consideration when deciding to adopt CC? Why?

Security:

24. Was the security of the users' data taken into consideration when deciding to adopt CC? Why?
25. Was control over the data taken into consideration when deciding to adopt CC? Why?

26. Was network security taken into consideration when deciding to adopt CC? Why?
27. Was server security taken into consideration when deciding to adopt CC? Why?

Sustainability:
28. Was sustainability taken into consideration when deciding to adopt CC? Why?
29. Was the reduction in carbon dioxide emissions taken into consideration when deciding to adopt CC? Why?
30. Was energy efficiency taken into consideration when deciding to adopt CC? Why?

Others:
31. Do you believe there are other factors related to the adoption of CC in the company? Which ones? Why (ask about each one)?
32. Scale of importance:

Factor	Not important	Not very important	Indifferent/ Immaterial	Important	Very important
Network access					
Reliability					
Cost savings					
Scalability					
Interoperability					
Privacy					
Security					
Sustainability					
Other:					
Other:					
Other:					