

Cloud Computing and Social Network Sites: US Leads, Europe Loses

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Cloud Computing and Social Network Sites (SNS) are some of the most controversially discussed IT developments in recent years. Huge expectations exist for Cloud Computing, providing lower costs of computing while increasing employment. However, Cloud Computing as well as the use of SNS may come with a substantial risk of losing data privacy. The project conducted on *Cloud Computing Services and Social Network Sites* addressed the potential and impacts of these technologies. The project report showed that (1) adequate data security and privacy are critical but difficult to achieve, that (2) more consumer protection is needed and that (3) the market for Cloud Computing is not growing as fast as initially forecast, resulting in a lower than expected increase of employment and lower contribution to GDP growth.

The study was carried out between 2012 and 2013 on behalf of the European Parliament's Science and Technology Options Assessment Panel (STOA) by the Danish Board of Technology (DBT), the Fraunhofer Institute for Systems and Innovation Research (ISI), the Institute of Technology Assessment of the Austrian Academy of Sciences (ITA), the Irish Centre for Cloud Computing and Commerce at Dublin City University (DCU/IC4), and ITAS. In this article, we highlight findings from interviews, literature reviews, and case studies. In addition, selected contributions from a project workshop under the auspices of the 5th European Innovation Summit are presented, conclusions drawn, and finally key policy options presented.

1 Economic Benefits and Potential of Cloud Computing

In this project we explored public computing services that are new and have characteristics such as on-demand availability, resource sharing, and supposedly lower costs than local computing. For the purposes of the study we did not include traditional forms of ecommerce, email or music services, or certain private computing services, such as outsourced data centres etc. Our analysis was based on primary and desk research and contributions from a project workshop held under the auspices of the 5th European Innovation Summit, which took place at the European Parliament (European Parliament 2013).

Cost savings: Lower costs are typically cited as a motivation for cloud adoption. In a case that we looked at, the German IT consultancy Viadee developed the app “Bestellbar” and is using the Google App Engine. Bestellbar is an application to order food and drinks in bars. The evidence from the study suggests that by having the application running in the cloud, rather than on a dedicated server, significant cost savings could be achieved. Similarly, it is reported that Nuremberg Airport migrated high demand traveller services to the cloud, resulting in cost savings (PAC 2012). Other commonly cited cases include using remote servers for email or backup. Certain computing services may, however, not be wholly suitable for migration to the cloud where network access is not available or response time is sub-optimal as in the cases of mission-critical, time-sensitive text-editing or shop floor machine control. In a survey referred to by the European Commission, business respondents cite savings of 10–30 % (Bradshaw et al. 2012). It remained unclear, however, what the overall ICT cost reduction in an organisation was in these cases. In general, there is a lack of empirical studies about cost savings (cf. Leimbach et al. 2014a).

The novel forms of interactions provided by SNS can bring about several benefits as networking effects enable and stimulate the production of new knowledge paving the way for innovation. The variety of new possibilities for information exchange, mutual learning, and collaboration is particularly relevant in scientific contexts. The increasing relevance of user-generated content

also provides a valuable source for various kinds of business models (cf. Strauß/Nentwich 2013).

Jobs: Estimates for job growth were made by Etro (2010). He estimated that 156,000 new firms will be created in the European wholesale and retail trade and 144,000 new SMEs in real estate and other business activities (Etro 2010). The expected causes for these developments remain unclear, however. For example, the author did not explain why he expected more jobs in real estate, where Cloud Computing might as well mean more concentration as large real estate companies with less staff could emerge. Therefore, the study appears to be overly optimistic. Even though no large employment reductions have been reported so far within in-house IT departments or IT service companies, one might posit that employment might decrease if Cloud Computing was considerably cheaper or more efficient for businesses (Dignan 2011; Schubert et al. 2012). The evidence suggests that few IT jobs can be outsourced or replaced through the use of the cloud although more study is required. However, the Commission's support for Cloud Computing is based on studies such as those by Etro.

Revenues: For 2010, Forrester Inc. presented a figure of US\$ 14.7 billion for the global market for public cloud services (Reichmann 2011). IDC stated that the 2012 market was US\$ 40 billion (IDC 2013). While the computations differ, they indicate the size of the global market. These revenues seem to be driven by providers such as Amazon, Google, Dropbox, Rackspace, and Salesforce. Amazon Web Services revenue is estimated at US\$ 1.5-2 billion for 2012 (Babcock 2013). Google Cloud Services (Drive, App Engine, and Compute Engine) are estimated to have generated revenues of US\$ 314 million in 2012 (Panettieri 2013). While large providers such as Amazon and Google sell excess capacity cheaply, others, such as Rackspace and Salesforce, while generating significant revenues, may not generate substantial profits, if at all (Henschen 2012; O'Gara 2012).

While global SNS revenue figures do not seem to be available, there is evidence of significant revenue growth for SNS. Information on companies such as Facebook and Twitter sug-

gests a significant worldwide market for SNS-related revenues. For example, Facebook, LinkedIn, and Twitter had significant revenue growth with total revenues of US\$7.9bn, US\$1.5bn, and US\$665m respectively for 2013 (Facebook 2014; LinkedIn 2014; Twitter 2014). However, global figures relating to economic impact at a macro or micro level are difficult to ascertain.

GDP: We do not see a plausible justification for a boost of GDP growth yet, as anticipated by European Commission research (EC 2012b). Estimates for a GDP growth of 0.05 % to 0.3 %, also by Etro (2009), seem overly optimistic as this may require, e.g. significant outsourcing in telecommunications into the cloud. This is difficult to imagine due to the latency requirements of telecommunications companies.

2 Issues

Certain issues of Cloud Computing and SNS are overarching, namely data privacy, user control, and market development.

Privacy: Following the Snowden revelations, it was discussed in the media that information stored on Internet servers is widely evaluated by state agencies such as the NSA. According to Bowden (2013), the NSA has a three-day rolling buffer of all data on major Internet servers. One might think that encrypted information, e.g. when uploading encrypted files for backup, is not at risk. However, one of the Snowden documents reads that the NSA is able to "insert vulnerabilities into commercial encryption systems, IT systems, networks, and endpoint communications devices used by targets". This means that any information on a connected computer may be compromised.

Related issues are a far-reaching loss of control of user data through the re-use of data in other contexts and the ever-changing contractual terms with a lack of distinction between user information, interactions, and content in social network as well as consumer cloud services. This increases the existing barriers for users to exercise their right to informational self-determination. Insufficient privacy protection mechanisms in the IT architecture reinforce this problem. This situation is exacerbated by not only the limited options for users to control their personal information but the

increasing reliance on business models based on the value and monetisation of personal information. This is particularly evident in SNS where the default settings serve to stimulate data sharing (Strauß/Nentwich 2013). Academic literature suggests a “naturalisation of consumer surveillance”, often habitualised through social network and other cybernetic participation, which has significant implications for policymakers and society as a whole (Andrejevic 2007).

User control: Privacy and user control are inextricably linked. Unfortunately, our review of literature and research relating to the contractual terms and conditions of SNS and cloud services suggests that these are, unsurprisingly, biased towards the service provider disadvantaging the consumer or SME. This is not only evidenced in the legal agreements *per se*, but also in service level agreements and acceptable use policies, which together reduce the ability of the consumer or SME to control their data and actually manage their relationship with the service provider.

Market development: The European market for Cloud Computing and SNS lags behind the US market; the corporate headquarters of leading service providers are located in the US. There are a number of infrastructural considerations within Europe that need to be addressed to foster and develop the market for Cloud Computing within Europe and beyond. Many rural areas lack fixed and wireless broadband availability which impacts Cloud Computing as well as SNS adoption and use. Cloud Computing requires new skills and knowledge from both providers and consumers, not only in the technical domain, but in the legal and business domains too. Without broadband access and associated knowledge and skills, one can foresee a new digital divide emerging from both the industrial and the societal perspective. Furthermore, European investment in key enabling technologies, software exploiting those technologies (and specifically the Internet and Cloud Computing), and the companies that drive the adoption of these technologies lagged behind their US counterparts (cf. Weber et al. 2011). It is therefore not surprising that US-headquartered companies dominate the market in both Cloud Computing and Social Network Site services.

3 Policy Options

Regarding privacy: Issues of confidentiality of consumer data or business secrets can be dealt with on several levels. On the legal level, it is important to note that the existing mechanism, the US-EU Safe Harbor Principles (designed to require US providers to meet EU data protection rules), did not protect European citizens from widespread eavesdropping and re-use of data by US players. As a remedy, the pending draft data protection regulation aims at achieving extraterritorial applicability (EC 2012a). Regarding SNS, the new regulation would further allow the enforcement of “Privacy by Design” methods, such as the use of pseudonyms or the right to have data deleted.

On the technical level, the development of open and secure soft- and hardware should be supported, to make sure that these do not contain any backdoors or flaws. For practical usability, such new types of platforms should be compatible with existing software. This could be realised using, for instance, virtualisation. This path should initially be supported by means such as research funding, and later by imposing concrete minimum requirements for computers used in Europe.

Regarding user control: To address contractual issues, a standardisation of acceptable use policies and service level agreements should be promoted, and proposals for model clauses should be encouraged. There should be minimum requirements for contracts, for example regarding notifications of changes.

Regarding market development: Another issue for the adoption of Cloud Computing and the realisation of its potentially positive impacts is the existence and functioning of a competitive market. This is a problem difficult to tackle, but related entrepreneurial activities could be encouraged. In addition, the costs for network access should be addressed, for example by abolishing mobile data roaming fees to make Cloud Computing cheaply available for people travelling and working inside the EU. The Snowden revelations resulted in a loss of confidence in many cloud vendors, specifically US ones (Keiser 2013). This is an opportunity for European market participants to exploit if privacy can be truly established as a location advantage. By

modernising the data protection regime, Europe could not only ensure better protection of citizens, but also serve as a model for users from non-European markets. Policymakers, academia, and industry called for research on trustmarks in the Cloud Computing context to communicate policies, quality of service, and other trust-building signals (Lynn et al. 2013; IAMCP 2011; Global Access Partners 2011; Robinson et al. 2010). Other somewhat heavy-handed options were proposed to address these issues, including mandatory storage and processing of European data within the EU and by European citizens only (Bowden 2013). Caution needs to be taken when evaluating such options.

Regarding broadband coverage: The progress in the EU member states towards broadband coverage should be reviewed and alternatives for access to finance sought. International benchmarking may provide useful insights, e.g. Sweden and Japan managed to fund the rollout of their fibre infrastructures.

Regarding skills: Professional users need appropriate education to migrate their systems to the cloud, to implement the data security regime, to leverage the potential opportunities and mitigate the potential risks of Cloud Computing. Private users need to understand the implications of Cloud Computing and SNS with regards to their data including technical knowledge of how to control access to their identities and their data and, of course, their legal rights with regards to their online identities and data.

These and other policy options are listed in the project's "Options Brief" while their justifications are discussed in more detail in the final report (Leimbach et al. 2014a; Leimbach et al. 2014b).

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