GOVERNMENT CLOUDS: EXPERIENCES AND RISK MANAGEMENT

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ABSTRACT. The cloud computing model puts forward on-demand services in order to reduce the costs of ICT resources without losing potential business opportunities. The paper reviews the main features of cloud computing that government agencies should consider when evaluating the possibility to move their core ICT activities to the cloud, substituting their own 'ICT factory' with the use of cloud services. The paper analyzes the possible drivers and facilitating factors for European "government-clouds" and illustrates relevant examples of cloud adoption by government agencies as well as some initiatives at institutional level. The author, learning from his experience in payment systems oversight, argues that government agencies, when moving to the cloud, should modify their existing risk management framework to adapt their organization and procedures to set up control models suitable for a cloud environment.

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INTRODUCTION

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provided and released with minimal management effort or service provider interaction.

The goal of the analysis - which makes reference to a study conducted in 2011 by Banca d'Italia Oversight Department involving banking supervision and ICT departments, Universities and ICT providers - is not to evaluate pros and cons of the cloud ICT delivery model but to understand risks and opportunities for government agencies.

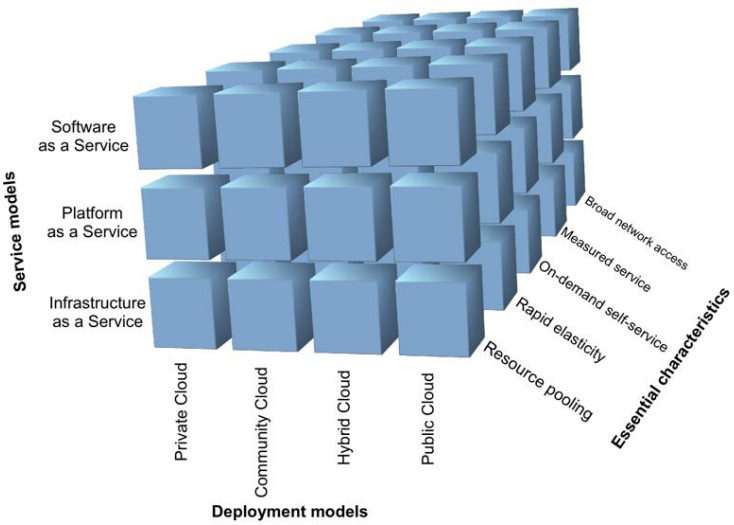
Among the new emerging strategies for ICT services provisioning, cloud is probably the most controversial. In particular, the benefits of the cloud computing model seem to go beyond reducing ICT costs; it might facilitate innovation. At the same time, the risks of cloud computing are still to be well understood; the adoption of cloud computing services may change the entire risk management model of government agencies.

Main features of cloud computing

Cloud is a fresh look at old problems: a different *weltanschauung*. The *idea phase* of cloud computing started in the 1960s and stretched up to the pre-Internet bubble era; during this phase, the core ideas of computing as a utility and grid computing were developed. The *pre-cloud phase* started around 1999 and lasted till 2006: the idea of using the Internet as a way to provide applications as a service was developed. The true *cloud phase* started in 2007 when the term became popular and the sub-classifications of SaaS, IaaS and PaaS (see the box in this chapter) were formalized. The basic technological drivers that allowed it are: the growing availability of storage, a wide range of virtualization techniques and the Internet bandwidth.

According to the OECD definitions (OECD - Oslo Manual, 2005), cloud computing might be considered a process innovation[1]. It may change the way public services are offered and demanded, encouraging a behavioral innovation in government agencies and stimulating innovation in risk management practices.

The National Institute of Standards and Technology (NIST) defined a taxonomy of: i) five essential characteristics that all cloud services exhibit; ii) three service models available to cloud consumers; iii) four deployment models describing how the computing infrastructure that delivers these services can be shared. They can be represented on a cube (Craig Wood, 2010):



(NIST DEFINITION OF CLOUD COMPUTING, 2011)

ESSENTIAL CHARACTERISTICS:

On-demand self-service*. A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.*

Broad network access*. Capabilities are available over the network and accessed through standard mechanisms that promote use by*

heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).

Resource pooling*. The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or data centre). Examples of resources include storage, processing, memory, and network bandwidth.*

Rapid elasticity*. Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.*

Measured service*. Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.*

SERVICE MODELS:

Software as a Service (SaaS)*. The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.*

Platform as a Service (PaaS)*. The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming*

languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

Infrastructure as a Service (IaaS). *The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).*

DEPLOYMENT MODELS:

Private cloud. *The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.*

Community cloud. *The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.*

Public cloud. *The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.*

Hybrid cloud. *The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).*

The key novelty of cloud computing is in being able to distribute worldwide making optimum use of resources. Service providers are able to utilize data centers, telecommunications and desktop services to deliver services to customers across the globe using both fixed and mobile networks. Cloud services are offered on every layer, from network access and infrastructure, through the service layer (application software, customer services), to the customer front-end (EU Commission - Cloud computing public consultation report, 2011).

The diffusion of cloud computing may create a pervasive impact on the global economy (Garg, 2011). The estimated (CEBR, 2011) cumulative economic benefits of cloud computing to the EMEA (Europe, Middle East, and Africa) over the period 2010-2015 - with baseline assumptions - are +1.67% of total EMEA GDP over the same period. The two key factors are: the size of the cost savings in ICT spending and the reduction of the fixed costs of production (Armbrust et al., 2009).

As to the first factor, business literature emphasizes large savings. IDC (Perry et al., 2009) calculates savings ranging between a total cost reduction of about 20% to 50% or more in the private sector. The expected figures (CISCO, 2010) for public actors are less favorable, ranging between a reduction in total costs of 10% in a pessimistic scenario and of 30% in an optimistic one.

As regards the second factor, cloud would induce a generalized reduction of the fixed costs, in terms of shifting ICT fixed capital expenditure (CAPEX) into operative costs (OPEX). This might contribute to reducing the entry barriers especially for SMEs because there is no need for them to purchase an ICT infrastructure to serve infrequent computing needs; this would allow quick scalability. A range of reduction in the fixed costs in the long run between 1% and 5% has been predicted (Etro, 2011).

In a model for evaluating the impact on public finance (Etro, 2011), the impact of cloud on the reduction of the deficit/GDP ratio would be between 0.1 % in a pessimistic scenario and 0.2 % in an optimistic one. This would happen because public finances would benefit from the direct cost reduction and from the additional tax revenues derived from the boost to the economy and to the creation of new businesses.

European Government clouds (G-clouds): drivers and facilitating factors.

Public services are provided by public administrations, either to one another or to businesses and citizens, directly or by financing private provision of services (EU Commission - Towards interoperability for European public services, 2010). High standards in public services are considered a key driver in realizing inclusion, social cohesion and quality of life, all cornerstones of the Lisbon goals for the European Union (EU Commission - The Lisbon Strategy and the Information Society, 2007). ICT in this context is considered to be one of the most promising instruments for the improvement and innovation of public services and the public sector in general (EU Commission - Public Services 2.0, 2009). Therefore, in the past decade, national, local and European governments have invested heavily in ICT-enabled public services. Nevertheless, until now the results of these investments in the public sector have not met expectations: the take up of e-enabled public services has been relatively low and the anticipated transformation of the administrations not as rapid and radical as envisaged (OECD - The Economic Impact of ICT, 2004). Looking more closely at the deployment of ICT in the public sector, innovation had a strong technocratic character with ICT deployed primarily in an instrumental way and not as a driver of more fundamental innovations. Today, public sector ICT is characterized by high levels of duplication, silos of infrastructure, fragmented and often inappropriate provision and low levels of server utilization. It is estimated that in some cases, infrastructure utilization is less than 10% (UK Cabinet Office - Government Cloud Strategy, 2011).

Cloud computing, with its shift to *light technologies*, may result in substantial cost savings allowing government agencies to reinvest in their most critical mission needs. Cloud is a *process innovation* that has the potential to create new grounds for *public innovation*. But, if we look at the cloud computing trend, successful applications of ICT need to pair up with more fundamental innovations in business models, value-chain concepts and risk management to produce the leapfrog in innovation dominant in the current crop of cloud services.

The EU needs to be cloud-active and not only cloud-friendly and, to fully realize the benefits of cloud computing, government-clouds (G-clouds) may play a fundamental role. Besides allowing for the

provision of cloud computing in its various forms, G-clouds in the EU have to address the needs of citizens and businesses end-users and protect their rights. At the same time, G-clouds would facilitate the development of a strong industry in this sector in Europe (Industry recommendations to Vice President Kroes on the orientation of a EU cloud computing strategy, 2011). Nevertheless EU Member States setting up cloud-supported national public services need to be more aware of the risk of creating new electronic barriers if they opt for regional or local cloud solutions.

G-cloud initiatives have the potential to pave the way for a mature European cloud market. If nothing is done, there is a risk the cloud market in Europe (users, suppliers and regulators alike) will mature slowly over many years during which time European organizations will be at a competitive disadvantage compared with those in other regions. A concerted European effort, drawing on both users' expectations and suppliers' inputs, is needed (EU Commission - Cloud computing, hearing with user industries, 2011).

It should be also noted that broadband – both fixed and mobile – is necessary to deliver cloud services and is a framework condition for their success. Network operators across the EU are wrestling with exploding data traffic, which cloud approaches will exacerbate. Connectivity will be one of the key determinants in the performance of cloud services, especially as more and more users connect over mobile devices. While policymakers are already addressing this issue under the *Digital Agenda for Europe* (EU Commission - A Digital Agenda for Europe, 2010) and elsewhere, things are not moving fast enough. **Regulators have to provide credible incentives for the rollout of ultra-fast networks** (EU Commission - Cloud computing, hearing with telco and web hosting industry, 2011). The deployment of G-clouds would force the creation of such networks that would be then available for other private initiatives, especially for SMEs that tend to be quite suspicious about new technological solutions – as has been seen with websites, social media and online commerce – and want to see demonstrable and concrete benefits before investing (EU Commission - Cloud computing, hearing with SMEs, 2011).

EXAMPLES OF G-CLOUD INITIATIVES

In October 2011 the **UK Government** defined a cloud strategy (UK Cabinet Office - Government ICT Strategy, Strategic Implementation Plan, 2011) that moves UK government from attempting to be the architect of bespoke digital solutions to a consumer of widely available and constantly improving mass-market products. The UK vision is for government to robustly **adopt a public cloud solution first** policy, though this will not be possible in every case. The UK G-cloud will be enabled via the creation, by April 2013, of a Government Application Store (G-AppStore). This will take the form of an online portal, and will provide an open marketplace displaying services that will be able to be procured, used, reviewed and reused across the public sector. The G-AppStore will be the first point of call for any public sector ICT requirement; it will be a shop window where all the relevant public sector ICT services can be found encouraging innovation, competition and new suppliers. From a public procurement perspective the G-AppStore will enable collaborative procurement, driving up supplier performance by providing an open feedback mechanism and facilitating re-use of services. The UK G-cloud strategy aims at moving ICT from custom to commodity solutions and this will encourage simple and fair alternative procurement strategies, more appropriate to commodity services such as dynamic purchasing systems, that allow any supplier who meets the criteria for the provision of the commodity service or solution to be included within the framework. **By Dec. 2015, 50% of UK central government departments new ICT spending will be transitioned to public cloud computing services**. The UK Cabinet Office received more than 500 expressions of interest to its invitation to tender for cloud framework, worth up to £60 million and designed to be accessible to SMEs. The initial G-Cloud framework will operate for six months and will include all suppliers that pass the simplified assurance processes. Successful suppliers will form the G-AppStore. Services available on the G-AppStore are likely to include: email, word processing, system hosting, enterprise resource planning, electronic records management, customer relationship management and office productivity applications. It is also an example of public procurement

changing: rather than rigid requirements expressed in overly complex tenders, the UK Cabinet Office asks suppliers what they can offer and sets out its requirements in the simplest way possible (Government procurement service - G-cloud 'simple' procurement instructions, 2011).

Defined in 2011, the cloud strategy for **Singapore** Government is to leverage the public cloud offerings only for appropriate needs, adopting a multi-prong approach. At end of 2011, the Singapore government opened a tender (UK Trade & Investment - Singapore G-cloud services to central government, 2011) for Central G-Cloud, a private G-cloud where security and governance requirements cannot be met by public clouds. Government agencies may also set up their own clouds to address specific needs which cannot be met by public clouds and Central G-Cloud. Interoperability between Central G-Cloud and agencies G-clouds will be enabled through a set of G-Cloud standards (Singapore ministry of finance – eGov master plan 2011/2015, 2011).

In 2009 the **Japan's** Ministry of Internal Affairs and Communications defined plans to build a cloud computing infrastructure - *Kasumigaseki Cloud* - to support all of the government's ICT systems. The new infrastructure will be built in stages until 2015. The goal of the project is to consolidate all government ICT systems into a single cloud infrastructure. Another key objective is the creation of industries that leverage local demand to create internationally competitiveness for the country (Ministry of internal affairs and communications - Cloud services in Japan, 2011).

Released in Apr. 2011, the Cloud Computing Strategic Direction Paper states that **Australian** Government agencies may choose cloud based services if they demonstrate value for money and adequate security. The strategy encourages a tactical approach to public cloud, as offerings mature, for "unclassified" government services and to undertake proof of concept studies to fully understand the risks of the cloud environment. In the same time, the strategies encourages a strategic approach to cloud where Government agencies may conduct proof of concept activities utilizing community clouds, without advocating the establishment of an Australian equivalent to the UK

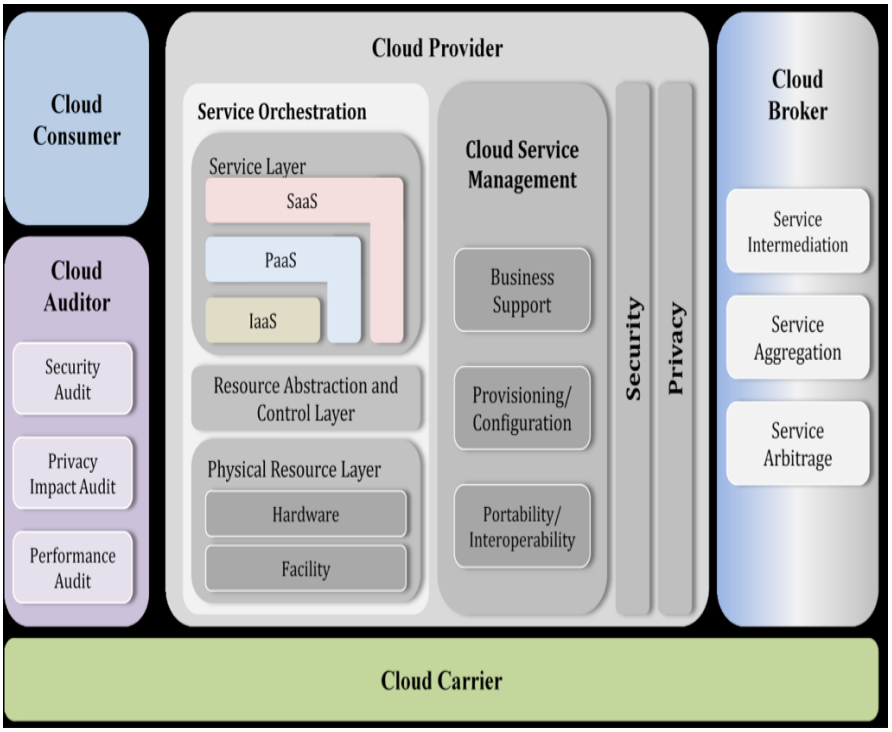
government's G-cloud initiative (Australian department of finance and deregulation – Cloud computing strategic direction paper, 2011).

In Dec. 2010 the **US Government** acknowledged (U.S. Chief Information Officer - 25 point implementation plan to reform Federal IT management, 2010) the technology gap between the use of ICT in the public and private sector and proposed specific reforms to address it. They include the reduction of the number of federal data centers by at least 40% by 2015 and the shift of the government Chief Information Officer (CIO) role from owning data centers and custom systems to provisioning them like utilities. The Federal Government therefore shifted to a *cloud first* policy, aiming at using commercial cloud technologies where feasible, launching private government clouds, and utilizing regional clouds with state and local governments where appropriate. As regards procurement, the General Services Administration[2], in July 2011, successfully migrated its employees to a cloud-based email service (GSA, 2011) and established the website Apps.Gov, where government agencies can search for infrastructure, platform, and software *as a Service*. Apps.Gov also has information on no-cost social media applications that have agreed to "government-friendly" terms of service. In Feb. 2011 the Federal CIO released (U.S. Chief Information Officer - Federal cloud computing strategy, 2011) the Federal cloud strategy. According to it, agencies should make risk-based decisions carefully considering, among others: security requirements, service features, market characteristics, network readiness, government readiness, technology lifecycle of legacy systems. The main guidelines for provisioning are: pool purchasing power by aggregating demand to the greatest extent possible, ensure integration and interoperability of cloud services into the existing ICT portfolio, repurpose or decommission legacy assets and redeploy freed resources, contract effectively to ensure agency needs are met. A government-wide risk and authorization program for cloud solutions allows agencies to rely on existing authorizations so only additional, agency-specific requirements need to be authorized separately. In Dec. 2011, the Federal CIO announced the Federal Risk Authorization Management Program that provides a common approach to low and medium risk cloud security assessments, grounded in NIST standards and using independent third party assessors.

ONGOING INSTITUTIONAL INITIATIVES

The **National Institute of Standards and Technology** (NIST) was designated by the US Federal CIO with technical leadership for US government agencies efforts related to the adoption and development of cloud computing standards. In September 2011 the NIST published its cloud computing reference architecture (NIST cloud computing reference architecture, 2011). It is a generic high-level conceptual model that defines a set of actors, activities and functions and relates to a companion cloud computing taxonomy. The NIST taxonomy has also been adopted by the ICT department of Banca d'Italia.

NIST conceptual reference model



NIST – ACTORS IN CLOUD COMPUTING	
Actor	**Definition**
Cloud Consumer	A person or organization that maintains a business relationship with, and uses service from, *Cloud*
Cloud Provider	A person, organization, or entity responsible for making a service available to interested parties.
Cloud Auditor	A party that can conduct independent assessment of cloud services, information system operations,
Cloud Broker	An entity that manages the use, performance and delivery of cloud services, and negotiates relationships
Cloud Carrier	An intermediary that provides connectivity and transport of cloud services from *Cloud Providers* to

In 2011 the **World Economic Forum**, a Swiss non-profit foundation best known for its annual meeting in Davos, produced a report (World Economic Forum, 2011) on cloud in order to explore its geopolitical implications identifying three major issue areas related to cloud computing: data governance, security and business environment. The World Economic Forum highlights concerns that may derive by the current dominance of cloud providers based in the United States, because of the potential loss of competitiveness and decreased ability to influence how the cloud operates. This may explain, together with data privacy issues, the development of *local* clouds. The skills issue also comes into play because a country's capacity for innovation could be compromised if its governments are not sufficiently aware of how to utilize cloud technologies, especially if no local cloud providers exist. There are also questions about whether national identities, autonomy and sovereignty could be compromised if financial operators increasingly rely on the same few foreign cloud providers. Finally, it is still far from clear how principles of free trade should be applied in the cloud, whether countries that host cloud data centers have an obligation to provide open access to these

centers to customers from other countries, under what terms and with what protections.

The **EU Commission** launched in 2010 the digital agenda (EU Commission - A Digital Agenda for Europe, 2010), a flagship of the EU 2020 strategy. Its overall aim is to deliver sustainable economic and social benefits from a digital single market based on fast and ultra fast internet and interoperable applications. The ICT sector is directly responsible for 5% of European GDP, with a market value of € 660 billion annually, but contributes far more to overall productivity growth (20% directly from the ICT sector and 30% from ICT investments). The digital agenda contains commitments to undertake 101 specific policy actions (78 actions to be taken by the Commission, including 31 legal proposals, and 23 actions proposed to the Member States) intended to stimulate a virtuous circle of investment in and usage of digital technologies. It identifies 13 key performance targets to show whether Europe is making progress in this area. The Agenda foresees how Europe should build its innovative advantage in key areas through reinforced e-infrastructures (SIENA initiative, 2011) and **should develop an EU-wide strategy on cloud computing** notably for government and science. The cloud strategy should consider economic, legal and institutional aspects. In its annual progress report (EU Commission - Digital Agenda for Europe, Annual Progress Report, 2011) the EU Commission anticipates that the Commission will publish a strategy on stimulating cloud computing in the European digital single market in 2012.

From May to August 2011 the **EU Commission** ran a public consultation on cloud computing in Europe (EU Commission - Cloud computing public consultation report, 2011). The survey highlighted the need for clarification on rights, responsibilities, data protection and liability, especially in cross-border situations. Respondents declared they would appreciate guidelines on good practice in contracting, model terms and conditions, reasonable expectations for service level agreements. According to the final report and following a well known literature (Swann, 2005), a rapid deployment of cloud standards could be stimulated by the public sector that could set requirements for standards in security, interoperability and data portability. International agreements on certain principles such as

certification, data protection and security are considered necessary by respondents.

Cloud computing does not introduce new requirements in terms of data privacy, but rather it highlights tensions and loopholes within existing legislation. In this regard, the **European Commission** is working closely with the European Parliament and the Council to ensure an agreement on the EU's new Data Protection Framework by the end of 2012. It should consist of a Data Protection **Regulation** and a new Police and Criminal Justice Data Protection **Directive**. The new framework, according to draft versions currently available, should include adequacy decisions and appropriate safeguards such as standard contractual clauses or Binding Corporate Rules – with the twofold aim of securing a high level of data protection in international processing operations and facilitating data flows across borders. To address the challenges of globalization the Commission is proposing the following measures:

- clear rules defining when EU law is applicable to data controllers established in third countries, in particular by specifying that whenever processing activities are directed at individuals in the EU, European rules shall apply;
- any decisions certifying data protection standards in third countries (adequacy decisions) will be taken by the European Commission on the basis of explicit and clear criteria, including in the area of police cooperation and criminal justice;
- legitimate flows of data to third countries will be made easier by reinforcing and simplifying rules on international transfers to countries not covered by an adequacy decision, in particular by streamlining and extending the use of tools such as Binding Corporate Rules[3], so that they can be used to cover data processors and within groups of companies, thus better reflecting the multiplicity of actors involved in data processing activities, especially in cloud computing;
- engaging in dialogue and, where appropriate, negotiations, with third countries – particularly EU strategic partners – and relevant international organizations (e.g. Council of Europe, OECD, UN) to promote high and interoperable data protection standards worldwide.

G-clouds risk management: cloud auditing.

Moving to the cloud requires that government agencies and regulators modify their existing risk management framework to adapt their organization and procedures to set up control models suitable for a cloud environment.

In Europe, U.S. companies offering cloud services have to comply with *safe harbor*[4] agreements which contain seven principles including security, user access to data and accuracy. Is the *safe harbor* enough to assuage security concerns? Is it robust enough to protect EU citizen's personal data in the cloud? Actually the German Data Protection Authorities takes a careful approach to *safe harbor* certifications suggesting that: i) customers should not rely solely on the *safe harbor* service provider's assurance; ii) the service provider should accept to cooperate in investigations by, and to comply with the advice of, competent EU authorities (Schuppert, 2011). Here comes the relevance of audits, which are not only for data loss but also for quality and absence of service. Several **cloud providers tend to write very broad disclaimers relinquishing them from as much liability as possible for data loss and other problems**. Though the industry agrees that auditing is necessary to build trust and increase the uptake of cloud services, some warn new audits could add extra expense to a technology which relies on its relative cheapness to attract clients. Further audit requirements would create costs that would potentially be passed on the user. Auditing the cloud could be more cumbersome as the selling point of the service relies on having multiple back-ups spread around different data centers in different parts of the world (EurActiv, 2012).

The National Institute of Standards and Technology (NIST), in its cloud computing reference architecture, adopts an actor/role based model where the *cloud auditor* plays a key role. According to the NIST, the cloud auditor should conduct independent assessment of cloud services, information system operations, performance and security of the cloud implementation.

Government agencies and regulators should delve into the roles and responsibilities of a cloud auditor with extended skills, able to analyze the *criticality* of each process considering different risk factors – e.g.

strategic, reputation, compliance, operational, financial, governance, in a *public* perspective – and choose the proper cloud deployment model.

A discrepancy exists between the rates of adoption of cloud and those of the evolution of risk management models. Government agencies are confronting now with ICT innovations without any *cloud specific* risk management models. Organizational and ICT innovations cannot squint because this would hinder the development of cloud. Regulators might be urged to protect confidence in the short run.

In order to fasten the creation of cloud auditors, a strong and immediate cultural shift (Damanpour & Evan, 1984) both for markets and regulators, is necessary. In particular organizational roles and ICT management models must integrate technical, economical, legal and governance issues so facing the main shortcomings of the cloud delivery model.

In this regard government agencies that have already deployed a comprehensive risk management systems, based on a map of processes and a thorough understanding of related risks, seem to be in a better position to answer to the cloud challenges: they could be able to differentiate their demand for cloud services - defining the proper mix of public, private, community and hybrid clouds – depending on risk profiles of each internal process/ service.

As for cloud providers, they are expected to increase the dialogue and the cooperation with authorities, not only at national level, in order to minimize the cost of compliance with data protection and promote the adoption of standard for critical services.

NOTES

[1] A *process innovation* is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these. A *product innovation* is the implementation/commercialization of a product with improved

performance characteristics such as to deliver objectively new or improved services to the consumer.

[2] The General Services Administration (GSA) is an independent agency of the US government, established in 1949 to help manage and support the basic functioning of federal agencies.

[3] **Binding Corporate Rules.** Consider a corporate group that needs to transfer personal data from its affiliates based in the 27 EU Member States to its affiliates located in third countries on a regular basis. The group would to introduce a set of Binding Corporate Rules (BCRs) in order to ensure that a single set of rules would apply throughout the group instead of various internal contracts. Today BCRs adoption implies a burdensome process; following the data protection reform the process should be streamlined.

[4] The United States Department of Commerce runs the *safe harbor* certification program which aims to harmonize data privacy practices in trading between the United States of America and the stricter privacy controls of the European Union Directive 95/46/EC on the protection of personal data. [On-line] Available at http://en.wikipedia.org/wiki/Safe_harbor and http://export.gov/safeharbor/ [Retrieved Feb. 28, 2012]

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