Journal of Global Information Management
Volume 27 • Issue 1 • January-March 2019

Strategic Values of Cloud Computing Transformation:
A Multi-Case Study of 173 Adopters

Mohamed Makhlouf, Kedge Business School, Talence, France
Oihab Allal-Chérif, Kedge Business School, Talence, France

ABSTRACT

This article aims to study the strategic transformative value dimensions of cloud computing. Organizational requirements, managerial strategic objectives, and their attendant challenges are very specific indicators that enable characterization of these dimensions. An exploratory study of 173 cases of companies, covering 17 distinct economic activity sectors, spread over all continents, was conducted, taking into account contingency factors such as culture, size, and structure. The elements of industry, strategy, and technology were also considered, as well as managerial cognition. The analyses of needs, objectives, challenges, implemented solutions, and results of the transformation to cloud computing, enabled us to identify these dimensions. Strategies to maximize the transformative value of cloud computing are then presented. The results of this study can be used by managers to facilitate and optimize this cloud computing transformation.

KEYWORDS

CISCO, Cloud Computing, Contingency Factors, ICT Adoption, Multi-Ccase Study, Transformation, User Experience, Value Creation

INTRODUCTION

To survive the multidimensional changes in markets related to the frequent evolution of national and international regulations, consumer behavior, information and communications technologies (ICT), and globalization phenomena, companies constantly have to reinvent themselves. They seek to transform their information systems in order to integrate faster technological and sociological mutations such as cloud computing, big data, and mobility. These frequent changes and their induced reconfigurations are accelerating.

These disruptions are challenging companies as well as their IT service providers. In fact, in their endeavors to reduce IT costs, firms at the same time need to improve their performance, optimize their transformation programs and mitigate potential risks. They constantly strive to align their information systems with their strategic objectives (Chou, 2015). As a result, digital transformation has become a high priority on leadership agendas, with nearly 90% of business leaders in the U.S. and U.K. expecting IT and digital technologies to make an increasing strategic contribution to their overall business in the coming decade (Hess, Matt, Benlian & Wiesböck, 2016, p. 123).

However, in this context of disruptive innovations, such organizational transformations involve deep changes of business processes and corporate strategy. It is therefore essential for these companies to find transformation models enabling them to lower costs and guide disruptive transitions so they

DOI: 10.4018/JGIM.2019010107

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don't hinder development, degrade quality of service and customer satisfaction, or increase risks of instability and weaken security (Tiers, Mourmant & Leclercq-Vandelannoitte, 2013).

Meanwhile, challenges facing these companies constitute profitable business opportunities for IT providers. Hence, these companies need to be distinguishable in a market characterized by ferocious and international competition. It is therefore essential for them to find a marketable transformation model to meet their clients' requirements. The market challenge is twofold: firms look to cope with technological turmoil and providers must bring high-performance operational solutions.

Cloud computing provides the ability to conduct ambitious transformation programs currently hampered by the need for huge investments in information systems. Actually, cloud computing enables significant reduction of the financial and human investment required for a company to take advantage of new technologies, therefore fostering access to modern and powerful information systems (Armbrust et al., 2010). From this perspective, cloud computing represents a major evolution in the ICT industry.

To convince actors of the transformative value of cloud computing, it is necessary to check if the outcomes meet the expectations of cloud stakeholders, customers, and suppliers. The objective is to implement a comprehensive, rational, and action-oriented approach, optimizing the benefits and minimizing disruptions and discontinuities because of the adoption of cloud computing. This article is based on a positivist qualitative exploration methodology associating deductive and inductive methods. The study of 173 cases enabled us, along with a two-year interaction with the Director of cloud transformation of one of the largest cloud pure player vendors, CISCO, to identify, classify, and discuss the transformative value dimensions of cloud computing.

The contribution of this research is managerial, methodological, as well as academic. Indeed, following a grounded theory methodology, a wide range of firms that endeavored the cloud migration are qualitatively analyzed. 19 positive and nine ambiguous factors influencing the transformation toward cloud computing are identified during the back and forth analysis of these cases, providing crucial elements for managerial decision-making and academic research.

The first section of this paper provides a literature review, centered on the benefits and limitations of cloud computing. The second section describes the research field and the methodology followed in this study. In the third section, the results of the studied cases are discussed and the transformative values provided and analyzed. The last section provides our conclusions and recommendations for future research.

LITERATURE REVIEW

In spite of the huge corpus of literature, it is still a formidable task to define this research object. Indeed, there are many definitions of cloud computing that significantly differ according to (1) the chosen approach—structural or functional, technological or managerial, service provider or final user—and (2) the type of actors—researchers, service providers, users, or analysts. These definitions remain vague, ambiguous, changing, and consolidating, and they create many debates on what cloud computing really means (Oredo & Njihia, 2014).

Towards a Definition of Cloud Computing

Cloud computing is broadly defined as a set of virtualized computing resources, reconfigurable and adjustable in an optimal way depending on user needs through service-level agreements. This is not a new technology but a set of technologies associated with a toolbox designed to manage firms in a different way. This is a new business model based on a utilitarian approach of information technology and communication.

Cloud computing involves using the Internet as a portal for applications and personal or business data. *Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services* (Armbrust et al., 2010, p. 1). Cloud computing enables managing IT resources on demand via the Internet. There is

no up-front investment required: the payment is made according to the consumption of the service. Although cloud computing has been massively used since the last decade by individuals through web mail, YouTube, Flickr, Google Apps and Facebook, it has developed much more recently in all types of companies (Bhattacherjee & Park, 2014).

According to the NIST (National Institute of Standards and Technology), cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell & Grance, 2011, 6). Cloud computing is the combination of SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service).

The main goal of cloud computing is to circumvent the restrictions of individual computers with their limited power and storage capacity and that they become obsolete very quickly (Naldi & Mastroeni, 2016). On-site computers also can break down or be stolen, and users may lose data they have not saved. Therefore, some companies propose a virtual space, called "cloud", which will offer a wide range of on-demand services: software and storage spaces with a high level of security and very few resources required to access it from anywhere in the world and from any digital device. Indeed, with a very basic client computer, it becomes possible to use very heavy applications because they are processed by powerful servers from the service provider (Naldi & Mastroeni, 2016).

Benefits and Limitations of Cloud Computing

Thanks to cloud computing, IT resources can be adapted to business needs with a level of agility that was not accessible before. Indeed, it is no more complicated or expensive to enable a business to access 1,000 servers during an hour than to access a single server for 1,000 hours (Armbrust et al., 2010). Adapting its computing resources as needed and sharing those resources to share the costs gives managers the impression that they pay only for the systems they use, only when they use them, and they have the ability to optimize their costs. Indeed, customers can freely and in a completely automated way increase or decrease the computing capacity they use (Mell & Grance, 2011).

Cloud computing enables users to access infinite resources via the Internet, such as data and software, for as long as they want and from anywhere they want, without having to worry about updates or maintenance (Kulkarni, Gambhir & Palwe, 2012). This access is possible on any device connected to the Internet, which means eliminating stress on IT equipment and facilitating the adoption of tools despite heterogeneous terminals (Mell & Grance, 2011). Cloud computing therefore corresponds to an evolution of the Internet from a semantic Web 3.0 to a cloud Web 4.0. It also addresses the need to access information from different kind of computers, tablets, smartphones, professional and personal computers, mobile or not, game consoles, or Internet boxes without having ever to duplicate or synchronize data. Resources are allocated and reallocated, with great agility, serving a multitude of clients simultaneously, dynamically, through a multi-tenant model (Battleson, West, Kim, Ramesh & Robinson, 2016; Mell & Grance, 2011).

Cloud computing is interesting for SMEs because it enables them to have the same power of software as large companies but with a limited budget and an equivalent level of safety, often even higher than they had before. Cloud providers may also be better able to manage security, respond to distributed attacks and invest in sophisticated security hardware and software; facilities that are normally unavailable to all but the largest enterprises (Whitley, Willcocks & Venters, 2013, p. 87). It also enables a very high degree of flexibility and organizational agility. Enterprises that use cloud computing are generally not owners of these infrastructures. They do not need to make large hardware or software investments. Instead, they purchase their IT from remote service providers and pay only the amount of computing resources they consume.

Therefore, thanks to cloud computing, SMEs can access very easily, without material constraints and for a cost adapted to their resources and needs, tools as powerful as those used in multinational firms. This technological leap enables smaller companies to move quickly beyond several levels of

maturity of information systems and to significantly improve their competitiveness with respect to large companies, which lose a competitive advantage and a barrier to entering certain markets. Small and medium-sized enterprises (SMEs) can now afford enterprise-class services by adopting cloud computing. Cloud services also have the potential to alleviate the historical information systems (IS) challenges facing SMEs (Lacity & Reynolds, 2014, p. 31).

Cloud computing appears to be an economic and flexible solution to enable a company to gain access to the latest computer technologies. However, cloud computing is not without drawbacks. Indeed, having to be connected to the Internet to access data and applications can be a major handicap. Many companies do not want to entrust their "brain" to an outside company for confidentiality reasons. The shared and dynamic nature of cloud computing raises many problems of security and confidentiality that do not exist when everything is handled internally behind firewalls (Brynjolfsson, Hofmann & Jordan, 2010). However, the level of service and security often can be considered superior in a cloud context because it is the heart of the business of the providers who have access to the means and the skills unreachable even by a very large company (Tiers, Mourmant & Leclercq-Vandelannoitte, 2013). Cloud computing involves heavy dependence because any failure of the provider would lead to a complete paralysis of the company. Prices are for now low enough because the competition and alternatives are numerous, but they are likely to increase with market consolidations.

The Adoption of Cloud Computing in Organizations

The theory of adoption consists of the characterization of the factors that positively or negatively influence the decision to choose a new method or a new management approach. The adoption of information systems is generally influenced by the profile of decision makers, system characteristics, specifics of the organization, the environmental context (Thong, 1999), as well as the strategic vision, modes of interaction with other organizations, and the capacity of ownership and integration (Lyytinen & Damsgaard, 2011).

This discredit formulated by some researchers and experts negatively affect cloud adoption by individuals and companies. However, some positive aspects are perceived as indisputable by many users: the illusion of infinite capacity of computing resources, the absence of commitment, payment based on consumption, and access via any computer terminal (Chiu, Hsu, Jan & Chen, 2014).

Cloud computing can be considered a very efficient and sophisticated form of ICT outsourcing. The adoption of cloud computing, which relies on extremely complex circumstance, is facilitated at the individual level, although it remains very limited in organizations mainly because of the perception of a loss of control, a supposed lack of data security, and an incompatible or deterrent legislation regarding this ICT distribution model (Wu, Ding, Xu, Mo & Jin, 2016).

If cloud computing is adopted by a very large number of individual consumers and some SMEs wishing to benefit from greater IT resources and more secured systems at a lower cost, larger governmental groups and organizations do not see the same benefits. The main argument that leads SMEs to opt for cloud computing is lower cost, with a payment proportionate to the volume of consumed technology, which allows small organizations to access the same applications that large ones do at an appropriate cost for their size and budget (Armbrust et al., 2010).

Other reasons that smaller companies adopt cloud computing are the ease and comfort of use, on-demand invoicing, adjustment of resources based on real-time needs, adaptability and compatibility of technologies, and accessibility of data and tools regardless of the location or the device used. However, the cost of the adoption of cloud itself is often a major obstacle that deters decision makers, despite the potential future savings that the adoption could eventually generate.

Cultural and societal readiness of the organization, control of complex dynamics generated by the cloud, trust in the relations among the different actors, and close involvement of managers in the transformation process are other factors found in successful adoption of cloud computing (Battleson, West, Kim, Ramesh & Robinson, 2016). The optimization of these parameters and the consciousness of impacts induced by the adoption of cloud computing on individuals, organizations,

and technologies will facilitate and accelerate this adoption and enable faster implementation of expected performance. Moving IT services to cloud computing reshapes a company's IT landscape and can heavily impact its IT strategy and performance. Selecting the wrong IT services for the cloud can therefore be operationally costly and potentially could harm a business strategy (Loebbecke, Thomas & Ullrich, 2012, p. 11).

METHODOLOGY

The methodology is based on the exploration of multiple case studies to define and characterize the transformative value dimensions of cloud computing. 173 firms of various types and sectors were studied with the collaboration of a director of cloud transformation of CISCO, one of the largest cloud computing pure player providers in the world.

Theoretical Foundation: Contingency Theory

The transformative value of cloud computing and its impact on business and organizations have not yet been covered in the literature nor have its characteristics and implications. Thus, no expert can assert that any particular cloud solution is the best possible or offers the highest value. Hence, using the theory of contingency as a theoretical foundation seems to be a positive choice in such an evolving context of immaturity.

Operational management is contingent, that is to say, subject to internal and external environmental and situational constraints. Contingency theory was built on the idea that there is not a unique best way to decide, organize, or run a business. Many authors have argued that it remains a dominant theoretical approach to organizational design and perhaps is the most widely used in studying organizations (Scott, 2002). Since the 1960s, several contingent approaches have been developed. These approaches consider that contingent factors, or environment aspects, affect organizational structure, operational management, and decision making. For Galbraith (1973) solutions to organizational design problems require searching for consistency among several areas, including strategy, organizational modes, and individuals. Klaas (2004) stresses that the fundamental proposition of contingency theory is that the survival and viability of an organization depends on the achievement and maintenance of consistency between the organization and its environment. Moreover, organizational effectiveness is achieved through harmonization between organizational characteristics and contingent variables (Morton & Hu, 2008).

Selection of the Research Field

To identify contingency factors determining the value of the transformation decision to cloud computing, it was necessary to find a relevant research field that would enable the study of a representative sample of companies that have adopted cloud computing. Moreover, in order to build a generalizable model, taking into account the contingency factors already confirmed by the research literature, these companies must be very diverse. To consider industry, strategy, technology, and managerial contingency factors, the selected firms must cover a great number of businesses in different economic sectors. In addition, they must also be from several countries and continents to take into account cultural factors. Finally, they must be of different sizes and structures.

To face this challenge, the major global actors in cloud computing are considered. These actors are very large multinational groups, whose clients perfectly meet our research needs. The actor who best matched our requirements is the American company CISCO Systems Inc., the worldwide leader of networks. It supplies cloud computing providers with solutions that they can distribute to their clients. CISCO is unquestionably one of the highest performing companies in the cloud computing technologies field, with a very developed and audacious cloud strategy. Moreover, together with HP and Microsoft, it offers one of the most elaborate and complete cloud solutions portfolios on the market. It not only provides the infrastructure and tools of cloud computing but also customized strategies and appropriate deployment models. In addition to being a pure player cloud provider, it

is an intermediary bringing together corporate customers with the most appropriate cloud suppliers. Indeed, as evidenced by its advertising campaign "Internet of Everything", CISCO has entirely focused its strategy for the next decade on cloud computing in order to support organizations to interconnect with individuals, businesses, services, data, processes, platforms, and all that reduces the costs of managing information systems. CISCO has developed expertise in cloud computing from the perspective of providers and customers.

Data Collection, Processing, and Analysis

In 2014, one of the authors of this article conducted a workshop about disruptive technologies with the CISCO Europe Director of cloud computing transformation. The idea was to study the transformative value dimensions of cloud computing that had emerged, and the Director showed great interest in participating in this study. From 2014 to 2016, many meetings were held and e-mails were exchanged. This provided an opportunity to get the point of view of a senior expert and a major world figure in cloud transformation, hearing about his experience with hundreds of cloud transformation projects all over the world. Later this Director validated the dimensions that arose from the analysis of the case studies. The cases studied are those published on CISCO's website and are accessible by everyone, so this Director divulged no confidential data. However, his expert view of these cases enabled to read between the lines and to see behind the words.

The companies studied cover 17 economic sectors: education, energy/utilities, entertainment/media, financial services, administration, health, law, industry, nonprofit, professional services, retail, ISPs, technology, technological services, telecommunication, transport, and wholesale. They are classified in two major categories: the cloud computing–providing companies (Sellers) and organizations that have adopted the cloud (Clients). These firms are from several countries on different continents. The selected geographical classification is the most used, with a distribution into three main economic regions representing all countries of the world: AMERICAS: representing the American continent; AJPC: representing Asia, Japan, Pacific, Oceania, and China; and EMEAR: representing Europe, Middle East, Africa, and Russia (Table 1).

8 sectors include more than 10 companies, 4 sectors less than 10 companies, and 5 sectors are represented with one company. The scarcity of companies in these sectors is explained by the fact that they are either less prone to use technologies with a low level of maturity (Energy, Organizations, Wholesale), or are themselves cloud computing companies (Telecommunications).

Once the cases to be studied were identified, data were collected in three phases. Several sources of information were exploited because transformation toward cloud projects is generally strategic and confidential. In the first phase, the documents published by CISCO about each of the companies were explored in depth. The exploratory approach was facilitated by the CISCO cloud transformation Director. The documents described client cloud projects, identifying their needs, motivations of their projects, challenges they had overcome, solutions supplied by CISCO, and the results of the adoption of the cloud solutions. The second phase consisted of systematic exploration of the studied companies' communication about cloud projects published on their websites. In the third phase, a review of the professional press, specializing in the field of cloud computing, enriched our data corpus with any information mentioned about cloud projects of these companies.

In addition to the data collected in the first phase, the last two phases have increased significantly the amount of the studied data. Triangulation of these data improved the reliability of the case data collected through institutional sources, which enabled more accurate and nuanced analyses.

A Grounded Theory Research with a Positivist Epistemological Approach

The first reading of the case studies leads to a categorization of companies according to their industry, size and continent of origin. The analysis follows the different steps common to each case with a chronological approach: needs analysis, definition of objectives, expected results, difficulties to overcome, implementation of the solution, measurement of obtained results, variance analysis, corrective actions, and achieved performances.

Table 1. Cases studied by sector and continent

Activity	Americas	APJC	EMEAR	TOTAL
Education	11	1	10	22
Energy	0	1	0	1
Media	1	2	3	6
Finance	10	2	4	19
Administration	10	0	4	14
Health	7	0	4	11
Law	0	1	0	1
Industry	6	1	7	14
Organizations	1	0	0	1
Services	3	0	1	4
Retail	3	0	0	3
Internet	15	9	4	28
Technology	14	0	3	17
Technology Services	16	3	8	27
Transport	2	0	1	3
Telecom	0	0	1	1
Wholesale	1	0	0	1
Total	**100**	**20**	**53**	**173**

A second reading enables the characterization of value factors that in each case influences positively or ambiguously the transformation toward cloud computing, before, during and after the conducted projects. This characterization relies on a sharp coding of factors that where validated by the CISCO cloud transformation Director to guarantee consistency.

The themes used as value factors enrolled in the transformation toward cloud computing were identified during the literature review.

A three-step process is followed to analyze the data in accordance with the precepts of the grounded theory systematic methodology (Glaser & Strauss, 1967): comparing, categorizing and linking. NVivo software is used for encoding, processing and analyzing data. The semantic analysis of the cases allows to identify 53 codes on which a frequency analysis is conducted to determine the importance of each one in each case.

The similarity method, using synonyms and words from the same lexical field, resulted in 19 positive and nine ambiguous factors influencing the transformation toward cloud computing. Exchanges between the authors and the CISCO cloud transformation Director reduced ambiguities and set a level of granularity appropriate to the study, using the Strauss and Corbin (1998) coding approach.

The initial comparison phase consists of choosing data to study among all the collected data.

Categorization helped identify common elements and differences among all studied cases, which leads to consider three dimensions – user experience, economy and structure – for the positive factors, and three other dimensions – insurance, criticality and resistance to change – for the ambiguous factors. Linking consisted of searching connections between categories to proceed with the verification, interpretation, and inference of results, and therefore identifying the cloud computing transformative value dimensions details.

DATA ANALYSIS AND RESULTS

Access to accurate data and such diversity of cases made it possible to analyze the value factors of cloud computing adoption. The 173 studied cases represent a sample of companies whose observation can identify contingency factors, organizational conditions, as well as strategic, tactical, and operational impacts of the transformation toward cloud computing, enabling the determination and classification of transformative value dimensions.

Transformative Value Dimensions

The analysis of case studies helped to understand the transformation projects of clients who adopted cloud computing in their organization, more precisely, the contingency parameters characterizing the value of the decision of transformation toward the cloud. The case studies show that the cloud has many impacts on all sectors studied.

Characterizing Transformative Values of Cloud Computing

In areas such as public administration, health, and education, cloud computing is a paradigm shift. For instance, in administration, the cloud can foster citizen interaction with government services. In addition, it contributes to improving the transparency of the administration by increasing its visibility and facilitating the supervision of its activities. Furthermore, the cloud enables better management of public funds, not only by reducing infrastructure costs but also by reducing the uncertainties in managing budgets and therefore the opportunities for corruption. Another benefit of the cloud is to offer accelerated services with high values and better quality for millions of customer citizens.

In the health sector, using the cloud allows for a better focus of investments on core competencies while reducing investments in IT services and information systems. It improves remote access to patient records and delivers health services and quality products to patients geographically remote from major medical centers.

In terms of education, the value of cloud computing is also strong. Indeed, increased competition, particularly between higher education institutions, has pushed these organizations to transform their business models radically by providing better training levels with lower costs. The cloud has played a major role in achieving this transformation. More and more institutions are currently using important environments on the cloud such as virtual learning environments (VLEs), e-learning platforms, learning management systems (LMSs), and student management information systems. In this sense, cloud computing can offer a lower-cost environment of collaboration between teachers and researchers, teachers and students, students and school services, and among the students themselves.

The cases showed the operational benefits of a cloud transformation. In fact, the cloud provided an opportunity for organizations that have adopted it to transform a large part of their capital investment expenditures (Capex) into operational expenditure (Opex). Cloud computing has enabled these organizations to carry out projects that were not possible a few years ago. Dreams thus can finally turn into reality for these companies, especially SMEs, who suddenly are able to access agility and functionalities in unexpected ways. Their managers just have to imagine they are in front of an unlimited set of computing resources and invent new high-added-value services to achieve their strategic objectives. They no longer have to worry about investing in infrastructure and information systems, just operational and strategic projects within their heart of businesses.

The analyses of the cases enabled to identify several transformative value factors of cloud computing. We distributed these factors into two classes of dimensions: positive and ambiguous. We identified three positive dimensions: User Experience, Economy, and Structure; and three ambiguous dimensions: Insurance, Criticality, and Resistance to Change. All dimensions and factors were validated in a back-and-forth process with the CISCO Europe cloud transformation director.

Positive Transformative Value Dimensions

The first positive dimension is User Experience. The employees of the enterprise using cloud computing are primarily consumers, and they behave as such even in their professional lives. This dimension can have a double impact. On the one hand, they have empathy with the company's customers. They understand their requirements and wish to fulfill their consumption practices. On the other hand, they are themselves consumers with habits and specific requirements, and they wish to enjoy at work the same technologies as the ones they use and appreciate at home. As employees, they want to have access to the data, content, and applications they need from any location, from any device, and at any time, as they do at home when they use public cloud solutions, such as Picasa, Gmail, Dropbox, or iTunes. However, cloud solutions for the public are not suitable for them to use in the workplace and usually are prohibited by information systems rules, hence the need to implement specific solutions.

The User Experience is also available in (1) simultaneous access to cloud services for multiple users, (2) tailored solutions that are instantly accessible, (3) instant collaboration technologies such as Cisco WebEx and Jabber, (4) universal mobility and multi-terminal with real-time synchronization. Metropolitan Council of Salford employees need, for example, to access simultaneously the same data from multiple locations using the community administration's tailored applications, or (5) collaborate seamlessly and interactively with different services, and use different types of materials, depending on specific situations and practices.

The second positive dimension is Economy. It is first expressed by (1) the agility allowed by the cloud and that businesses need to create, deploy, and offer new services and to adapt to changes in the environment and markets. For Carrier Education Corporation, the significant changes in teaching methods, the considerable increase in the volume of lecture materials and their diverse formats, as well as the rapid growth of the number of students wishing to access them make technologies used previously obsolete, necessitating radical changes. Economy is also (2) the refocusing of companies on their high-value-added activities. Cloud computing facilitates access to outsourced support functions, such as information systems that are not strategic in many sectors, and therefore supports the focus on what generates high added value. (3) Risk reduction is also improved by cloud computing. Companies look to reduce risks associated with the management of information systems by focusing on service level agreements (SLA) offered by cloud providers. (4) Cloud computing is accelerating the transformation of capital expenditure (Capex) into operating expenses (Opex), which is a requirement by external stakeholders, such as shareholders or the board of directors, and internal stakeholders, such as the business departments. (5) Cloud computing reduces the cost to upgrade equipment and IT infrastructures, which have shortening life-cycles. Indeed, technology obsolescence is developing rapidly because of the acceleration of innovation, increased computer power, and exponentially larger amounts of data to be processed. Cloud computing enables companies to not worry about this obsolescence, which would require regular equipment updating. Some companies have businesses with a strong seasonality, such as toy stores that make most of their profit at Christmas and who therefore need to adapt the size of their platforms to manage this quick scalability. If they had to rely on a constant computing power platform, they would manage a large excess of capacity for the remainder of the year. However, thanks to cloud computing, (6) companies with seasonal activity can adjust in real time their digital resources according to their needs. (7) The funding capacity is also among the Economy positive dimensions. SMEs and SMIs cannot have the same level of IT services and management of information systems in large groups because of induced costs, their lack of expertise, and in-house competencies. Cloud computing has a considerable influence on (8) the ability of a company to adopt a global approach, a key driver to its economic growth. (9) The model of pay per use, or pay as you go, enables companies using cloud computing to pay only for the services used and the resources consumed. *The availability of on-demand IT services and the pay-as-you-go pricing model makes it attractive for firms to source many IT services from the cloud* (Choudhary &

Vithayathil, 2013, p. 68). This significantly reduces the necessary investment. For the cases studied, this reduction was up to 80%.

The third positive dimension is Structure. (1) Data are particularly strategic for all business types and in all sectors. Therefore, it is a very strategic decision for an organization to entrust the management of its knowledge to another organization. This is probably why a company such as Criteo has chosen a proprietary private cloud solution to retain full control of data that are at the heart of their activities and performance. Thanks to the cloud, (2) IT infrastructures are becoming more consolidated and virtualized. With recent automations and the development of orchestration layers, the way users consume IT infrastructures through the cloud resembles more and more a utility consumption, such as energy or water. A company can easily move from one service to another, activate and disable a service, or switch providers according to their needs. (3) The elasticity capacity of the cloud enables offering services on demand. Capacity is flexible according to the willingness of clients. Scalability is guaranteed during peaks of use, and then capacity is instantly reduced when activity lessens.

The (4) ease of implementation is an obvious advantage associated with the cloud computing structure. Indeed, it is much easier to buy a cloud service than to develop, integrate, and manage information systems. Moreover, companies using cloud services no longer have to worry about (5) regulations, which are becoming more demanding. They account for a significant share of the IT infrastructure cost. The legal deadlines for data retention and the constraints of security and accessibility of these data are the heart of the requirements of managers of information systems.

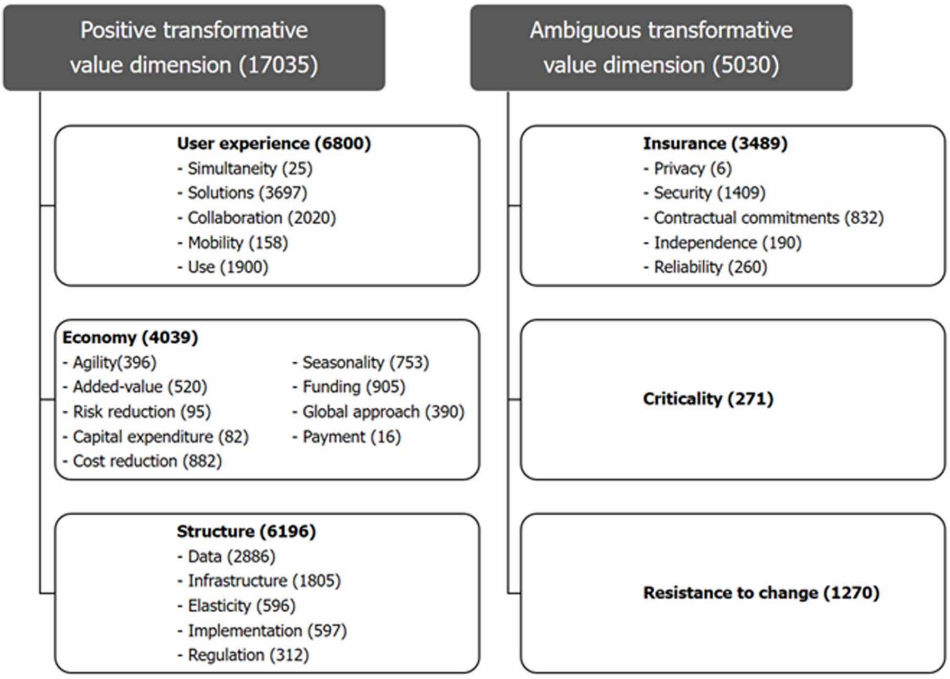
Ambiguous Transformative Value Dimensions

Although many factors are positive, there are some significant ambiguous dimensions to cloud computing. The first of them is Insurance. In fact, the main concerns expressed by managers are related to (1) privacy, (2) security, (3) contractual commitments, (4) and independence. (5) Reliability is also a key issue because managers fear a service interruption by their cloud providers, although these providers usually guarantee high levels of availability, much higher than levels achieved by the company itself. This fear is amplified by the connection interruptions because of incidents on the Internet service provider's network (xDSL or fiber optics), which handles all the cloud traffic. The (6) location of the cloud and related services is also problematic because it can be in a country other than that of the client company and therefore be subject to different legislation, particularly in terms of security, privacy, and confidentiality. The second ambiguous dimension is Criticality of Application components. Indeed, some applications are critical and even vital for business. No risk of temporary unavailability, security, or privacy can be tolerated. The third ambiguous dimension is Resistance to Change. This is a well-known phenomenon nowadays. Regardless of the industry, change is very difficult to control, although several methods have begun to appear since the late 1990s. A transformation toward cloud computing (Figure 1) is a major paradigm shift, implying that resistance to change is likely to be very strong for some stakeholders.

Improving the Strategic Transformative Value

In a forward-looking dynamic, actors' expressed opinions and anticipated forecasts may orient the construction of the current and future components of cloud computing. Anticipating difficulties and being prepared and adaptable are much more efficient than reacting to unexpected events. Using foresight and early identification of potential problems enable appropriate solutions to be formulated and implemented in time to avoid disastrous consequences. With the new knowledge and new theories being developed, the formulation of strategic orientation scenarios of the transformation toward cloud computing becomes possible, resulting in higher transformative value. In a continuous improvement endeavor, the identification of transformative value dimensions, associated with the process of transformation to the cloud, leads to a reflection on the preparation, implementation, various steps, and possible scenarios enabling the maximization of this transformation value.

Figure 1. Strategic values of cloud computing transformation and their occurrences



A Gradual Transformation in Several Stages

Buying a cloud solution is usually done ad hoc for a specific need and for a limited time or to experiment with cloud services for less critical business elements, such as e-mail or VoIP. For medium to large companies, where cost reduction is not significant enough to offset the risk and lack of control of public cloud services, the trend is to start with a private cloud as a test. *The shorter time period required to install and implement new software applications could be a major advantage to small and medium-sized enterprises (SME) that lack the organizational resources incurred in installing and configuring complex business applications, while larger firms can benefit from reduced capital investments and improved purchasing power* (Susarla, Barua & Whinston, 2009, p. 207).

Investments then remain as the responsibility of information systems management and are still recognized as Capex. Moving toward a private cloud solution or a shared public cloud solution means taking a leap in terms of adaptability and flexibility and an evolution toward Opex, resulting in a considerable change in model and business processes. Historically, because of the structural transformation it generates, the cloud is the responsibility of information systems management. Currently, business department influence is increasingly important. This requires close cooperation between information systems management, which is often reluctant, and business directions, which are very demanding. As a result, companies are forced to transform their decision-making processes and to rebalance power relationships.

The transformation to cloud computing requires going through several different levels of maturity that will enable the gradual incorporation of all contingency factors by considering all the factors that favor and inhibit the transition (Tiers, Mourmant & Leclercq-Vandelannoitte, 2013). These intermediate steps are phases in the sourcing process of the cloud computing provider that enable the company to take the time to reconfigure itself, ensure change management, adapt decision flows, and explore the world of cloud computing through understanding its diversity and potential.

A Transformation Compromised by the Very Nature of Cloud

Another key challenge for cloud computing transformative value maximization is that of migration. Attracted by the benefits that cloud computing can bring, companies are increasingly tempted to migrate their old infrastructure to the cloud. However, the cloud market is evolving very quickly, and it is impossible to predict which deals will take precedence over the others. These products are diversifying and multiplying, increasing confusion and reducing the transparency necessary for an informed solution choice. Despite the fact that managers of some companies are determined to migrate to the cloud, they are unable to decide what to migrate, how to do it, where to start, or what to focus on (Schneider & Sunyaev, 2016; Tiers, Mourmant & Leclercq-Vandelannoitte, 2013). Indeed, they are confronted with a market that is not stabilized and with a typology of cloud that constantly becomes more complex with several levels of public, private, internal, external, community, or hybrid clouds.

Managers therefore try to choose a target cloud configuration toward which to evolve among moving targets that are becoming more and more numerous and complex, which are not all equivalent, and which some are not even really cloud tools but old products renamed for commercial purposes. Furthermore, not all the companies are in a configuration that is immediately transformable to the cloud. This type of project requires consolidated processes and accurately defined information flows before being implemented. A thorough analysis of information systems and a diagnostic of user skills and practices are also essential to ensure effective processing (He & Wang, 2015).

Before starting the migration, transformation to the cloud project planning proves a major challenge. Indeed, the company must take into account the necessary continuity of its services, the technical and functional characteristics of its information systems, integration with the various components, and integration with customers, suppliers, and partners. The power of the IT direction will be much less once the transformation to the cloud is completed. The business departments will be much more independent and have more specific and integrated tools, and the general management will define the strategy of the business without worrying about the information systems, because their agility will enable them to align almost instantly. Information and decisions flows will be better controlled, more fluid, more transparent, and will generate a rebalancing of the influence areas of the different stakeholders.

Transformation Prepared to Post to the Cloud

If companies are seeking the immediate maximization of the transformative value, sustainability will be drastically challenged and earned value will drop if they do not take into account the post-cloud disruption in their transformation project. With the proliferation of connected devices, the emergence of the Internet of Things, and the development of BYOD (bring your own device), the cloud is rapidly becoming even more popular, whether in public or private, enabling professionals to connect anywhere, anytime, on any device. This trend is accentuated by the emergence of the concept of the Inter Cloud, which is accelerated by the transformation toward cloud computing.

However, the evolution of cloud web to a hyper-cloud web, super cloud or everyweb, is planned to occur by 2025 (Mateescu & Vladescu, 2013). There will be a convergence among computers, tablets, phones, and credit cards, with the appearance of thin client terminals that don't rely on hard disks but use high-speed connections in e-Fi (Everyweb Fidelity) to remote servers. Individuals will no longer own the data, applications, or spaces but only an account that will enable them to access specialized clouds able to make instant, automated, and dynamic analysis of massive data (Bhattacherjee & Park, 2014; Pande & Padwalkar, 2014).

To face these challenges, it is not enough to simply transfer identical computing resources to the cloud without conducting a deep reflection of the place and role of information and communication technology in all departments and at all levels of the company. This analysis should be conducted with a prospective vision and taking into account all the transformative value dimensions. Information systems therefore must take advantage of this migration to the cloud to adjust and align with the strategic objectives of the company and to enable better operational efficiency, greater investment

performance, a rigorous safety control, and more accurate appreciation of risks while driving innovation and organizational agility (Chou, 2015).

CONCLUSION

Cloud computing not only improves the way information systems are deployed, managed, and used but also how they will evolve and fit with the organization's strategy. However, despite the cloud's apparent benefits—commercial, financial, and technical—several challenges have to be taken into account, especially during migration. Several contingency factors positively or negatively influence the decision to transform to cloud computing. Contributions of this research are threefold: managerial, academic, and methodological.

From a managerial point of view, this research studied 173 cases. The analyses of these cases enabled to identify positive and ambiguous transformative value dimensions of the transformation toward cloud computing. Although this technology seems to be particularly popular with many advantages that favor migration, there are significant ambiguous factors, such as criticality, insurance factors such as privacy or security, as well as resistance to change, which managers should take into account in order not to compromise transformation projects. However, positive dimensions, namely, user experience and economic and structural dimensions, might be justified and generally lean the balance of managers to making the decision to transform to cloud computing. These benefits may vary highly, depending on specific circumstances, even though some issues are common to almost all businesses.

From an academic point of view, this study contributes to the research on cloud computing in management science as well as in computer science. Indeed, it proposed a framing of the current state of research in this area according to the different aspects analyzed. Moreover, it helped enrich the research knowledge database with the different contingency factors determining the value dimensions of the transformation to cloud computing.

From a methodological point of view, this research has taken up a challenge that seemed insurmountable, namely, the study of many companies that adopted cloud computing in a variety of industries and were spread over several countries on several continents. Moreover, the input from the director of cloud transformation of one of the largest pure player cloud vendors, CISCO, was very valuable, enabling to make our theoretical contribution consistent with managerial concerns.

However, this research has several limitations. Beyond the usual limits related to the choice of the case studies and the methodology used, this work has limitations related to the adopted framing and perspective. This article focuses on the perspective of cloud client companies. These companies need methodological assistance in their projects of transformation toward cloud computing. It will be interesting to complete this view assessing cloud sellers' transformative value, because they have an opportunistic approach guided by declination and progressivity of offers. Indeed, cloud computing is a challenge facing companies. Nevertheless, it constitutes a profitable business opportunity for ICT providers. Hence, they need to distinguish themselves in a market characterized by ferocious and international competition. It is therefore essential for them to find a marketable transformation model meeting their clients' requirements. The challenge is twofold for firms looking to cope with technological turmoil as well as for providers that must offer high-performance operational solutions.

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Mohamed Makhlouf, Pr., PhD, was Advisor to the President of the Tunisian Republic, before joining KEDGE Business School as Management Information Systems Professor. Previously, he has had a large senior managerial experience in some of the largest European companies, in the telecommunications, financial and industrial sectors. He has his PhD in Management (Unification of Governance based on Information Systems), from Telecom Business School, Paris, France. He also holds an MSc in Management of Information Systems, and a Research Master in Mathematics, Computer Sciences and Applications to Human Sciences. Furthermore, he is Engineer in Computer Sciences, graduated from the National Engineering School of Computer Sciences. He elaborated an end-to-end digital transformation framework, allowing giving a comprehensive holistic unifying vision of Governance in a Strategic Alignment purpose. He published numerous papers in top ranked international journals.

Oihab Allal-Chérif, Pr., PhD, is the Director of the Operations Management and Information Systems Department of KEDGE Business School, France, since 2010. He is a member of the school's research team in creative industries and the research cluster in supply chain management. He earned his HDR habilitation in information systems management at Nantes University, his Doctoral Degree in management sciences from Grenoble Alpes University and his Master Degree in management from Grenoble École de Management. His research and teaching interests are in the areas of cloud computing, IS governance, serious games, casual games, change management, innovative learning, e-business, information systems for supply chain management, and in the firms of Google, Apple, Facebook, and Amazon. His work has been published in international journals such as Journal of Business Research (JBR), International Journal of Physical Distribution and Logistics Management (IJPDLM), Information Systems and Management (SIM), Supply Chain Forum: an International Journal (SCF:IJ) and in conference proceedings such as Hawaii International Conference on System Science (HICSS), Global Innovation and Knowledge Academy (GIKA), Working Conference on Virtual Enterprises (PRO-VE), and Institute for Operations Research and the Management Sciences (INFORMS).