A Methodology for the Impact Assessment of a g-Cloud Strategy for the Italian Ministry of the Economic Development

Francesca Spagnoli, Francesco Bellini and Alessandra Ghi

Abstract The paper has the objective to provide a methodology for the socio-economic, technological and environmental impact assessment of a Cloud Computing strategy for the Italian Ministry of the Economic Development and more specific at the service of the Department for Communications. In order to develop a detailed and tailored model for implementing the g-Cloud strategy, we analyse the current services and functions performed by the Department for Communications of the Italian Ministry of the Economic Development, showing the current ways of managing information flows within and outside the administration. Starting from the available background analysis on the current state of the art of the adoption of g-Cloud services in Europe and USA, we provide assumptions and hypotheses for the definition of the g-Cloud Strategy. We then compare the requirements provided by the General Directorates of the Department for Communications of the Italian Ministry of the Economic Development in order to validate the hypotheses previously defined. By reviewing the approaches for the impact assessment available from literature review, we define the best effective methodology for assessing the potential impacts of g-Cloud strategies. The methodology considers four areas of impact: economic, social, legal and environmental impacts. For each area of impact we identify specific indicators for the assessment of efficiency and effectiveness of Cloud Computing initiatives in the Italian PA that have been validated by a set of Cloud Computing experts.

Keywords g-Cloud computing · Impact assessment · Methodology · Italian Ministry of the Economic Development

F. Spagnoli (✉) · F. Bellini · A. Ghi
Università Degli Studi Di Roma La Sapienza, Rome, Italy
e-mail: francesca.spagnoli@uniroma1.it

F. Bellini
e-mail: francesco.bellini@uniroma1.it

A. Ghi
e-mail: alessandra.ghi@uniroma1.it

C. Rossignoli et al. (eds.), *Organizational Innovation and Change*,
Lecture Notes in Information Systems and Organisation 13,
DOI 10.1007/978-3-319-22921-8_2

1 Analysis of g-Cloud State of the Art in Europe, in Italy and in the U.S.A

1.1 European Cloud Strategies for the Public Administration

The European Economic and Social Committee, on January 20, 2011, decided to draw up an opinion on the subject: "Cloud Computing in Europe" [1], in accordance with art. 29, paragraph 2 of the Rules of Procedures. Based on Europe 2020 strategy [2], and in particular on the Digital Agenda, the European Economic and Social Committee (EESC) primarily aimed to gather and share experiences developed by stakeholders and the market in the Cloud Computing field. The opinion had also the objective of formulating a series of recommendations to encourage Europe to position itself at the head of this promising field, with the help of leading companies. The opinion highlighted potential economic benefits and weaknesses of the Cloud Computing technologies, which are mainly due to a lack of maturity. With reference to the economic model of Cloud infrastructures, the Economic and Social Committee supported the following elements as the most relevant for the full development of the economic model: a larger number of potential users, the sharing and optimization of resources, the users mobility, the easy, flexible and transparent integration of the technical components, the distribution of costs throughout the complete life cycle of the technology, the focus on the core business and the growth opportunities offered by the creation of new fields of activity. Instead, at European level, the weaknesses of Cloud technologies are mostly related to the lack of a core governance structure, the multiplicity of regulations, the lack of reference points to support the users to evaluate the potential risks, the fragility and the saturation of internet and servers, the risks related to outsourcing and relocation of data and processes in other countries with a different legal system, the complexity of the contracts available. However, the European Union understands the importance of Cloud Computing strategies in order to operate on a promising and strategic market. With specific reference to the adoption of Cloud Computing in the Public Administration, the Committee states that these technologies are fully legitimized in the general austerity context, as they do not require huge initial capital investments. Furthermore, public investments could generate a leverage effect by encouraging private national and European telecommunications operators to invest in Cloud Computing technologies.

1.2 U.S.A g-Cloud Strategy

Vivek Kundra, CIO of the US Government, is the creator of the Federal Cloud turning point [3], a first step for the technological modernization process that will generate greater efficiency and transparency on the US government. Kundra is the

head of strategic IT investments plans with a federal budget of over $70 million/year. Hence, the US government stands as the largest buyer of technology in the world. The US Government has developed a "Federal Cloud Computing Strategy" on 8 February 2011 with the aim to provide guidance to federal agencies on complying with the Cloud first strategy. The choice to turn to Cloud Computing technologies has been strongly supported by Obama, in order to reduce the government operation costs and make it safer, open and flexible. The expected number of IT services that will migrate to the Cloud are about $20 billion out of $80 billion broken down by individual agency, mainly based on private Cloud deployments. The decision framework for the migration of the US Government to Cloud technologies is based on three processes: selection, to analyse and identify the IT services to move and the time; provision to aggregate the demand, ensure interoperability and integration with IT portfolio, provide security contracts, repurpose legacy assets and redeploy freed resources; management, to shift IT mindset from assets to services, build new skill sets, monitor the compliance of the provider with SLAs and re-evaluate vendor and service models.

Within these processes, Kundra has first identified the IT operations that had not produced relevant results, to redirect $25 million to more profitable activities. The Cloud transformation has not only affected the technologies, but also the cultural and organizational processes of the US government. The processes started by the US government arise coherently in the broader dematerialization strategy and encourages the creation of new service delivery models. Within this context, it will be developed the Data.gov site that will gather and make available the information of the US government. Actually, the US government budget for the migration to Cloud Computing technologies is of $19 billion dollars. The US Government Cloud Computing strategy is aimed at changing how the institution thinks.

1.3 Italian Cloud Initiatives for the Public Sector

According to the Global Cloud Computing Scorecard [4] developed by the Business Software Alliance, which drafted a global ranking of countries prepared to deploy and use Cloud technologies, Italy is third in Europe and sixth in the World. In the first positions of the Global Cloud Computing Scorecard are Japan, USA, France, Germany and Australia. The research was based on several indicators, mainly related to the quality of infrastructures and effectiveness of the Italian legislations in terms of Cloud Computing cybercrime and privacy security. A negative element of the Italian government for the full adoption of Cloud Computing technologies is constituted by the slow bureaucracy, for instance legislation on the digital signature while is in line with the international standards, often encountering problems in its application. Unfortunately, in terms of adoption of Cloud Computing technologies for the Public Administration, we have no positive data. Indeed, Italy is in delay in adopting infrastructures, platforms and applications residing on the network, rather than on corporate servers. In addition to the physiological delay related to the decision, there

is also the lack of a central governance. Compared with the growing attention that the US federal government is devoting to the optimization of technological resources, and the adoption of Cloud Computing technologies in Northern Europe, in Italy we are far behind. The Italian Cloud and ICT as a Service Observatory of the Polytechnic Institute of Milan [5] analysed since 3 years ago the evolution of Cloud Computing in Italy through an empirical ad hoc research involving 35 Public Administration, in-house companies validated the results of the surveys. According to the Observatory, the Cloud infrastructure could be very useful for the Italian Government in order to reduce costs and the inefficiencies of the current systems to move to a new IT paradigm, to lower the critical mass of investments and skills required, also allowing the smaller Governments to access and benefit from a widespread digitisation. However, the analysis of the current technological situation of the Italian Government shows a fragmented infrastructure that is inefficiently handled. Looking at the current Data Center scenario, an important source of cost and complexity is involved in managing the IT infrastructure, as the central Government has 1033 Data Centers, plus 3000 Data Centers of local Governments. The hardware of these Data Centers is managed unevenly and is used only for a fraction, with an use of the virtualisation techniques only for a 25 % of its potential. Consequently, the IT spending, although not high in absolute terms, is inefficient and is hiding management costs approximately per 1 billion euro a year in human resources management and the energy expenditure is estimated at 270–300 million euro. According to the Italian Observatory, by following a rationalisation scenario and considering these three main aspects, in five years, the Italian Government could achieve a saving of 3.7 billion euro. Moreover, if the local Governments will start to use the virtualisation techniques more widely, they will overcome the 1 server—1 application paradigm and benefits could grow to 5.6 billion euro. The process of rationalisation of resources through the Cloud infrastructure will require a set of actions, including the most important that is the rationalisation of the infrastructure (Data Centers) to guarantee medium-term returns easy to quantify, removing the scepticism and pushing the Governmental actors to action. However in Italy, during the 2012, several positive initiatives were initiated for the adoption of g-Cloud infrastructures. For instance, one best practice is related to the Health sector, where the debate is more active. Indeed, several Local Health Authorities (ASL) tested online payments solutions and are adopted Cloud technologies (ULSS of Asolo).

2 Services and Functionalities of the Department for Communications of the Italian Ministry of the Economic Development

In order to correctly analyse the services and functionalities of the Department for Communications it is required to identify the different organization charts of the Department, which is constituted by 3 General Directorates, the Institute of

Communications and Information Technology (ISCOM), 16 Territorial Inspectorates of the Ministry of the Economic Development (Abruzzo e Molise, Calabria, Campania, Emilia Romagna, Friuli-Venezia Giulia, Lazio, Liguria, Lombardia, Marche e Umbria, Piemonte e Valle D'Aosta, Puglia e Basilicata, Sardegna, Sicilia, Toscana, Trentino—Alto Adige, Veneto) and the Staff Offices of the Head Department. A detailed description of activities developed by the 3 General Directorates and the High Institute of Communications and Information Technology (ISCOM) is required in order to identify the services provided.

2.1 General Directorate for Electronic Communication Services and Broadcasting

The General Directorate for electronic communication services and broadcasting is mainly aimed at granting authorizations for the sound and television system, and more generally for all electronic communications services acquiring royalties relating to concessions, providing grants to support publishing, monitoring on progress obligations in the electronic communications sector and in particular of the RAI contract service, controlling premium rate services, participating in the work of national and international organisations, as well as the formulation of legislative and regulatory proposals in the field of communications.

2.2 General Directorate for Planning and Management of the Radio Spectrum

The General Directorate for planning and management of the radio spectrum is aimed at allocating frequency band to the different radio-electrical companies, managing the allocation of frequencies to station of different services, protecting duly authorized services through the monitoring and control of the radio spectrum. The Directorate manages the radio spectrum through a coordination and technical assistance process for the resolution of specific problems with the collaboration of the Regional Inspectorates and the National Center for the control of radio frequency emissions, that is a body set up within the International Telecommunicaton Union in the field of Communications.

2.3 General Directorate for the Regulation of the Postal Sector

The General Directorate for the regulation of the postal sector establishes the conditions, prices and tariffs of services, defines the quality level of the postal

service and verifies the compliance of Poste Italiane spa, responsible for the provision of the service, applying penalties for breaches. This Directorate also sets the "Program Contract" with Poste Italiane spa. in order to regulate the relationship between the parties, ensures the compliance with the obligations of the service provision and participates in the work of international and European organisations.

2.4 Institute of Communications and Information Technology (ISCOM)

The Institute of Communications and Information Technology (ISCOM) is taking care of the experimentation and research, technical support to companies, institutions and citizens through the testing of activities, data and network security, check for ICT services quality, training, specialisation and dissemination in the field of electronic communication, regulation and standardisation. The School of Specialisation in Telecommunications is also part of the Institute of Communications and Information Technology.

3 A Model for Assessing the Impact of Cloud in the Italian PA

According to the commonly agreed approach [6], the methodology for the impact measurement we are proposing, is focusing on the inputs, outputs, outcomes and impacts approach, where:

- *Inputs* are the investments made in, or the resources required to produce a product or develop/undertake an activity.
- *Outputs* are the products or services provided (e.g. number of services created, papers published, events held, etc.).
- *Outcomes* are the immediate changes resulting from an activity—these can be intentional or unintentional, positive or negative (e.g. employment, increased usability and personalisation).
- *Impacts* are the net difference made by an activity after the outputs interact with society and the economy (e.g. higher and easier access to cloud services in new member countries leading to the increment of local human resources) (Tables 1, 2 and 3).

The methodology presented in this chapter is based on a quali-quantitative approach to impact assessment and builds on the principles of the Cost-Benefit analysis [7, 8] and of the Multi-Criteria analysis [9]. These two methods are seen as complementary to one another, as they help framing both impacts that can be represented in a monetary form, as well as impacts that are better described in

Table 1 Economic impact indicators

Economic indicators
Improve service/product/system quality
Reach more users
Improve the access to large amounts of data. Improve the possibility to exploit large amounts of data (more efficient data analysis)
More efficient data exchange
Improve scalability
Improve reliability
Improve recoverability
Improve portability
Reduce the time needed to deliver a service
Ability to better target users/beneficiaries' needs
Reduce hardware costs
Reduce connectivity costs
Reduce maintenance cost
Lower software development costs
Cost reduction due to increment in software reusability
Cost reduction due to improvement of test-deploy-rework cycle management
Cost reduction due to less process break/system failure
Cost reduction due to energy saving
Indicators of cloud ROI cost ratios
Availability performance compared to current service levels
CAPEX cost on premise ownership versus cloud
OPEX cost for on-premise ownership versus cloud
Cost effective cloud workload utilization
Percentage of IT asset workloads using cloud
Indicators of cloud ROI profitability
Rate of new product market acquisition
Indicators of cloud ROI saving models
Rate of time change of TCO reduction by cloud adoption
Rate of cost change of TCO reduction by cloud adoption
Increase in provisioning speed
License cost reduction from cloud adoption
Indicators of "perceived efficiency"
Content retrieving time-saving
Time savings accessing or using the service

non-monetary terms (such as social or technological impacts). The combination of the two methods enables us to not only consider a wide spectrum of impacts, but also to combine variables that need to be expressed in different ways. The methodology considers four areas of impact: Economic, Social, Legal and

Table 2 Legal impact indicators

Indicators of "legal offered efficiency"
Improve transparency level of the conditions for the provision of the cloud services
Improve fairness of the conditions for the provision of the cloud services
Ensure security of personal data
Ensure fair collection of personal data
Ensure fair processing of personal data
Ensure fair transfer of personal data
Ensure confidentiality of PA data
Assume liability for loss of data
Assume liability for failure to provide the cloud services
Assume liability for defective provision of the cloud services
Minimize violations of IPRs
Frequency of defective responses (SLA response error rate)
Indicators of l legal "perceived efficiency"
Transparency of conditions of use of the cloud services
Fairness of conditions of use of the cloud services
Easy procedures for accessing personal data by data subjects
User friendly procedures for exercising rights by data subjects
Notice-and-take down procedures to notify violations of IPRs

Environmental. For each area of impact we identify specific indicators to be validated by the experts in the next chapters for the assessment of Cloud Computing initiatives in the Italian PA. The process for the development of the methodology for assessing of the socio-economic, environmental and legal Impact of the Cloud Computing model for the Italian Public Administration is based on 4 steps:

1. Background analysis and literature review.
2. Definition of impact indicators.
3. Validation by a set of experts of the impact indicators.
4. Testing of the methodology on current available initiatives in the Italian PA.

With reference to the efficiency, we identified some indicators to be measured quantitatively and to be further expressed in monetary terms. The assessment of the efficiency will be made in two different ways and using two different viewpoints: the first, will be called "offered efficiency" and will be calculated by analysing the technological advances brought by the Cloud Computing infrastructures. The second, will be called "perceived efficiency" and will be calculated by asking the stakeholders and end-users to describe which are the benefits they experience by using the service/product offered by the PA through Cloud Computing infrastructures. Starting from the literature review and the previous considerations, we identified the following list of indicators for assessing the social, economic, legal and environmental impacts of Cloud Computing initiatives/projects in the

Table 3 Technical SOA impact indicators

Technical Indicators
Robustness: any system must be capable of withstanding errors which should not affect system stability
Security and confidentiality
Extensibility: the system must allow support for a variable number of users
Integration: the system must have the ability to communicate with other systems that they supported SOA
Management and provisioning: the system must ensure its management and monitoring of implemented services.
Based on open standards
Interoperability: the ability of a system or product has to work with other systems or products without special effort
Portability: it is possible that the application may be available on all machines regardless of the system architecture
Availability: to be freely available or that it is ready for use or used
Persistent: ensure the ability to store information of the system to return to the previous or retrieve information
On time: the response of the system should be given within an appropriate timeframe
Reliable or deterministic: the system should give the same result while making a deal with the same operators
Transactional: the system should be able to return to its state before the transaction started
Modifiability: is about the ease with which a change can be made to application architecture.
Support for extended web services protocols like decentralization, security, flexibility, ubiquity or extensibility

Italian PA. Below in the following tables we provide a list of indicators that could be used in assessing outputs efficiency (Tables 4 and 5).

Once the indicators are defined for measuring the impacts of the identified assessment categories, the third assessment step consists in measuring the related costs and benefits. In consistence with the principles of cost-benefit analysis, the evaluation of the benefits generated by a project/strategy may be evaluated by identifying the willingness that the society has to pay for obtaining that positive impact. The final assessment of a project/strategy efficiency, will be made by using the following indicators:

- Economic net present value (ENPV*) perceived: the difference between the discounted total economic benefits and costs. The benefits will be evaluated as (1) the total willingness to pay of the users (i.e. the average willingness to pay of the users multiplied for the total number of users), (2) the average time savings (in hours) per user multiplied for the average hourly salary of

Table 4 Environmental impact indicators

Environmental impact indicators
User count: number of provisioned users for a given application
Server count: number of production servers to operate a given application
Device utilization: computational load that a device (server, network device or storage array) is handling relative to the specified peak load
Power consumption per server: average power consumed by a server
Power consumption for networking and storage: average power consumed for networking and storage equipment in addition to server power consumption
Data center power usage effectiveness (PUE): defined as the ratio of the total data center power consumption divided by the power consumption of the IT equipment.
Data center carbon intensity: amount of carbon emitted to generate the energy consumed by a data center, depending on the mix of primary energy sources (coal, hydro, nuclear, wind, etc.) and transmission losses.

researchers/workers/users multiplied for the total number of users. The costs corresponds to the total budget of the project.

- B/C* ratio perceived, i.e. the ratio between discounted economic benefits and costs (as above).
- WTP/C* the Willingness to Pay is evaluated by the stakeholders and end-users and it is compared to the costs of the project. The Willingness to Pay of the user indicates how much a user is willing to pay for that service. If the total Willingness to Pay (WTP) calculated by multiplying the average declared by the users to the number of total users indicated in the project scenario) is greater than the cost of the project, i.e. the ratio WTP/C* > 1, it means that the services can be commercially sold on the market or however he can assess the marketability of this service. Otherwise, WTP/C* < 1 means that most likely the project can sell such a service and so it would be necessary to investigate any alternative business models or at least think about mixed business models (finance and marketing).

3.1 Results from the Interviews with the Experts of Cloud Computing for the Italian Public Administration

During a first round of interviews with a set of experts, the indicators previously mentioned were validated and consistently reduced, in order to provide to a second group of experts, only the indicators that can be effectively relevant for the analysis

Table 5 Social impact indicators

Social impact indicators
Changes in the volume of digitally available cloud resources
No. of services offering customisable access to content
Composite index of usability
Composite index of personalization
Composite index of expected impacts on improvements in way citizens experience PA online services
Support knowledge transfer
Make available high-quality knowledge/information to citizens
Support democratic processes/democratization
Enable diversity and individual expression
Make highly innovative services available to citizens
Develop services that will positively impact on citizens' everyday life
Reduce the digital divide
Flexibility for personalisation on a large scale/high interface adaptability
Reduce the work of the users (more operations will be automated)
Improve the way in which users communicate and collaborate with each other (the quality of the collaboration)/facilitate social interaction
Improve trust among PA target users
Improve citizens' trust in public administration
Support network creation/collaboration of enterprises working for the PA
Support network creation/collaboration among citizens

of a g-Cloud strategy for the Italian PA. Interviews were conducted with fourteen major experts in the Cloud Computing field for the Italian PA to explore the Cloud possible adoption process and outcomes for the Italian Public Administration. The open-ended interviews are one of the approaches used among researchers, and an increasing number of researchers are using multi-methodology approaches to achieve broader and often better results. Interviewing is currently undergoing not only a methodological change but a much deeper one, related to self and other [10]. We have structured each interview on six open-ended questions. The experts have been selected according to their experience and knowledge of national and international experiences of Cloud Computing services adoption both in private and public sectors, so they can effectively provide for a real and correct analysis. The interviews were conducted in different ways: on skype, face-to-face, by phone and by e-mail. In this paragraph we will focus on the analysis of the results of the six open-ended questions, presented in a single section. The experts were invited to express an opinion in terms of assessment of the benefits and legal issues, managerial and operational impacts of Cloud strategies for the Italian PA. With regard to

the first question, about the possibility of Cloud Computing to be a winning resource from an economic, operational and social point of view in the future of the Italian PA, all the experts answered affirmatively, pointing out a reduction in operating costs, especially in the short term on the condition of setting real effective implementation of Cloud strategies aimed at the control of process and data security. With reference to the second question, about the real and effective benefits of Cloud Computing for the Italian PA, experts have pointed out the relevance of cost reduction, as incurred for the effective use, the accessibility to all, the platform standardization, the increased data security and the continuous monitoring and improvement of the overall processes of service delivery to users. The third question was related to the possibility of a Cloud infrastructure to increase the legal and personal data management issues of citizens using the Public Administration services and focus on the measures that may be adopted to reduce such risks. All the experts have highlighted that the localization of the Cloud issues and the protective measures to be taken could improve the adoption of a specific legislation relating to data protection and the use of structuring agreements between the cloud services provider and the Public Administration, to protect the privacy. With reference to the fourth question, about the possibility of Cloud Computing to increase the operational risks (e.g., disaster recovery) of the Italian PA and what measures could be adopted, most of the experts answered negatively. However, experts have said that any hypothetical operational risks arising from the high levels of integration are waged through distributed cloud architecture, using a modeling approach to the Cloud for the provision of common services, also highlighting the importance of service delivery contracts and the contractors professional skills. With regard to the fifth question, about the possibility for the Italian PA to adopt a Cloud strategy in a short time, there is an uncertainty among experts. They have answered that although the intention of adopting Cloud Computing in Italian PA exists, however the current regulatory, contractual barriers and economic barriers (such as the shift of costs from capital costs to operating costs), and the transition costs on the expiry of the contractual delivery of IT services, every 3–5 years are slowing its adoption in the PA. With reference to the sixth question, on which typology of Cloud infrastructure to implement, if centralized or not, the experts have suggested the possibility for the government to manage a unified and centralized cloud, based on a distributed private infrastructure. Other assumptions made by the experts concerned the future convergence of different private Clouds into a single public Cloud, or the creation of a network of regional data centers on which to consolidate the municipalities data centers, also implementing cooperation policies with private Cloud service providers. The “Community” Cloud model based on the sharing of resources and services could be a model for the future.

3.2 *Results from the Validation of the Indicators Through an Online Survey*

The survey was developed through a web platform called www.surveygizmo.com and was online from the 2nd of June until the 14th of July. The survey has been sent by email to the major experts in the Cloud Computing field for the Italian Public Administration. It was really difficult to identify experts of Cloud Computing infrastructures for the Italian PA, for this reason we decided to focus our research only on experts that could effectively provide real and correct analysis of the indicators. The questionnaire has been sent to more of 20 experts in the field and was included in the ANCITEL web news at the following link http://portale.ancitel.it/evidenza.cfm?i=686. The survey was composed of sixteen questions, of which two questions were related to general information, six questions were open questions (the same included in the interviews) and eight questions were closed questions proposed as a Likert scale (1–5), focusing on the validation of the potential indicators for evaluating an Italian g-Cloud strategy. In this paragraph wefocus on the analysis of the results of the 8 closed questions. For this analysis we considered the values that achieved 4 or more than 4 in the survey. According to the experts, with reference to the economic indicators, the main benefits for the Italian PA were related to: improving the quality of products/services/systems, reducing the time needed to develop a product/service, improving scalability, practices for data exchange, reliability and performance in comparison to the current levels of service. In terms of costs indicators for the Italian PA, the Cloud Computing infrastructures can reduce costs due to energy savings, maintenance and hardware costs. With reference to the relevance of efficiency indicators perceived by the users of the PA, the experts supported that the most relevant indicators for the Italian g-Cloud strategy are the reduction of the time required for the storage of digital data and the time required for data recovery. In terms of offered efficiency related to legal issues, the experts stated that the most relevant indicators are: the ability to ensure the proper rescue and transfer of personal data and the availability of the error rate of responses (SLA). However, less important but still valuable is the need for an improvement in the fairness of the conditions for the supply of services, for ensuring the confidentiality of the data of the PA and the unequivocal identification of the liability part in case of data loss. With reference to the technical indicators related to a potential Italian g-Cloud, the most relevant are: robustness of the system, extensibility of the system, management and monitoring of implemented services, availability of the system, ability to provide answers quickly, reliability of the system and transactional system. The experts sustained that a Cloud Computing infrastructure for the Italian PA will not have a huge relevance in terms of social impacts, the only indicator relevant for this specific analysis is the one who evaluated the ability of a g-Cloud infrastructure to offer more innovative services that can positively impact on the lives of the Italian citizens. In terms of environmental impacts, the experts supported that this field is very relevant for an Italian g-Cloud strategies, as these infrastructures can really develop relevant environmental

benefits. In order to evaluate the impact of a g-Cloud infrastructure on the environment, the experts sustained that the following indicators can effectively contribute to this analysis: number of users of each application, number of servers required to perform each application, average power consumed for networking and storage devices, Data Centre Power Usage Effectiveness, relationship between the consumption of energy of a traditional infrastructure and of a Cloud infrastructure.

4 Conclusions

It is necessary to reorganize the processes to increase productivity and improving the performance of public services by reducing also costs. In addition, Cloud services represent an effective and inexpensive way to enable e-Government services to be efficient, transparent and to improve participation, sharing and interoperability, in order to better meet the needs of the Italian citizens. In small Public Administrations it is difficult to implement IT infrastructures, because of the long leading times and the complex processes related to the acquisition of the infrastructural components. Cloud infrastructure can solve these issues, as they reduce the need to build and manage the IT infrastructure internally and the time of acquisition of the technology [11]. The transformation process will not be instantaneous, the results of this technological challenge can only be achieved through a strong and consistent long-term Roadmap to be developed in close collaboration between three major players: the Public Administration, citizens and the IT industry, which will provide secure and comprehensive services tailored according to the evolving needs of the Public Administration. The Public Administration will start to use a private Cloud infrastructure, but only by implementing an hybrid model, allowing to provide a homogeneous set of applications anywhere, anytime and from any device, the Italian P.A. can completely benefit from the advantages of Cloud solutions.

References

1. European Commission: Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. In: Unleashing the Potential of Cloud Computing in Europe. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0529 (2011)
2. European Commission: Europe 2020: A European strategy for smart, sustainable, and inclusive growth. http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/index_en.htm (2010)
3. House, W., Kundra, V.: Federal cloud computing strategy. https://www.dhs.gov/sites/default/files/publications/digital-strategy/federal-cloud-computing-strategy.pdf (2011)
4. Business Software Alliance: Global cloud computing scorecard, country report Italy. http://portal.bsa.org/cloudscorecard2012/assets/pdfs/country_reports/Country_Report_Italy.pdf (2012)

5. Corso, M., Mainetti, S., Piva, A.: La via del cloud per la rivoluzione digitale nella PA. www.agendadigitale.eu (2012). Accessed 20 Nov 2012
6. UNDP Evaluation Office: Guidelines for outcome evaluators. http://web.undp.org/evaluation/documents/HandBook/OC-guidelines/Guidelines-for-OutcomeEvaluators-2002.pdf (2002)
7. Boardman, A.E.: Cost-Benefit Analysis: concept and practice, 3rd edn. Pearson Prentice Hall, Upper Saddle River (2006)
8. Brent, R.J.: Applied cost-benefit analysis, 2nd edn. Edward Elgar, Cheltenham (2007)
9. Köksalan, M., Wallenius, J., Zionts, S.: Multiple criteria decision making: from early history to the 21st century. World Scientific, Singapore (2011)
10. Fontana, A., Frey, J.: Interviewing: The art of science. In: Denzin, N.K., Lincoln, Y.S. (Eds.) Handbook of Qualitative Research, pp. 361–376. Sage Publications, Thousand Oaks (1994)
11. Digit, P.A.: Raccomandazioni e proposte sull'utilizzo del cloud computing nella pubblica amministrazione. http://archivio.digitpa.gov.it/sites/default/files/forumPA2012/RaccomandazioniCloud.pdf (2012)

http://www.springer.com/978-3-319-22920-1

Organizational Innovation and Change
Managing Information and Technology
Rossignoli, C.; Gatti, M.; Agrifoglio, R. (Eds.)
2016, VII, 280 p. 30 illus., 4 illus. in color., Softcover
ISBN: 978-3-319-22920-1