Economics behind ICT infrastructure management

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ICT infrastructure management

The impact of information and communication technology (ICT) has become significant compared to other disciplines. It has transformed economies into digital economies. Businesses, industries, and services have challenged ICT with the need to take faster and more informed decisions in an increasingly complex and competitive environment. To keep up with this demand, the management of ICT needs to be based on business and economic principles.

The first visible effect has been the operation models of ICT infrastructures (e.g., cloud data centers) that are based on pay-per-use models. This incorporation of economic principles into the ICT management has broken with models that have only exploited the technical aspects, such as virtualization technologies, resource management, energy efficiency, performance requirements, and latency.

Consequently, technological decisions must go hand in hand with an economic and business vision. To develop and manage cloud infrastructures, engineers and economists must strive for evaluating risks and economic impact of technical changes, and for assessing emerging disruptive service models (Pham et al. 2017; Haile and Altmann 2018).

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Sustainability and feasibility of cloud infrastructures

For an infrastructure or service to be successful, it is necessary to evaluate its feasibility and sustainability (Baig et al. 2018; Hernández et al. 2015; Kim et al. 2015). Beyond technical aspects, it requires governance tools, ways to keep customers, and support for creating innovative business models and value chains (Pittl et al. 2017; Mohammed et al. 2009). For fulfilling these requirements, countless issues need to be solved: fair compensations of customers by a cloud provider who has vowed to pay the customer for service disruptions (Naldi et al. 2013), regulations in the context of clouds (Maillé and Tuffin 2014), decision models and metrics for evaluating investments in security, portability, interoperability, and models for supporting the adoption of cloud infrastructure (Novelli 2012; Haile and Altmann 2016).

The adoption of cloud computing requires a clear understanding of its benefits by clients and its requirements. The adoption decision depends on decision factors such as the trust into performance, security, data protection and an appropriate pricing schema by providers (Kett et al. 2012; Hernández et al. 2015). The cloud adoption must also be supported by open markets, enabling negotiation processes for handling ambiguous selection criteria (Pittl et al. 2017; Slawik et al. 2016; Filiopoulou et al. 2017). From the provider point of view, a pay-per-use model of the cloud implies solving the problem of proposing pricing schemas based on all involved cost such as the energy consumption of virtual machines (Kostopoulos et al. 2016; Kavanagh et al. 2016; Altmann and Kashef 2014), or it can require new ways for maintaining cloud infrastructures such as community network clouds (Khan et al. 2016).

Legal certainty is another essential aspect for supporting trust in the cloud and for stimulating participation and investments. In some domains (e.g., health sector), there are also strict compliance constraints (e.g., enterprise policies and

legal regulations) on the adoption decision factors (Thatmann et al. 2012). Regulations for network neutrality are also required (Maillé and Tuffin 2014). Among these legal challenges, the regulation for cloud provider viability needs to be properly addressed. It requires the definition of clear mechanisms and specifications for evaluating penalty clauses in service level agreements and for evaluating risks. Additionally, it would provide certainty when a cloud service provider goes out of business (Bartolini et al. 2016), and it would determine which courts are competent to adjudicate disputes arising out of a service level agreement (Petri et al. 2012; Ghumman and Schill 2017).

Focus of this special issue

The objective of this special issue is to build a strong multi-disciplinary community in this increasingly important area of digital economies. It is aligned with the purpose of the annual International Conference on the Economics of Grids, Clouds, Systems, and Services (GECON), which has been established in 2004. The research presented at GECON comprises extensions to existing technologies, successful deployments of technologies, economic analysis, and theoretical concepts on grids, clouds, systems, and services. This special issue extends earlier papers presented at GECON, that have shown the largest potential impact, and have received the highest assessment in the GECON reviewing process with three to four reviews per paper. After an additional thorough reviewing process that involved many additional peer reviews and revisions, we have selected 3 articles. These articles discuss sustainability and feasibility aspects of cloud infrastructures, explaining a few economic aspects behind ICT infrastructure management.

The first paper, entitled “On the Applicability of a Service-Specific Metrics Suite to Assess Firm-Level Cloud Computing Adoption Readiness” by Dan Ma, Robert J. Kauffman and Martin Yu (Ma et al. 2016), focuses on gauging perceptions of managers and organizations in situations when cloud computing is considered for outsourcing IT infrastructure and data. The authors present a firm-level cloud computing readiness metrics suite considering different aspects (technological, organizational, strategy, economic and regulatory dimensions) and assess its applicability for various cloud computing service types. Evidence is derived from empirical cases.

The second paper by Cesare Bartolini, Donia El Kateb, Yves Le Traon and David Hagen, entitled “Cloud Providers Viability: How to Address it from an IT and Legal Perspective?” (Bartolini et al. 2018), addresses the problem of cloud provider viability. Cloud provider viability defines the reasonable certainty that a cloud provider will give support to clients when filing for bankruptcy or simply shutting down operations. It increases customers’ trust

in cloud computing. The authors introduce a structured perspective into the topic of cloud viability, describing the risks, factors, and possible mitigations. They propose the modelling of viability as a non-functional requirement and identify some approaches that can be used to mitigate the problem, both from a technical and from a legal perspective.

The final contribution in this special issue by Mauricio Naldi, Marta Flamini and Giuseppe D’Acquisto, entitled “Negligence and Sanctions in Information Security Investments in a Cloud Environment” (Naldi et al. 2017), analyzes the conflict between a sanctioning behaviour and the search for economic profit. The authors employ well known models, to determine the optimal amount of investments in security, if data is distributed over several clouds. Authors show that the company is held negligent, if it does not invest in security in the case of a limited number of clouds.

With respect to issuing this special issue, we would like to thank Electronic Markets' Editor-in-Chief, Rainer Alt, for his support and Maxi Herzog for her valuable help as the Executive Editor of Electronic Markets, The International Journal on Networked Business, for making this special issue successful. In addition to this, we would like to thank our reviewers for their work on improving the quality of the articles of this special issue. Without their timely reviews, this special issue would not have been possible. Last but not least, we are grateful to all the authors, who have submitted articles to this special issue and are its main architects.

We sincerely hope that you will enjoy this special issue.

Sincerely,

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