> Future Business Clouds

Cloud computing in Germany – requirements, national activities and global competition

acatech POSITION PAPER – Executive Summary and Recommendations

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The unabated growth of the Internet is triggering fundamental changes to the world we live in. Advances in information and communication technology are leading to the emergence of a digital service landscape where almost every product or service is available to us 24/7. As a result, the Internet and the services it enables are increasingly regarded as commodities, just like water, electricity and indeed telecommunications. Cloud computing is a concept that enables digital services to be provided to a consistent quality standard at any time of day or night. Germany has huge potential in terms of the development of platforms for these Web-based services and has an opportunity to become established as a leading provider in e.g. the business and administration sectors over the coming years.

A cloud can be understood as a collection of easily accessible services that are usually billed on a pay-per-use basis. The key idea behind cloud computing is the separation of applications and the information that they require from the underlying physical infrastructure and means of delivery. This means that IT resources can be reconfigured to meet different needs, allowing them to be deployed in a more dynamic and flexible manner.

More and more businesses are showing an interest in cloud computing. With 75 percent of users rating their experience as entirely positive, user numbers are continuing to rise – the number of cloud users grew by six percent between 2012 and 2013. Among the benefits frequently cited by users are the fact that new applications can be implemented more rapidly without having to tie up capital in processing and memory resources.

Nevertheless, a significant number of both large businesses and small and medium-sized enterprises (SMEs) remain rather sceptical about cloud computing and continue to favour private services provided exclusively to their own organisation. The reasons for the reluctance shown by many businesses when it comes to adopting cloud computing include the confusing legal framework and difficulty both in comparing the quality of the different

services that are available and in calculating their overall cost. In addition, many businesses lack suitable strategies for integrating cloud services into their in-house IT structures. Further issues include opposition from within companies' IT departments and a general lack of conviction regarding the value-added provided by cloud computing. Moreover, the widespread scepticism about cloud computing and people's doubts about its security are exacerbated by events such as the NSA scandal and the Snowden affair and the manner in which they are covered by the media. Guaranteed data protection is thus key to the widespread adoption of cloud services by businesses.

At a glance

— Advances in the Internet are resulting in a digital service structure where products and services are available 24/7.

— Cloud computing enables these services to be provided to a consistent quality standard at any time of day or night. This means that IT resources can be reconfigured to meet different needs and enables them to be deployed more flexibly.

— Although more and more users are showing an interest in cloud computing, the uncertain legal framework, difficulty in calculating its overall cost and a lack of confidence in the security of cloud services all mean that small and medium-sized enterprises in particular are still rather reluctant to adopt it.

— There are a number of publicly funded projects in Germany that address some of the key themes in the field of cloud computing, for example the establishment of cloud ecosystems, the legal compliance of cloud services and various aspects relating to security.

— The establishment of a binding legal framework, a diverse cloud service landscape and harmonisation at EU level can all help to make future cloud applications more attractive to both individuals and businesses.

Despite the fact that it is currently well positioned, Germany needs to address its weaknesses with regard to products and services in the cloud. The US, China and Singapore continue to be the global market leaders in the field of cloud services. Indeed, US providers even enjoy a dominant position on the German market, where more than half of all cloud services are provided by US companies. Germany currently has a relatively strong position in the managed clouds market and in the fields of Software as a Service and cloud service integration. Furthermore, Germany is funding a wide range of programmes with numerous application-specific projects that are embedded in an overarching cloud strategy. For example, the *Trusted Cloud* programme of the Federal Ministry for Economic Affairs and Energy (BMWi) provides support for trialling innovative, secure and legally compliant cloud services. Further funding priorities in Germany include the establishment of representative cloud ecosystems and security suite addressing. Meanwhile, Germany is also driving initiatives at European level focused on marketplaces and cloud service interoperability. In so doing, it is addressing two of the most attractive areas in this field. Other important topics, however, such as big data, data warehousing and cost and market transparency continue to occupy a much lower position on the agenda in Germany compared to other countries. More also needs to be done to simplify the legal framework and tackle the issues of data protection and confidentiality, since very few publicly funded projects currently address the trust and security issues specific to SMEs.

The main technical challenge relates to the heterogeneous nature of the platforms and the need to further enhance service interoperability. Standardised interfaces will be required in order to address this issue. It will also be necessary to ensure that cloud services are delivered in an attractive manner. This goes beyond simply providing the relevant functionality and includes important factors such as ensuring that services are simple and intuitive to use and can be configured to meet individual companies' needs.

Following on from the points outlined above, acatech has formulated the following recommendations:

1. An expert group should be established in order to develop a strategy for bundling national initiatives on Web-based products and services.

2. This expert group should draw up a national roadmap setting out both the continued long-term development and the short- to medium-term implementation of German research and industry's technological strengths. The roadmap should outline how Germany can position itself as a leading provider of Web-based products and services.

3. It will be necessary to clarify and proactively communicate the legal and regulatory framework for facilitating the establishment of dependable cloud services, particularly in terms of data protection, data security and security and liability. This will require the formulation of recommendations and actions that comply with the law and regulations in all of the relevant legal fields, starting in Germany but with the aim of achieving harmonisation throughout the EU and ultimately throughout the world.

4. It will be particularly important to develop a diverse and attractive cloud service landscape for users and providers from the large SME sector.

5. Higher education institutions and other providers of academic and vocational training and CPD must rapidly start producing more skilled workers with cloud computing skills that are relevant to the labour market.

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