



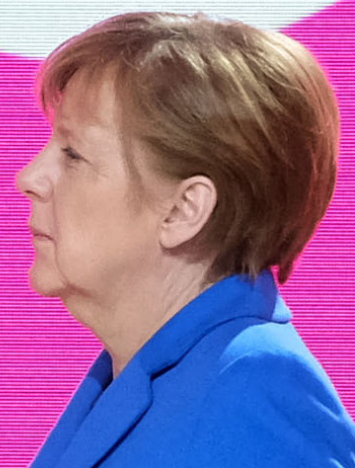
Atlantic Council

FUTURE EUROPE INITIATIVE

INTO THE CLOUDS

**European SMEs and the
Digital Age**

TYSON E. BARKER



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ISBN: 978-1-61977-514-5

Cover photo: German Chancellor Angela Merkel walking past a cloud symbol at the CeBIT fair in Hanover, Germany, on March 15, 2016. Peter Steffen/DPA.

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October 2016

ACKNOWLEDGMENTS

This paper is part of the Atlantic Council's Transatlantic Digital Marketplace Initiative, which explores the conditions required for a barrier-free transatlantic digital economy. Cloud computing—which relies on automatically available services, including storage, that can be shared among devices—is considered crucial to the digital transformation of industry and the economy overall, and even plays a key role in determining how consumers relate to the digital world. This study focuses on the adoption of cloud computing in the business-to-business environment across Europe. It asks whether cloud computing is used to its optimal level in Europe, and how that usage differs from country to country. It examines the motivations behind cloud adoption—and behind the failure to adopt cloud computing. And it places a special emphasis on small and medium enterprises, which may find adoption of digital technology especially challenging but also especially valuable.

We are grateful to Tyson Barker for his outstanding work in surveying existing research and integrating it into a coherent whole, with the addition of new work on SMEs in particular. His knowledge of digital issues and of Europe, especially Germany, has been key to the success of this effort. He has had excellent support from research assistant Anastassios Adamopoulos, who especially focused on the charts, graphs, and data. Sarah Bedenbaugh did her usual super job of managing the process of turning the paper into a printed report, while Jorn Fleck helped coordinate events and meetings to discuss the report. But our excellent digital team would not have been able to do this work without the support of the Software & Information Industry Association (SIIA) and Thomson Reuters. We very much appreciate their engagement on these issues and their desire to encourage greater awareness and discussion about “the cloud” and its implications in Europe and across the Atlantic. All conclusions, of course, are those of the author.

Cloud computing will have broad implications for both citizens and companies on both sides of the Atlantic. We hope the results of this report will encourage a more vibrant transatlantic discussion about building strong economies in this digital age, and how Europe and the United States can work together to achieve that end.

Frances G. Burwell

Vice President for European Union and Special Initiatives

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SIX POLICY RECOMMENDATIONS

The European Commission's Digital Single Market strategy has laid the groundwork for ambitious changes in Europe's cloud-computing landscape. Given the potential to add up to one million new digitally dependent jobs in the EU, the Commission should take further steps to accelerate cloud adoption, especially among small and medium-sized enterprises, including:

1. promoting policies that reinforce the global nature of the cloud;
2. enhancing the business-to-business (B2B) and business administration aspects of cloud-computing adoption;
3. setting policies aimed at building operational and legal trust in Europe's cloud environment;
4. incentivizing public sector procurement and e-governance as instruments to promote SME cloud adoption;
5. increasing awareness-raising and training on cloud computing among EU SMEs; and
6. advancing the transatlantic dialogue on data treatment, privacy, and surveillance by building on the Privacy Shield breakthrough.

KEY FINDINGS

- In the European Union, Scandinavian countries and Italy are stand-out adopters of cloud computing relative to their gross domestic product (GDP) per capita and digital competitiveness. Germany is a stand-out laggard.
- Wealthier, advanced economies of core Europe—Austria, France, the United Kingdom (UK), the Netherlands, and Belgium—are underperforming in cloud-computing adoption given their GDP per capita.
- Political risk, concerns about data protection and organizational disruption weigh more heavily on German small and medium-sized enterprises (SMEs) than some of their Organization for Economic Co-operation and Development (OECD) counterparts contributing to low cloud adoption rates. A majority of German SMEs (61 percent) are either skeptical or undecided about cloud computing.
- Concerns about data protection in the cloud remain high in Germany post-Edward Snowden.¹ Eighty-three percent of German cloud clients consider maintenance of data exclusively in Germany as a “must have.”
- Factors contributing to low cloud adoption among German SMEs include: lack of knowledge about the cloud among SME managers; underdeveloped cybersecurity insurance markets; lack of interoperability, portability, and legal certainty; questions about cybersecurity and data protection; and public policy ambivalence to the US role in cloud computing following the Snowden revelations.

¹ The 2013 revelations of the US National Security Agency's bulk data collection by former NSA contractor, Edward Snowden, increased awareness of personal data protection in Germany and suspicion of US surveillance on Germans' personal online activities.

INTRODUCTION

It was only a few years ago that a majority of people believed that “the cloud” required a raincoat. Today cloud computing has become one of the keys to the digital industrial revolution—transforming business models, means of production, and marketplaces. Cloud adoption was expected to increase by 42 percent in 2015 as the rate of adoption by governments and companies accelerated globally. And it is expected to grow from \$180 billion in 2015 to \$1.3 trillion by 2018.²

In 2010, the European Union began looking at ways to promote cloud adoption in earnest under the Digital Agenda for Europe program. It adopted an ambitious strategy, “Unleashing the Potential of Cloud Computing in Europe,” in September 2012 aimed at accelerating Europe’s lagging cloud adoption rate. The urgency was reinforced by the European heads of state in October 2013 and the European Commission’s 2015 Digital Single Market strategy, which notes that digital transformation of industry will be a key driver of growth.³ In April 2016, the Commission publically launched its “Digitising European Industry” package including a new €4.7 billion European Cloud Initiative that aims to create a publically driven “mega-cloud” for science and research and to build out Europe’s Data Infrastructure.⁴ These efforts have been brought under the umbrella of the EU’s Digital Single Market initiative, which envisions cloud computing at the center of Europe’s economic and digital future.⁵

According to Eurostat, EU cloud-computing adoption ranges from 51 percent in Finland to just 5 percent in Romania.

The Commission will have its work cut out for it. According to Eurostat, EU cloud-computing adoption ranges from 51 percent in Finland to just 5 percent in Romania. Germany, Europe’s economic and export leader, lags in cloud adoption with just 11 percent of business in the cloud.⁶ Why is that the case? What are the economic, cultural, and organizational factors that affect European companies’ choices about whether or not to use the cloud? And what is the role of government?

This report will examine what motivates cloud-computing adoption and what holds it back among the most important slice of European business: small and medium-sized enterprises (SMEs). The first section will provide a brief look at the economic impact of cloud adoption, and the second will draw on existing research to map the topography of cloud adoption across the EU-28. It will look at rates of cloud adoption, and draw some basic comparisons on cloud-computing adoption when examined against other indicators like gross domestic product (GDP) per capita and the EU’s Digital Economy and Society

Index (DESI).⁷ The third section will delve more deeply into the state of business-to-business (B2B) cloud adoption using German SMEs as a case study. The final section will conclude with six recommendations for European policymakers to better address small business concerns and facilitate cloud-computing adoption.

2 Deloitte, “Economic Impact of Cloud Computing in Europe,” Study for the European Commission, DG CNECT, Presentation at C-SIG meeting, October 29, 2015, p. 10.

3 Ken Ducatel, “European Cloud Computing Strategy,” European Commission, February 4, 2014, http://www.cepal.org/socinfo/noticias/noticias/9/52119/Ken_Ducatel_03.02.14.pdf.

4 European Commission, “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Cloud Initiative - Building a competitive data and knowledge economy in Europe,” April 19, 2016, p.12, <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0178&from=EN>.

5 European Commission, “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the

Regions: European Cloud Initiative - Building a competitive data and knowledge economy in Europe,” op. cit.

6 Konstantinos Giannakouris and Maria Smihily, “Cloud computing - statistics on the use by enterprises,” Eurostat, Data from November 2014, http://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises#Main_statistical_finding.

7 European Commission, “Digital Economy and Society Index,” 2016, <https://ec.europa.eu/digital-single-market/en/desi>.

1. THE ECONOMIC BENEFITS OF CLOUD COMPUTING

Cloud computing has the potential to be one of the most transformative economic innovations of the twenty-first century—allowing companies and government agencies to scale resources quickly, increase portability and accessibility, reduce costs, and increase productivity. Cloud computing can transform important supply chain-reliant sectors like advanced manufacturing, chemicals, and retail. This is particularly true for SMEs, which can take advantage of network effects and lowered barriers of access for sophisticated, IT-intensive applications. The marginal rate of return is higher for SMEs whose fixed costs can be lowered—jolted by the economies of scale of the collective resources across companies’ user bases—and employ BYOD (“bring your own device”) policies that reduce overhead, increase efficiency, and allow workers greater flexibility to work remotely.

The US experience with cloud computing is illustrative. The United States’ broadly uniform legal context, large market size, and customer base that is at ease with digital applications primed the country to be a first mover in the cloud computing space. Of new

US businesses, 69 percent attribute part of their productivity growth to cloud computing, 60 percent say cloud computing saves time, and 40 percent say it saves money.⁸

In the EU, the impression is similar. The European Commission estimates that every €1 spent on software as a service (SaaS) replaces €2.30 spent on traditional administrative solutions.⁹ Finance decision-makers in European companies believe that cloud computing brings many business benefits, such as increased flexibility (57 percent), capacity (56 percent), and scalability (53 percent). An overwhelming 96 percent believe that cloud computing provides their business with quantifiable benefits, such as reduced information technology (IT) maintenance costs, reduced IT spending, reduced operational costs, and improved process efficiency. And 55 percent believe that cloud computing offers better value than traditional outsourcing.¹⁰

The macroeconomic impact is eye-opening. The growth in cloud computing is coupled with massive new labor force demands. According to a WANTED Analytics study, there are over eighteen million cloud-dependent jobs globally with 40.8 percent of jobs in China, 21.7 percent in the United States, and 12.2 percent in India.¹¹ In the EU, the Commission estimates cloud computing could add one million more jobs, almost 303,000 new businesses, €499 billion to the economy, and 0.71 percent to GDP by 2020.¹²

BOX 1. HAZY ANALYTICS

Cloud-computing technology, certification, and interoperability have not been standardized and neither has the literature examining it. Attempts to measure rates of cloud adoption vary widely, particularly in the EU. Even the European Commission’s own studies use different yard sticks. For instance, one 2013 study asserted that approximately 61.5 percent of EU businesses use some form of the cloud even if it is simply an email service,¹ while a 2014 Eurostat study set the number at 19 percent.² The variability in the studies makes compelling analysis difficult. In the interest of consistency, this study relies exclusively on the 2014 Eurostat data for its analysis.

- 1 Sectors with the highest usage were ones like telecommunications/media and financial services (70 percent) whose reliance on IT is high across their operations. See European Commission, “Final Report of the study ‘SMART 2013/0043—Uptake of Cloud in Europe,’” op. cit.
- 2 The Eurostat Survey was conducted in 2014 across 151,000 European enterprises. See Giannakouris and Smihily, “Cloud computing—statistics on the use by enterprises,” op. cit.

- 8 Google, “Cloud Productivity Is Key to Success: A Survey of Young Businesses,” 2014, <http://www.artronica.com/pdf/google-young-business-report-10.pdf>.
- 9 European Commission, “Final Report of the study ‘SMART 2013/0043 - Uptake of Cloud in Europe,’” June 10, 2015, <https://ec.europa.eu/digital-single-market/en/news/final-report-study-smart-20130043-uptake-cloud-europe>.
- 10 VansonBourne, “The Business Impact of the Cloud,” March 2012, <http://static.ziftsolutions.com/files/8a57cb7d3e5aa0dd013e61c646bb1d58.pdf>.
- 11 Louis Columbus, “Where Cloud Computing Jobs Will Be In 2015” *Forbes*, December 12, 2015, <http://www.forbes.com/sites/louiscolombus/2014/12/12/where-cloud-computing-jobs-will-be-in-2015/#7551b376323>.
- 12 European Commission, “Final Report of the study ‘SMART 2013/0043 - Uptake of Cloud in Europe,’” op. cit.

2. THE TOPOGRAPHY OF CLOUD COMPUTING IN EUROPE

Despite the economic evidence supporting cloud adoption and the political weight the EU has put behind it, the potential of cloud computing in Europe remains unrealized. This is particularly true among the EU's twenty million SMEs, which comprise 99 percent of European businesses.¹³ According to one Eurostat survey,¹⁴ cloud adoption in the EU hovers around 19 percent of European firms—slightly lower for SMEs—whereas 37 percent of American small businesses have already taken to the cloud.¹⁵

The picture in the EU is striking. Cloud adoption across the EU falls broadly into five clusters: a north-south cluster of high adopters (Scandinavian countries and Italy), the English channel cluster (British Isles, the Netherlands, Belgium, plus Croatia), a core Europe cluster (Germany, France, smaller and more industrial Central European states), and an Eastern European cluster (Poland, Romania, Bulgaria, Latvia, Hungary, and Greece).

Finland (51 percent) has the highest rate of cloud adoption. Perhaps it is unsurprising given the global competitiveness of Finnish IT. One estimate suggests that half of Finland's economic activity will be digital by 2025. The telecommunications sector has

traditionally played an outsized role in the country's economic development, raising awareness of the cloud and greasing the wheels for cloud adoption beyond tech-dependent sectors like IT and finance. And Helsinki is the world's workshop for mobile gaming applications. Sweden (43 percent) is similarly placed. This makes sense given its structural similarities with Finland: its level of connectivity, strong IT sector, historically muscular telecommunications sector, educated population, and cultural inclination toward

early adoption of new business technology. Italy (40 percent) is a stand-out early adopter. Whereas businesses across Europe spend less than 3 percent of IT investment on cloud computing,¹⁶ the number in Italy is more than double—approximately 7 percent.¹⁷

When looking at the relationship between GDP per capita and the level of cloud-computing adoption, one would expect to find a positive correlation between the two. And that is indeed the case. The higher the level of income, the higher the level of cloud adoption.

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That said, when looking at the member states that fall above the line (underperformers) versus those that fall below the line (overachievers), relative to their GDP per capita, the results are quite revealing (see figure 1). Some countries (Italy, Finland, Croatia) are outperforming their expected level of cloud adoption. In fact, given the trends, the Eastern cluster—those with the lowest business use of cloud services—are actually over-performing given their GDP per capita.

In contrast, the states that are underperforming given their GDP per capita tend to be the wealthier, advanced economies of core Europe (Austria, France, the UK, the Netherlands, Belgium). In fact—aside from

13 Christian Borggreen, "New Research: Conflicting Company Data Rules Inhibit Intra-EU Business," Project DISCO, February 23, 2016, http://www.project-disco.org/information-flow/022316-new-research-conflicting-european-accounting-rules-inhibit-intra-eu-business/#.Vubgo_krLcs.

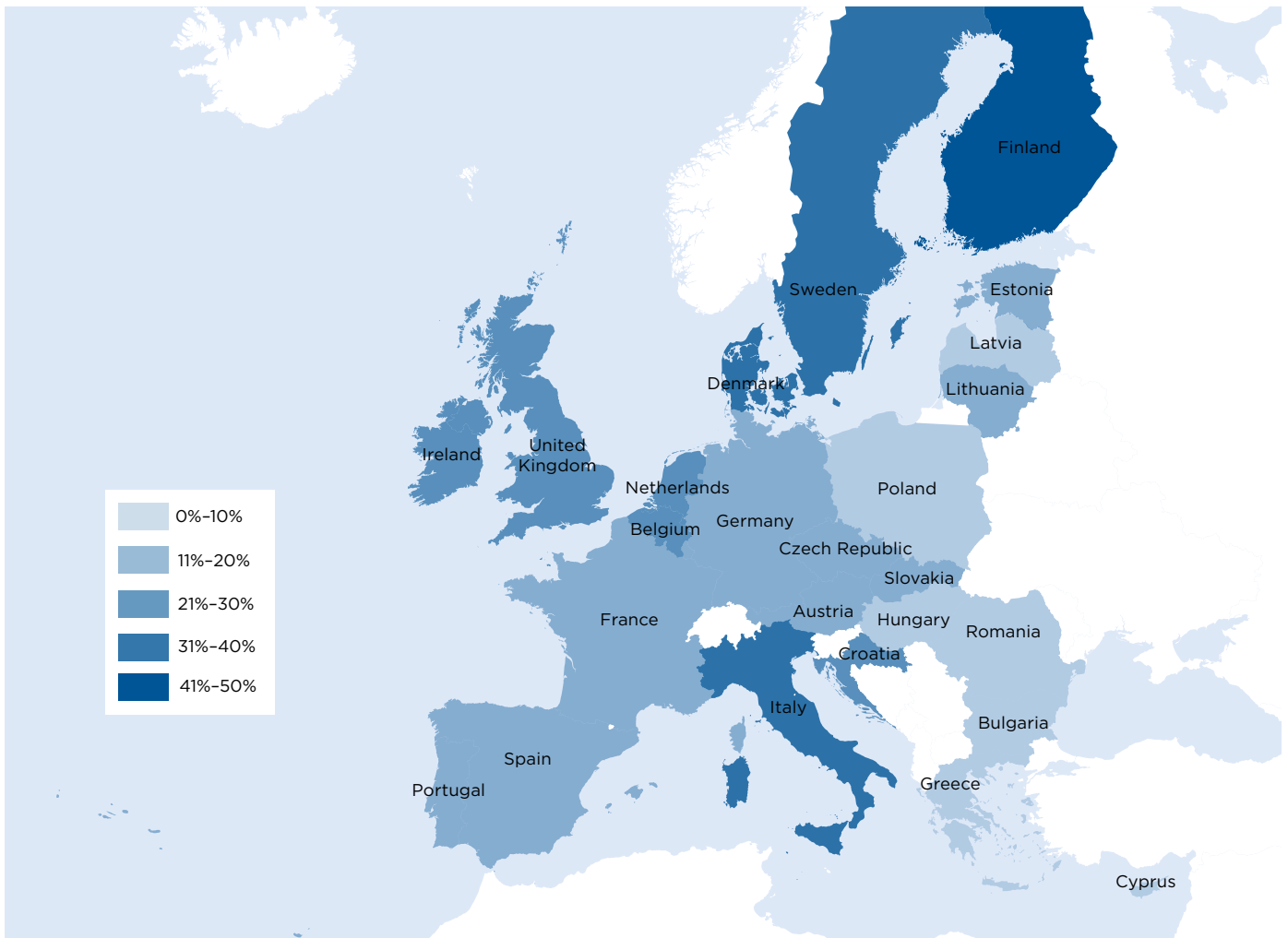
14 Giannakouris and Smihily "Cloud computing - statistics on the use by enterprises," op. cit.

15 Amdocs, "Cloud Adoption in Small- to Medium-Sized Businesses," 2014, <http://www.amdocs.com/Solutions/Documents/amdocs-cloud-adoption-WP.pdf>; goERPcloud. "American businesses lead world cloud adoption-Cloud Statistics Infograph," <http://www.goerpcloud.com/resources/american-businesses-lead-world-cloud-adoption-cloud-statistics/>; Reuven Cohen, "The Cloud Hits the Mainstream: More than Half of U.S. Businesses Now Use Cloud Computing," *Forbes*, April 16, 2013, <http://www.forbes.com/sites/reuvencohen/2013/04/16/the-cloud-hits-the-mainstream-more-than-half-of-u-s-businesses-now-use-cloud-computing/#e5c00d867c2c>.

16 European Commission, "Final Report of the study "SMART 2013/0043 - Uptake of Cloud in Europe," op. cit.

17 Piero Macri, "Cloud applications spread across IT in Italy," *ComputerWeekly.com*, August 2014, <http://www.computerweekly.com/feature/Cloud-applications-spread-across-IT-in-Italy>.

Map 1. Cloud computing service usage across the EU



Source: European Commission

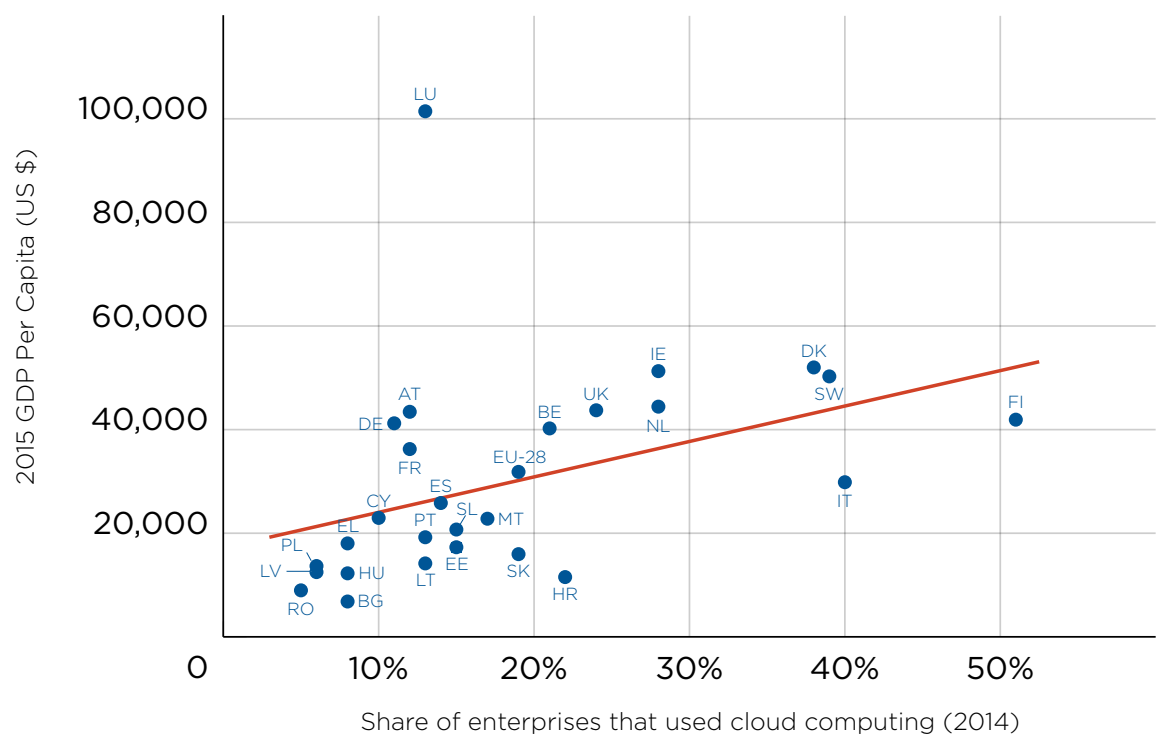
Luxembourg and Ireland¹⁸—the EU member-state underperforming most significantly in its business cloud-computing adoption rates is Germany. Even though Germany (11 percent) is in the lower “middle of the pack” as far as absolute adoption levels, it is significantly lower than one might expect given its GDP per capita.

Let’s look at this from another angle. The Commission recently released the 2016 scorecard for its Digital Economy and Society Index (DESI). The DESI gives member-states a composite score on their digital competitiveness based on five principal dimensions—connectivity, human capital, use of the Internet, integration of digital technology, and digital public services.

¹⁸ Both countries are outliers because their small populations and roles as commercial and financial hubs skew their GDP per capita.

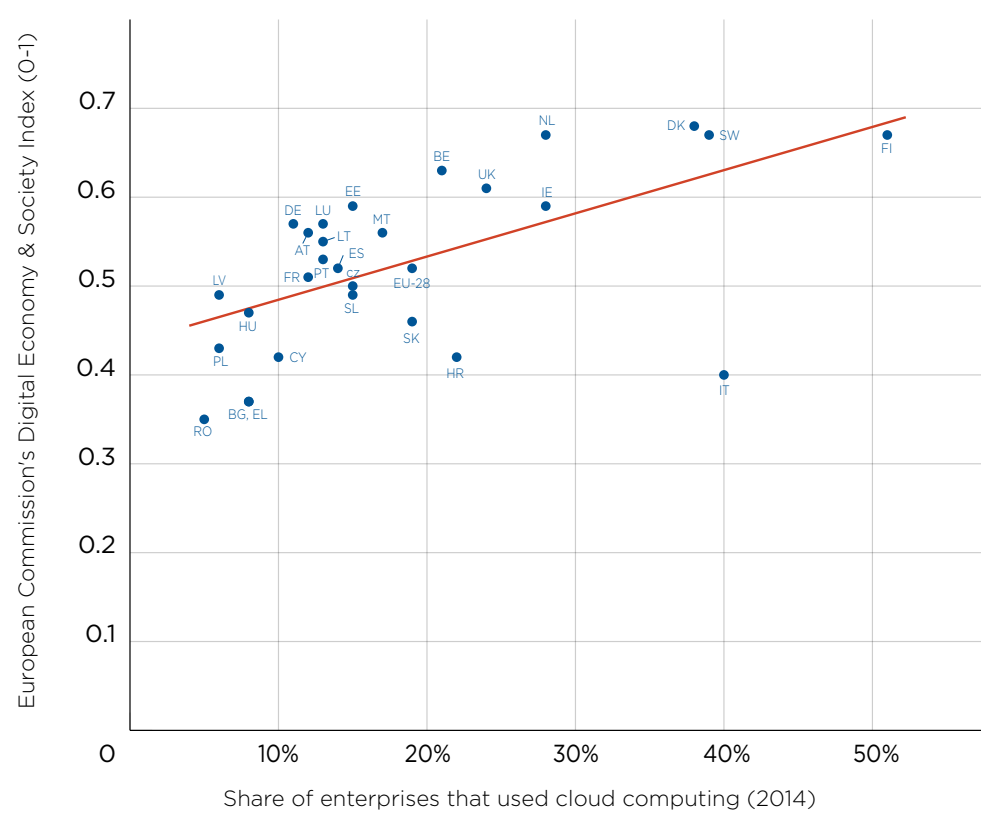
Again, the trend line demonstrates a positive correlation between higher overall digital competitiveness and higher cloud-computing adoption rates. No surprises there. But again the over/under picture is more complex. According to figure 2, Finland—the EU’s cloud adoption leader—is almost exactly where one would expect given the country’s overall level of digital competitiveness. Italy, which has a much lower composite score on digital competitiveness, is massively over performing on cloud computing adoption. Other states—particularly those in Central and Eastern Europe (Romania, Bulgaria, Poland, Cyprus, Hungary, Slovakia) are also over-performing relative to their overall digital competitiveness. But again, Western Europe (e.g. Belgium, the Netherlands) is underperforming with Germany among those with the lowest level of cloud adoption relative to its digital competitiveness.

Figure 1. EU enterprise cloud computing service usage compared to GDP per capita



Source: World Bank and European Commission (GDP per capita for Malta is from 2014).

Figure 2. EU enterprise cloud computing service usage compared to overall digital competitiveness



Source: European Commission.

3. THE UNLIKELY LAGGARD: A CASE STUDY OF CLOUD ADOPTION BY SMES IN GERMANY

What does this mean? Why are some of the most advanced industrial economies in Europe underperforming in their industrial cloud-computing adoption as a function of their GDP per capita and their digital competitiveness? And in particular, why is Germany—Europe’s largest economy, most competitive exporter, and political leader—not getting its head in the clouds more quickly? Cloud adoption in Germany is growing. But the rate of adoption remains anemic, especially compared with the favorable economic conditions in Germany.

If SMEs are the bellwether of economic competitiveness, then examining the motivations and concerns of the German small business and *Mittelstand* (SMEs) may be a place to start. The picture of German SME cloud computing is complex.¹⁹ Cloud computing is an Internet-reliant service. But being online does not seem to help determine whether or not a company uses cloud services. Ninety-seven percent of all EU SMEs are online. Germany’s connected rates are even higher. The correlation between SMEs that do business outside their home country and higher propensity for digitization is well-known. As a result, one might expect German SMEs to more quickly adopt cloud computing. After all, European SMEs are seven times more likely than American SMEs to engage in business across borders.²⁰ In Germany, the number is even higher.

German SMEs are aware of the importance of digital adoption to future competitiveness. Eight in ten SMEs believe digitalization will lead to greater productivity. Currently, German SMEs put 4.3 percent of their

investment into digitalization. A majority expect this number to grow in the future.

In fact, Germany seems to be the European economy best primed for cloud adoption. The 2016 BSA Global Cloud Computing Scorecard—which assesses data privacy, security, cybercrime prosecution, intellectual property rights, standards and harmonization of rules, promotion of free trade, and infrastructure—ranked Germany third out of twenty-four countries, the highest ranking in Europe and just behind Japan and the United States.²¹ Additionally, German firms are among a select “high readiness group” in adopting and routinizing B2B e-commerce because of their tech readiness, competitive pressure, education level, and tech integration.²²

However, German SMEs have a significantly less positive view of cloud computing when compared with their counterparts.²³ German SMEs are also more willing to put off cloud-computing adoption. Three factors stand out in German SME cloud-computing adoption. The first relates to broad political and economic uncertainty. The second two relate to perceived risks of cloud computing—external security and organizational disruption—that seem to weigh more heavily on German SMEs than on some of their OECD counterparts.

First, on the overall economic climate, cloud adoption is directly related to IT investment, which in turn is directly related to how a company feels about economic performance. German SMEs sense that economic conditions have deteriorated in the past

19 Even in Germany, regional adoption rates vary. Almost 37 percent of SMEs in western Germany rate themselves as having a high level of digital adoption; in northern Germany, the rate is 30 percent. Surprisingly, southern Germany has the lowest level of advanced digitization at 20.9 percent, lower than eastern Germany by 2.1 percent. East Germany, nevertheless, has the highest number of SMEs that have little or no digitization in their operations (41.7 percent). See: PricewaterhouseCoopers, “BDI/PwC-Mittelstandspanel: Die Digitalisierung im Mittelstand,” July 2015, p 20, http://bdi.eu/media/presse/publikationen/mittelstand-und-familienunternehmen/Mittelstandspanel_1-2015.pdf.

20 European Commission, “Digital Single Market,” http://ec.europa.eu/priorities/digital-single-market_en; International Trade Administration, “US Export Fact Sheet,” June 3 2015, <http://trade.gov/press/press-releases/2015/export-factsheet-060315.pdf>.

21 BSA, 2016 BSA Global Cloud Computing Scorecard, <http://cloudscorecard.bsa.org/2016/>.

22 Tiago Oliveira and Gurpreet Dhillon, “From Adoption to Routinization of B2B e-Commerce: Understanding Patterns across Europe,” p. 32, <http://www.igi-global.com/article/from-adoption-to-routinization-of-b2b-e-commerce/124900>.

23 For example, a study of New Zealand and German SMEs found that approximately 55 percent of New Zealand SMEs saw cloud computing positively compared to just 25 percent of German SMEs. See Stuart Dillon and Gottfried Vossen, “SaaS Cloud Computing in Small and Medium Enterprises: A Comparison between Germany and New Zealand,” in: J. Becker et al. (eds.), *Working Papers, European Research Center for Information Systems* No. 19, (Münster: March 2014) p. 13, https://www.ercis.org/sites/ercis/files/structure/network/research/ercis-working-papers/ercis_wp_19.pdf.

year. Geopolitics—China’s slow down, sanctions against an aggressive Russia,²⁴ the nest of conflicts in the Middle East, and the ongoing Eurozone crisis—has battered the perception of German SMEs about current economic conditions. Confidence among German SMEs—among the world’s most open—hit its lowest level since 2010.²⁵ Interestingly, larger SMEs (with more than one hundred employees) and those whose business is limited to the EU are more confident than those who operate globally. This uncertainty extends to the domestic environment. For instance, German SME confidence in information and communications technology infrastructure is declining.²⁶ As a result of this uncertainty, German SMEs—particularly those that do business outside of the EU—are less prepared to make capital-intensive investments in B2B cloud computing that have a long-term payoff.²⁷ Across Europe, 32 percent of SMEs perceive the high cost of cloud computing as an inhibiting factor in cloud adoption.²⁸

Second is the issue of data protection.²⁹ The specter of global surveillance and data breaches has become a fixture in German media in the wake of the Edward Snowden revelations—a reality demonstrated by the fact that Snowden was on the cover of *Spiegel* magazine more times than Chancellor Angela Merkel and US President Barack Obama combined in 2013. Concerns about data security permeate German perceptions of digitization, particularly cloud computing—75 percent of German SMEs believe data protection represents a challenge for digital adoption. Evidence shows that fear of data security in the cloud is actually increasing.³⁰ One survey comparing German and New

Eighty-three percent of German cloud clients consider maintenance of data exclusively in Germany as a “must have.”

Zealand attitudes is illustrative. Eighty percent of German SMEs surveyed said that “protection from 3rd party access” in the cloud was essential compared to only 30 percent of New Zealand SMEs.³¹ Eighty-three percent of German cloud clients consider maintenance of data exclusively in Germany as a “must have.”³²

At the same time, German companies also worry about how cloud usage will affect compliance with rules regulating data control and processing. Fifty-six percent of German companies worry about compliance with German and European laws protecting personal data—whether because of the cost and resource burdens of compliance or the uncertainty about where the contours of full compliance actually lie.³³

Finally, German SMEs worry about the organizational disruption that digitization brings; indeed, 53 percent cite their worry about how digitalization will disrupt current business models and organizational management. The logic of cloud computing—particularly in B2B operations—is to render operations more efficient by, at times, transforming modes of operation and, in the case of public clouds, relying more heavily on a suite of outsourced services and support.

Take again the comparison between New Zealand and German SMEs. New Zealand SMEs (25 percent) are also much more likely to rely on external staff to manage their IT compared to German SMEs (4 percent). Also telling

is who is making the IT decisions in the company. In New Zealand SMEs, a strong plurality of business owners themselves (43 percent), are responsible for IT decisions. In Germany, in contrast, it is most often a specialized computer scientist (60 percent).³⁴

This supports what one would expect: German SMEs are tech savvy. But they are much more likely to keep

24 One-third of German SMEs operating internationally do business in Russia.

25 PricewaterhouseCoopers, “BDI/PwC-Mittelstandspanel: Die Digitalisierung im Mittelstand,” op. cit., p. 11.

26 PricewaterhouseCoopers, “BDI/PwC-Mittelstandspanel: Die Digitalisierung im Mittelstand,” op. cit., p. 15.

27 PricewaterhouseCoopers, “BDI/PwC-Mittelstandspanel: Die Digitalisierung im Mittelstand,” op. cit., p. 14.

28 Giannakouris and Smihily “Cloud computing - statistics on the use by enterprises,” op. cit.

29 According to the World Economic Forum, 90 percent of businesses, cloud service providers and users already using the cloud, believe that privacy violations represent a “very serious” risk to wide-spread cloud adoption. See Accenture and World Economic Forum, “Advancing Cloud Computing: What to Do Now?” 2011, http://www3.weforum.org/docs/WEF_IT_AdvancedCloudComputing_Report_2011.pdf.

30 The same holds true in the UK. Fear of data security in the

cloud shot up 11 percent among British businesses to 70 percent. See Simon Porter, “The state of cloud computing in Europe,” June 17, 2015, <http://www.thoughtsoncloud.com/2015/06/the-state-of-cloud-computing-in-europe/>.

31 Dillon and Vossen, “SaaS Cloud Computing in Small and Medium Enterprises,” op. cit.

32 KPMG, “Cloud Monitor 2015: Cloud-Computing in Deutschland-Status Quo und Perspektiven,” 2015, p. 5, <https://www.bitkom.org/Publikationen/2015/Studien/Cloud-Monitor-2015/Cloud-Monitor-2015-KPMG-Bitkom-Research.pdf>.

33 Ibid, p. 34.

34 Dillon and Vossen “SaaS Cloud Computing in Small and Medium Enterprises,” op. cit.

BOX 2. CUTTING THROUGH THE FOG: WHAT IS CLOUD COMPUTING?

One of the most vexing “unknown knowns” of cloud computing is what “the cloud” actually is. A principle reason why survey data varies so wildly is because definitions of cloud computing are often poorly articulated, ill-defined, or rely on the survey taker to define it. The National Institute of Standards and Technology—also cited by the OECD—defines cloud computing as a “model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management or service provider interaction.”¹

Cloud services have five essential characteristics: they can be called up on-demand with no human interaction; they can be accessed broadly across platforms like phones and laptops; they can pool resources across multiple users independent of location; they have rapid elasticity that often gives the user the impression that the resources are unlimited; and they monitor and optimize service.

Cloud service can be delivered through a public cloud, where the service is used by multiple clients; a private cloud, where a single institution has access to the cloud’s operations and storage; or a hybrid cloud. Cloud services can be delivered at three models of service—software as a service (SaaS), which can include web-based email, games, and virtual desktops; platform as a service (PaaS), which can include web servers and databases; and Infrastructure as a Service (IaaS), which can include virtual machines, load balancers, and servers.

Cloud computing usage for SMEs typically falls into one of the following categories: email; enterprise resource planning; customer relationship management; content management; business intelligence and analytics; security; storage; external database services; and office collaboration.

¹ Timothy Grance and Peter Mell, “The NIST Definition of Cloud Computing,” National Institute of Standards and Technology, September 2011, <http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>.

services in-house as much as possible. In fact, there seems to be a more pronounced “set it and forget it” approach to IT systems for German SMEs in general. A full 36 percent of German SME managements are completely unfamiliar with their IT expenditures. This hands-off approach is combined with a willingness to protect legacy models of in-house IT support rather than reliance on public cloud services that could transform the B2B environment for Germany’s small business and *Mittelstand*. According to BITKOM, Germany’s digital association, use of private clouds at all sizes of German business is more common. Public cloud usage remains a “niche market” used by “very few German firms,” even less among SMEs, and even when they are deployed, it is for business-to-customer operations, mainly customer relationship management.³⁵

Attitudes are changing toward cloud computing—78 percent of German industry using the cloud report a very or mostly positive experience with it.³⁶ BITKOM’s 2015 Cloud Monitor reported that the number of cloud-interested businesses (38 percent) surpassed the number of skeptics (28 percent). But the number of skeptics and undecideds is still 61 percent.³⁷

³⁵ KPMG, “Cloud Monitor 2015: Cloud-Computing in Deutschland—Status Quo und Perspektiven,” op. cit., pp. 13 and 16.

³⁶ Ibid, p. 26,

³⁷ Ibid, p. 7.

4. POLICY RECOMMENDATIONS

The European Commission and member-state governments recognize that policy and—perhaps equally important—the political environment have not kept pace with cloud technology. Vice President Andrus Ansip expressed the view that Europe must avoid “the real risk of falling behind when others race ahead” in cloud adoption.³⁸

The European Commission’s Cloud strategy, launched in 2010 as part of its Digital Agenda, was initially designed to iron out irregularities across the single market. It focused on standardizing the cloud environment in Europe by reducing standards-based fragmentation, promoting interoperability, and developing model terms of service to smooth out contractual uncertainty. It also pushed for greater public sector cloud services through the European Cloud Partnership.³⁹ The Digital Single Market has added heft to some of these measures—particularly on standardization, data portability, and openness through its European Cloud Initiative. And the Commission is planning future proposals to address cloud terms and contracts; interoperability and switching between cloud providers; and the Free Flow of Data initiative.

In April, the Commission laid out an ambitious €4.7 billion European Cloud Initiative with two primary lines of effort—a European Open Science Cloud and a €3.5 billion plan to build up Europe’s data infrastructure. The European Open Science Cloud is intended to make research and development data open and available for science research to Europe’s 1.7 million researchers and seventy million science and technology professionals, and to others outside the EU.⁴⁰ Its focus is making big data related to research and science more accessible across disciplines and sectors, while at the same time socializing cloud technology in the scientific community. The Commission seems to envision the European Open Science Cloud as a “proof of

concept”—to see how state-driven cloud systems can foster cloud adoption within sectors with the hope that this can expand later to public and private sector cloud adoption.

The larger portion of the two-pronged initiative is aimed at increasing high-performance computing capacity within Europe and enhancing connectivity, data, and software services for researchers, businesses—particularly SMEs—and the public sector. The intention is to create capacity, widen access, and ease usage.

The EU’s cloud strategy is certainly ambitious. But as the German case makes clear, there is no one-size-fits-all strategy. Germany—a laggard given its economic sophistication, international competitiveness, high digital adoption, knowledge of the cloud—presents different policy challenges than other EU economies where familiarity with cloud computing is lower, digital infrastructure is weaker, and the percentage of SMEs doing business internationally is less substantial. Policy approaches must be tailored to specific markets. But even as the European and national strategies to encourage cloud adoption and routinization begin to be implemented, they still contain deficiencies, internal contradictions, and blind spots regarding SME cloud adoption that should be corrected.

With that in mind, here are six points that the Commission and European member states should consider as they work to promote SME cloud adoption.

Promote policies that reinforce the global nature of the cloud: The logic of cloud computing is based on access and economies of scale predicated on the free flow of data both in Europe and globally. The European Cloud Initiative recognizes fragmentation as one of the primary reasons that data-driven, cloud-enabled science has not reached its full potential in Europe. The same is true about the cloud’s administrative and commercial potential. The Commission and member-states can pursue this in three areas: an ambitious Free Flow of Data initiative, EU trade agreements with third country partners, and the US-EU Privacy Shield.

First, the Free Flow of Data initiative should make clear that data ownership, replication, transfer, reuse, and access rules do not stifle the EU’s chance at an open,

38 Andrus Ansip, “Speech by Vice-President Ansip: Helping European industry to turn digital,” European Commission, April 5, 2016, http://europa.eu/rapid/press-release_SPEECH-16-1242_en.htm.

39 Ducatel, “European Cloud Computing Strategy,” op. cit.

40 European Commission, “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Cloud Initiative - Building a competitive data and knowledge economy in Europe,” op. cit., p 6.



innovative, competitive future. The Commission must recognize that national localization requirements and other technical and regulatory barriers to digital trade can undercut the internal logic and effectiveness of cloud computing and it thus must examine national localization requirements rigorously. This will not be easy. It remains to be seen whether the Commission will have the political heft to successfully roll back moves toward localization in states like Germany. Regulation and political pressure have forced some companies like Amazon to build indigenous server farms; companies like Salesforce and SoftLayer have laid the groundwork to store data locally; and others like Microsoft have sought trustee alliances with German companies to cordon them off from a perception that they are cavalier with German data.⁴¹ This trend should be carefully watched and the Free Flow of Data initiative should seek to counter unnecessary localization and

create the space for a more seamless, effective cloud ecosystem in Europe.

Internationally, the EU should work to extend this ethos to its cooperation with international partners, particularly the United States. In the short term, that means providing legal certainty for cloud operators and their clients as the US-EU Privacy Shield comes into force. This will help keep down costs and will guarantee the efficiency, reliability, and recourse mechanisms necessary to attract new users. In the medium-term, this means concluding a Transatlantic Trade and Investment Partnership agreement that builds on the World Trade Organization's anti-forced localization requirements and provides more secure and predictable terms of usage as well as a more consistent environment for data flows in both the transatlantic and transpacific spaces.

Set policies aimed at restoring operational and legal trust in Europe's cloud environment: Trust is a key deficiency across the EU but particularly in Germany. Commission Vice President Ansip has noted as much, stating that building SME trust in cloud services will be

⁴¹ Brandon Butler, "Amazon launches German cloud region in nod to privacy concerns," NetworkWorld, October 23, 2014, <http://www.networkworld.com/article/2838179/cloud-computing/amazon-launches-german-cloud-region-in-nod-to-privacy-concerns.html>; Murad Ahmed and Richard Waters, "Microsoft unveils German data plan to tackle US internet spying," *Financial Times*, November 11, 2015, <https://next.ft.com/content/540a296e-87ff-11e5-9f8c-a8d619fa707c>.

BOX 3. THE UNITED STATES AND THE EUROPEAN CLOUD

The public cloud arose in the United States in the late 1990s when large tech companies like Amazon began to offer subscription-based application services provisions. Because cloud services are not limited by borders, European companies were able to avail themselves of US-based public cloud computing from the outset of the market. As one Commission report noted with resignation, “whatever the truth is, by the time the European IT industry was in a position to offer its own Public Cloud services the major US based players (as they are known today) had already established a presence in the market.”¹ Of the leading twenty-five public cloud-computing services for Europe, seventeen are located in the United States, controlling over 83 percent of the market.² The first Europe-based provider to make the list appears in eighth place.

1 European Commission, “Final Report of the study “SMART 2013/0043--Uptake of Cloud in Europe,” op.cit., p. 11.

2 Deloitte, “Economic impact of Cloud Computing in Europe,” op. cit., p. 11.

key to Europe’s digital transformation.⁴² But efforts so far to build new operational and legal trust have been insufficient.

On the operational side of security, the European Commission and other actors have launched several efforts to create a more transparent, reliable certification process that can instill confidence in cloud computing. The Network Information Security (NIS) Directive seeks to provide more normalized security requirements, breach notification procedures, and coordination within and across member states. Several national data protection authorities have also taken on issuing new guidelines. France’s National Data Protection Commission, CNIL, issued sample provisions. The German Federal Office for Information Security published guidelines related to both personal data and IT security and encryption procedures.⁴³ Germany has also instituted compulsory new security standards and breach notification requirements. But these efforts are relatively recent and the NIS Directive is not in effect. Furthermore, ENISA, the EU’s Crete-based cyber hub, lacks the financial or human capital to adequately

assess cloud-based security risks.⁴⁴ Developing robust standards that ensure that cybersecurity and personal data protection requirements are mutually consistent would be an important step.

On the legal side of security, long, legalistic consent agreements can obfuscate users’ sense of where information is stored, when it is transferred, how it is protected, etc. The Commission highlighted that terms and conditions for cloud services are often “non-negotiable,” seeming to hint that the Commission would look at tools to create greater flexibility in contract relationships. The Digital Single Market Strategy takes aim at the rigidity of contracts with cloud providers.⁴⁵ As it does so, the Commission must work closely with cloud service providers and business users—especially SMEs—to establish standard contracts and terms of service that provide transparent terms and adequate levels of protection for clients.

Adding to this is the lack of a liability market for breaches, which is another source of uncertainty. Germany, for instance, has an extremely underdeveloped cyber insurance market. Cyber premiums in Germany were valued at a mere \$10 million in 2015 compared with \$2 billion in the United States.⁴⁶ And the number of cyber policies continues to increase in the United States, upwards of 27 percent on average every year since 2013 according to one large US insurance broker.⁴⁷

In cases like the United States, demand in data-rich financial environments like banking and retail has driven the proliferation of cyber insurance. High profile data breaches at Target, Home Depot, and the US Office of Personnel Management have contributed to awareness of potential liability for breaches among US businesses—including SMEs—and have led to greater use of cyber insurance for risk mitigation in the United

44 Catherine Stupp “EU cybersecurity agency lacks funds for research on major tech issues,” *Euractiv*, July 31, 2015, <http://www.euractiv.com/section/digital/news/eu-cybersecurity-agency-lacks-funds-for-research-on-major-tech-issues/>.

45 European Commission, “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Digital Single Market Strategy for Europe,” May 6, 2015, <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52015DC0192&from=EN->.

46 Reuters, “More German firms turning to cyber insurance—Marsh,” September 29, 2015, <http://www.reuters.com/article/insurance-cybersecurity-marsh-mclennan-idUSL5N1I23KG20150929>.

47 Matthew P. McCabe, “The Role of Cyber Insurance in Risk Management,” Testimony before the Committee on Homeland Security, Subcommittee on Cybersecurity, Infrastructure Protection and Security Technologies, March 22, 2016, <http://docs.house.gov/meetings/HM/HM08/20160322/104668/HHRG-114-HM08-Wstate-McCabeM-20160322.pdf>.

42 Ansip, “Speech by Vice-President Ansip,” op. cit.

43 William Long “European Cloud Computing Strategy to create 2.5 million new jobs,” *ComputerWeekly.com*, January 2014, <http://www.computerweekly.com/opinion/European-Cloud-Computing-Strategy-to-create-two-and-a-half-million-new-jobs>.

States. Cyber insurance schemes can help incentivize the adoption of greater protective measures by digitally enabled businesses including cloud users and providers. Cybersecurity protocols, technology investment, and good cyber hygiene can drive down premiums. As such, cyber insurance plays an indirect role in fostering a more secure, better protected, and more trustworthy cloud environment.

Europe's relatively underdeveloped liability landscape undoubtedly plays a role in the uncertainty overhang over cloud-computing adoption. The EU must increase soft incentives and hard requirements for more accurate actuarial modeling, understanding of liability risks, claims options, and dispute mechanisms. These efforts are just beginning and should be accelerated.

Increase awareness and training on cloud computing among EU SMEs: SMEs—which stand to benefit most from cloud adoption—also are the least likely to have ever heard of cloud computing. Forty-two percent of European businesses not using the cloud cited “insufficient knowledge” as a reason.⁴⁸ Even of those who are aware, 32 percent of all EU SMEs cited insufficient knowledge as a limiting factor in their use of cloud technology.⁴⁹ This compared to just one in five larger businesses. The European Cloud Initiative recognizes that businesses, SMEs, academia, and the public sector are “simply unaware of the value of data sharing,”⁵⁰ and the European Cloud Initiative Communication envisions devoting €200 million on efforts to raise awareness.

But SMEs are also unaware of other potential benefits of cloud computing including storage, security, access, and cost-effectiveness. Efforts to raise awareness of the basic principles of cloud technology should be central to the cloud strategy. Awareness-raising efforts should also create new incentives for cloud adoption and routinization; encourage new SMEs and startups to be born-in-the-cloud, i.e., companies that integrate cloud use from their inception; and promote other positive aspects of cloud usage like the

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“green” dividends of energy optimization and e-waste conservation.⁵¹

In addition to a broader awareness-raising effort, the Commission can also include non-adopters in its multi-stakeholder consultations on the cloud. So far, it has neglected to properly bring in this largest constituency for cloud services—“non-users” of cloud services, particularly SMEs.⁵² As the Commission plans for its European Cloud Initiative consultation process, it must make sure to get those at the table who do not even know there is a “table” in the first place.⁵³ These non-users can provide insight into the factors holding back cloud adoption and help socialize cloud usage among potential new cloud adopters.

Build out the B2B and business administration aspects of cloud-computing adoption: The scope of Europe's cloud strategy so far has remained rather narrow, focused on the scientific community and infrastructure. B2B, organizational, and back-office aspects of digital transformation remain a weak link in the policy chain. These are areas where SMEs stand to benefit the most by moving contact data, accounting and tax history, enterprise resource planning, email services, and other internal operations into the cloud, SMEs can streamline management and cut costs.

Given their importance as a component of European and international competitiveness, B2B cloud resources, and the role of the private sector, cloud service providers must play a more significant role in the EU's cloud strategy. The Commission should support multi-stakeholder and nongovernmental efforts to determine which areas of SME business operations would benefit most from cloud adoption and work with them to translate these findings into specific policies that promote B2B cloud adoption.

48 Giannakouris and Smihily “Cloud computing - statistics on the use by enterprises,” op. cit.

49 Giannakouris and Smihily “Cloud computing - statistics on the use by enterprises,” op. cit.

50 European Commission, “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Cloud Initiative--Building a competitive data and knowledge economy in Europe,” op. cit., p.3.

51 Joe McKendrick, “Cloud Computing's Hidden ‘Green’ Benefits,” *Forbes*, October 3, 2011, <http://www.forbes.com/sites/joemckendrick/2011/10/03/cloud-computings-hidden-green-benefits/#1c6f7e5e5403>; Diwakar Vishakhadatta, “Having a greener cloud will pay dividends,” *Embedded Computing Design*, April 9, 2015, <http://embedded-computing.com/articles/having-a-greener-cloud-will-pay-dividends/#>.

52 Commission documents mention incorporating the cloud industry and public sector organizations like the Commission, ENISA and the Article 29 Working Party.

53 European Commission, “Cloud computing at the forefront of the digital economy,” <https://ec.europa.eu/digital-single-market/en/blog/cloud-computing-forefront-digital-economy>, op. cit.

Incentivize public sector procurement and e-governance as instruments to promote SME cloud adoption:

In the area of public procurement—where the Commission has looked to promote higher cloud usage—the available EU resources have thus far been negligible. It makes sense that local, state, and national governments should be the first movers in both administrative and back-office cloud adoption. After all, governments are responsible for more than 20 percent of all IT spending in Europe. When governments undergo the digital switchover, the communities and businesses that interact with them daily take notice. Governments—particularly at the local level—are primed to socialize cloud computing. But in Europe, public sector cloud usage continues to lag behind the private sector. And the Commission itself has only recently begun the move to the cloud. Future procurement guidelines should not only encourage cloud adoption by public administration. They should also have a “plug and play” mentality, emphasizing openness and accessibility for SMEs and other private sector players to public data and allowing access to procurement contracts for cloud storage of well-defined, non-sensitive data.

Advance the transatlantic dialogue on data treatment, privacy, and surveillance by building on the Privacy Shield breakthrough:

The 2013 Snowden revelations unleashed a storm of discussion and debate in Europe about the proper role of online surveillance in the age of terrorism. In its aftermath, European publics demanded greater attention to privacy guarantees enshrined in the European Charter of Fundamental Rights and the 1995 Data Protection Directive. New questions arose among European businesses and users alike, about the integrity and confidentiality of their data when housed in cloud storage based in the United States. This was compounded by the October 2015 *Schrems* decision by the European Court of

Justice striking down the fifteen-year-old Safe Harbor Framework.⁵⁴

Against the Snowden backdrop, the Commission, European national governments, and the United States continue to work together to grapple with European ambivalence regarding the fundamentals of cloud computing and the role of US-based cloud providers. Together, they launched a thorough review of Safe Harbor and, in the wake of the *Schrems* decision, accelerated the push toward a new US-EU Privacy Shield. The Privacy Shield—which entered into force on August 1, 2016—works toward restoring faith in the transatlantic digital space including in cloud computing. It has more stringent limitations on how cloud providers can process and transfer Europeans’ personal data; guarantees for the treatment of European human resources data in US-based cloud servers; stronger obligations on companies to comply with the Shield principles through greater federal—and indeed transatlantic—oversight; new recourse mechanisms both in the United States and EU; and an avenue at the State Department for Europeans to lodge questions regarding the treatment of their personal data by the US intelligence community.

The EU, its member states, and the United States now need to build on this trust offensive by emphasizing and embracing the potential economic and security gains that come from cloud usage even as they reassure the public that the high standards and protections for users will not only remain in place but be strengthened.

⁵⁴ The Safe Harbor Framework was a 2000 agreement negotiated between the US Department of Commerce and the European Union that provided US companies a means of attaining adequacy on the treatment of European personal data in compliance with the 1995 EU Data Protection Directive.

WILL THE DIGITAL FUTURE LOOK BRIGHT?

At the 2016 Hannover Messe trade fair, German Chancellor Merkel emphasized the role that common European—and transatlantic—approaches must have if Germany is to be successful in an era when data processing is one of the primary sources of value in advanced industrial economies.⁵⁵ But that success

begins at home. Cloud adoption by businesses—particularly SMEs, which stand to benefit most from cloud-based data storage and processing—will be an important litmus test for Europe’s digital future. The EU and member states like Germany must work more to address the unknowns, concerns, fears, and particular needs of the skeptics and non-adopters in the small business community. If not, Europe’s SMEs risk missing out on one of the key building blocks of future competitiveness.

⁵⁵ Angela Merkel, “Rede von Bundeskanzlerin Merkel bei der Eröffnung der Hannover Messe 2016 am 24. April 2016,” April 24, 2016, <https://www.bundesregierung.de/Content/DE/Rede/2016/04/2016-02-25-bkin-eroeffnung-hannovermesse.html>.

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