Cloud Computing in Europe Appendix 10 Challenges & Opportunities by SMEs

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Title	Cloud Computing in Europe. Appendix 10: Challenges & Opportunities by SMEs
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2   EXECUTIVE SUMMARY

SMEs[1] make up 99% of the European economy, and account for 66% of all employment in the EU[2]. They are a powerhouse when seen all together, but present a very fragmented market that is extremely diverse and difficult to penetrate especially for technological innovations and advancements.

Number of enterprises, turnover and persons employed and the share of enterprises with fewer than 250 persons employed, 2015

	Enterprises		Turnover (m €)		Persons employed	
	total	< 250 persons employed %	total	< 250 persons employed %	total	< 250 persons employed %
EU-28	23 500 341	99.8	27 309 775	55.8	137 444 935	66.3
Belgium	602 153	99.9	989 197	65	2 769 085	69.3
Bulgaria	326 219	99.8	121 308	69.9	1 911 916	74.8
Czech Republic	1 001 048	99.8	444 231	56.9	3 591 896	67.6
Denmark	210 726	99.7	479 464	59.3	1 666 048	64.3
Germany	2 408 352	99.5	6 061 400	47.5	28 258 410	62.9
Estonia	68 124	99.7	50 820	77.5	414 763	78.2
Ireland	243 433	:	595 095	:	1 308 019	:
Greece	789 975	:	236 153	:	2 162 572	:
Spain	2 465 540	99.9	1 789 292	62.2	11 109 702	72.8
France	2 908 814	99.9	3 624 869	55.3	14 645 799	61.4
Croatia	146 637	99.7	77 670	60.9	989 598	69.5
Italy	3 683 127	99.9	2 887 615	68.8	14 225 278	78.7
Cyprus	48 329	99.9	25 573	79.9	215 716	83.9
Latvia	109 642	99.8	51 304	77.8	633 450	79.4
Lithuania	186 468	99.8	73 997	68.5	934 440	75.9
Luxembourg	31 926	99.5	151 365	70	255 869	68.3
Hungary	536 610	99.8	277 690	57.1	2 596 236	69.8
Malta	26 059	99.8	18 665	85.1	134 212	79.7
Netherlands	1 092 243	99.9	1 412 433	61.8	5 461 082	65.7
Austria	322 325	99.7	653 111	:	2 742 655	:
Poland	1 606 559	99.8	921 350	56	8 652 063	68.3
Portugal	807 183	99.9	314 227	:	3 007 264	:
Romania	458 122	99.6	263 366	59.1	3 898 199	65.5
Slovenia	134 727	99.8	83 628	68.3	591 340	73.7
Slovakia	429 524	99.9	180 476	56.7	1 502 912	71.8
Finland	229 096	99.7	365 782	56.1	1 454 614	65.6
Sweden	686 433	99.9	811 397	:	3 102 080	:
United Kingdom	1 940 947	99.7	4 348 297	47	19 209 717	53.5
Norway	293 403	99.8	546 504	:	1 610 874	68
Switzerland	142 775	99.2	1 929 684	:	2 737 720	67.1

: not available

Source: Eurostat (online data code: sbs_sc_sca_r2)

eurostat

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[1] Official EU SME Definition at https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

[2] https://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_small_and_medium-sized_enterprises#General_overview

3   ADOPTION OF CLOUD TECHNOLOGIES BY SMES

Adoption of cloud technologies by companies has varied across the EU member states, and between SMEs and large companies. When taking companies as a whole regardless of size, 26.2% of companies in the EU28 made use of cloud computing services in 2018. The variance between countries was extremely large, ranging between 65.3% of companies on the cloud in Finland and 8.3% in Bulgaria[3].

Use of cloud computing services, 2018
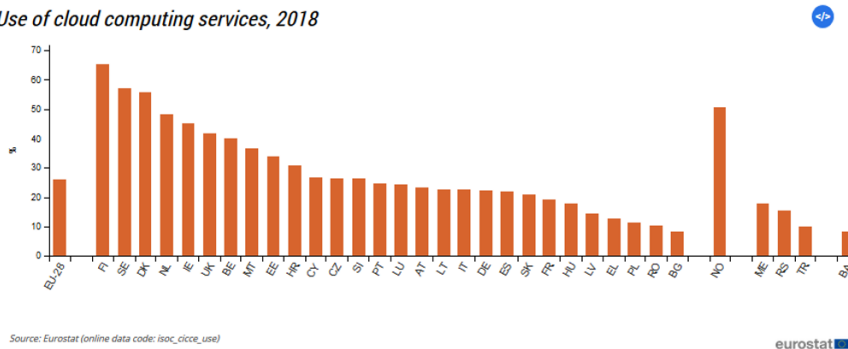
Source: Eurostat (online data code: isoc_cicce_use)

eurostat

When one looks at the figures for large companies and SMEs, it is clear that SMEs have lagged far behind in terms of adoption of cloud computing. Indeed between 2014 and 2018 large companies using cloud computing jumped from around 35% to over half. By comparison adoption among SMEs also increased but at a far slower rate, from under 20% adoption in 2014 to 26.2%.

The difference here shows two broad trends. Cloud uptake is certainly increasing across the board, but whilst large companies have quickly moved in a number of years so that being on the cloud is now the norm, SMEs' progress may show more action and assistance is needed to make use of cloud computing a general standard. This need is particularly pronounced in countries which have lagged behind in adoption. It also reflects diversity in the comparative strength of national industries, with certain industries moving much faster than others (such as the IT industry, where progress has been rapid).

The largest adoption within the EU can be found in Finland, Sweden and Denmark. According to a study conducted by Radar and published as Tieto and VMware's Cloud Maturity Index 2017[4], there are a few factors which contribute to this. Firstly, due to global market competition, high-cost economies have been put under pressure due to the low cost of skilled labor found in countries within the Asia-Pacific (APAC) region. In response to this, many businesses needed to find new ways to remain competitive particularly by cutting cycle times through digital initiatives.
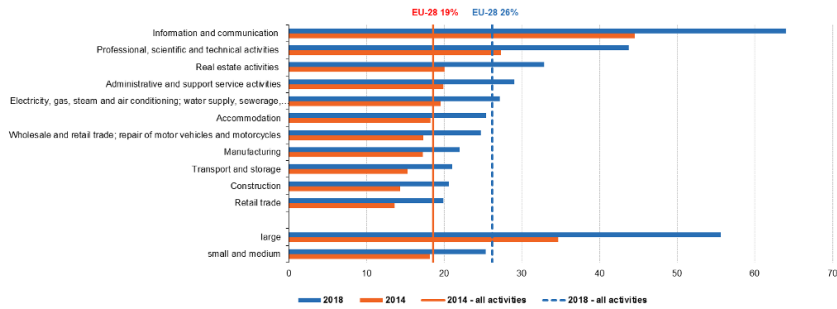
This uptake in cloud technologies coincided with the digital breakthroughs in the areas of cognitive platforms, artificial intelligence, virtual and augmented reality (VR/AR) - encouraging competition and innovation in the global marketplace. Additionally, these countries experienced a rapid industrialisation of their respective IT industries, with companies like Amazon and Google moving in to provide businesses with scalable virtual IT infrastructures. In time local and regional players matured and are now providing services to the areas that the bigger players missed.

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[3] All data cited is sourced from Eurostat 'Cloud computing - statistics on the use by enterprises', accessed at https://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises#Use_of_cloud_computing:_highlights

[4]   https://blogs.vmware.com/cloudprovider/2017/06/finland-norway-and-sweden-prove-the-business-value-of-cloud-maturity.html

Use of cloud computing services, by economic activity and size, EU-28, 2014 and 2018 (% of enterprises)

EU-28 19%   EU-28 26%

Economic activity	
Information and communication	
Professional, scientific and technical activities	
Real estate activities	
Administrative and support service activities	
Electricity, gas, steam and air conditioning; water supply, sewerage...	
Accommodation	
Wholesale and retail trade; repair of motor vehicles and motorcycles	
Manufacturing	
Transport and storage	
Construction	
Retail trade	
large	
small and medium	

■ 2018   ■ 2014   — 2014 - all activities   - - - 2018 - all activities

Source: Eurostat (online data code: isoc_cicce_use)

eurostat

Use of cloud computing services, 2014 and 2018 (% of enterprises)

■ 2018   ■ 2014
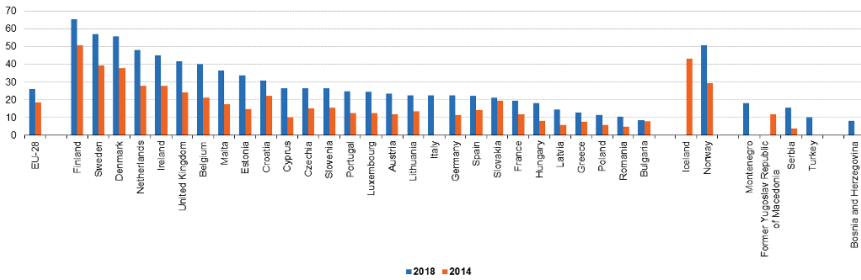
Note : Italy: Break in series. Iceland and The Former Yugoslav Republic of Macedonia: 2018 not available. Montenegro, Turkey and Bosnia and Herzegovina: 2014 not available.
Source: Eurostat (online data code: isoc_cicce_use)

eurostat

For those enterprises making use of cloud computing services, use of services seem at face value to reflect differences in demand between more generalist needs (such as the use of email and data storage) and more specialised needs (such as the use of computing power). The data also shows that use has increased across the board, albeit slowly. This may indicate that companies using cloud computing for one function may branch into others over time, particularly as the utility of cloud elsewhere becomes apparent.
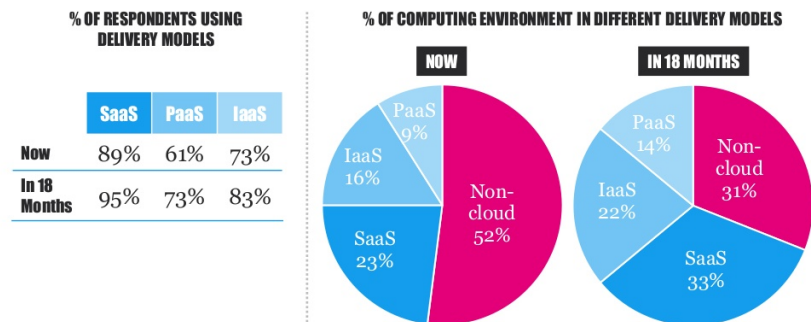
4 SME NEEDS CURRENTLY ADDRESSED BY EXISTING LARGE PROVIDERS

Out of the SMEs that have migrated to cloud, the largest 3 international providers - Microsoft, Google and Amazon are the obvious choice for many. When speaking to entrepreneurs[5] they focus the reasons[6] why they choose large providers and these include:

- Simplicity / Brand Awareness - quick to implement for all their employees, using known names that over the years users have learnt to trust.
- Security / Peace of mind - real (or perceived) higher security that the larger corporates offer without having to invest in more network and IT personnel in house.
- Cheap prices (as a start) - For small startups and micro companies, starting small is quick and cheap on the larger enterprise cloud providers.
- Flexibility - Able to scale to larger servers as needed / downscale when needed without having to purchase / lease own assets / servers or employ specific staff.

Many companies are also migrating to cloud since most of the software they are using nowadays is SaaS model based, and therefore ERPs, CRMs, office productivity software etc. are all migrating themselves to the cloud. This is therefore one of the main drivers for adoption and many of these software themselves utilise the larger infrastructures.

According to a survey conducted in 2018 by the International Data Group (IDG Communications inc.)[7] 89% of people surveyed responded that they leveraged SaaS in some capacity within their organisation (around 23% of their total computing environment) which was projected to reach 95% of total respondents by the

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5 https://www.computerweekly.com/feature/Interview-Dragons-Den-entrepreneur-Piers-Linney-on-cloud-and-UK-tech-sector

6
https://www.researchgate.net/publication/320866331_Drivers_and_Barriers_of_the_Cloud_Computing_in_SMEs_the_Position_of_the_European_Union

7 https://www.idg.com/tools-for-marketers/2018-cloud-computing-survey/

second half of 2019. Those who already made use of SaaS expected the service to increase its presence to around 33% of their organisations computing environment within 18 months.

Infrastructure-as-a-service and Platform-as-a-service delivery models were also forecast to increase in adoption growing from 73% to 83% and 61% to 73% respectively. Of those surveyed, it was estimated that by the second half of 2019, non-cloud based areas of their computing environments were set to drop from 52% to 31% due to the increased use of cloud based services.

The virtual/agile company approach is also allowing for more international collaboration between smaller companies and the ability for cloud connected collaborators is seen indeed as another facilitator of SME entrepreneurship in Europe[8].

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[8]

https://www.researchgate.net/publication/271940991_Cloud_computing_as_a_facilitator_of_SME_entrepreneurship

5   OPPORTUNITIES NOT CURRENTLY ADDRESSED

At the moment there is a lack of European cloud players[9] however there are still some needs that the large enterprise players do not fully address and this could be where the European opportunities lie.

- **Value for money even for large uses** (at the moment very expensive in higher tiers of usage for AWS / Google / Azure) - This can be seen in the Study published in 2019 performed by the European Commission on the Economic Detriment to the SMEs arising from unfair and unbalanced cloud computing contracts in 2016-2017[10]. Moreover the eFiscal[11] project analysed the costs of High Throughput and High performance computing eInfrastructures and showed that for those companies that need serious power, then the price tag might be too high.

- **Data location fully in Europe** - Thanks to the introduction of GDPR all the small and medium companies in Europe are now much more aware of where and how their personal and sensitive data is stored, since they have become the ones safeguarding it. With the large providers, how can they be sure it's still fully in the EU?[12] (See interview with OVH CEO[13] citing this as a reason to use their services to European SMEs). Furthermore, policy developments in the USA (notably the Patriot and CLOUD Acts) have given further cause for concern amongst EU businesses, which are now not sure about their standing in relation to such intrusions into their personal data. On the other hand, there is counter evidence that particular business sectors[14] do not give the matter much thought. Only policy level actions in Europe can address these issues but in the meantime some official clarity over the issues would be helpful.

- **IP Protection Security issues** - For very sensitive companies that are creating intangible intellectual property for their companies (like for example in the drug discovery sector[15]), the 'big brother' concept with the larger international cloud providers does not offer any comfort and they are either keeping their own servers in-house, or encouraging European-based cloud capabilities.

- **Value added services that integrate with their EU / country services** - Many of the European countries have implemented eGovernment services[16] (local, regional or national) and a potential opportunity for local cloud providers would be to integrate with these systems and thus provide a seamless workspace for SMEs. At the moment there is a lot of productive time lost by companies that need to download their materials from their 'corporate' cloud and then reupload to the governmental services[17].

- Interoperability problems between off-the-shelf solutions. Many small companies use local SaaS systems that however fail to talk to each other and create additional headaches for the companies. This was highlighted by experts in the H-Cloud SME webinar. Large cloud providers might not look into fixing such problems as they are deemed too small to be interesting.

- Wider accessibility of data. Data-based business models are becoming more popular due to their lower barrier to entry and as such the availability of trusted data is imperative. Data spaces where data can be shared securely are important, as is the increase of dataflows between businesses

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[9] https://www.cnbc.com/2019/01/09/cloud-computing-in-europe-salesforce-amazon-are-big-winners---.html

[10] https://ec.europa.eu/info/publications/study-economic-detriment-small-and-medium-sized-enterprises-arising-unfair-and-unbalanced-cloud-computing-contracts_en

[11] http://efiscal.eu/files/deliverables/D2%203%20Computing%20e-Infrastructure%20cost%20calculations%20and%20business%20_models_vam1-final.pdf

[12] https://www.spector.ie/blog/gdpr-what-does-it-mean-for-the-sme/

[13] https://www.computerweekly.com/feature/Interview-OVH-CEO-on-offering-a-European-alternative-to-the-US-public-cloud-giants

[14] https://www.bloomberg.com/news/articles/2020-03-06/european-banks-store-their-sensitive-data-on-american-clouds

[15] https://www.europeanpharmaceuticalreview.com/article/45049/security-considerations-external-research/

[16] https://ec.europa.eu/digital-single-market/en/public-services-egovernment

[17] https://ec.europa.eu/information_society/newsroom/image/document/2018-47/egovernment_benchmark_2018_background_report_F21FA84B-0254-F4DB-7B2FC4567D4AA925_55487.pdf

and governments. Usage-rights of such data must be reevaluated in order to minimise any possible disadvantages for SMEs.[18]

Several of these points align with the Cloud services marketplace proposed within the EUSD, in which the ability for service providers to participate will be conditional based on "the use of transparent and fair contract conditions". These conditions are not always present within the current market, specifically to micro-enterprises and SMEs.[19]

5.1 Employment issues ... finding skills in cloud computing

A large barrier that is being faced by lots of SMEs that want to actually migrate to cloud or use cloud more effectively is indeed the lack of potential employees to recruit with the right skills.

Several studies have brought this to the fore. The IDC European Skills Survey of 2018 quoted that there is a current digital skill gap potentially of 749,000 employees across Europe with Cloud being the most demanded skill[20].
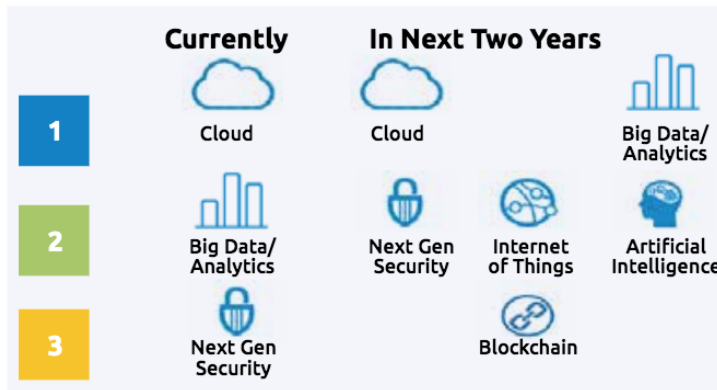
950 business decision makers from companies in the UK[21] cited loss of business revenue in 2017 for their employers due to such a lack of skills. The study conducted by the London School of Economics found that the barriers they are finding when recruiting are:

- Competition for talent
- The inability to offer competitive salaries
- The inability to provide sufficient career progression
- The inability to offer sufficient training

SMEs are particularly affected by this skill shortage. SMEunited President Ulrike Rabmer-Koller mentioned in 2019 "*Labour markets are rapidly changing and our SMEs are confronted with a lack of qualified workforce and face a real skills mismatch, in particular regarding digital skills.*"[22]

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[18] https://ec.europa.eu/info/sites/info/files/communication-european-strategy-data-19feb2020_en.pdf

[19] 'Study on the economic detriment to SMEs arising from unfair and unbalanced cloud computing contracts', https://ec.europa.eu/info/sites/info/files/dg_just_cloud_computing_final_report_web_final.pdf.

[20] http://docplayer.net/145128893-High-tech-skills-increasing-eu-s-talent-pool-and-promoting-the-highest-quality-standards-in-support-of-digital-transformation.html

[21] https://www.information-age.com/lack-cloud-expertise-loss-revenue-123468674/

[22] https://smeunited.eu/news/skills-shortage-holds-smes-back

There is a clear need for more collaboration between SMEs and vocational and educational colleges or universities to address this issue. Some good practices in this area include the Erasmus Mundus Project for Master's programme in Security and Cloud Computing[23] with partners from 6 countries that was funded in 2017 and goes on until 2022. Another Erasmus Mundus Project focused on Green Networking and Cloud Computing with 3 countries - Sweden, France and UK. This was funded in 2019 and goes on to 2025.[24]

However even here, the big 3 cloud providers are taking up a lot of attention in the education and employee training market since they all have their own "academies" or certifications[25] [26] [27]. Therefore the newly trained cloud engineers would have been used to their infrastructures, making them even more probable as the choice of provider that the future employee would advise their employer to use.

This issue is highlighted within the SME Strategy for a Sustainable and Digital Europe[28] in which, through the support of the Digital Europe Programme, a "Digital Crash Course" will be developed, enabling SME employees to become proficient in the latest technology areas including AI, cybersecurity and blockchain.

Further to this, a programme for "digital volunteers" is also mentioned, allowing "young skilled people and experienced seniors to share their digital competence with traditional businesses".

5.2 Examples of success stories in different regions of Europe by projects focusing on SMEs

5.2.1 COLA - Cloud Orchestration at the Level of Application

The COLA project[29] aimed to address the issue of SME and public sector resistance to use cloud computing services due to limited application-level flexibility and security concerns.[30] The project found that while organisations were increasingly investigating the possibility of using cloud computing in their businesses, the lack of their existing applications' flexibility and the shortages of cloud-specific skilled talent caused them to be hesitant.

The objective of the project was to develop a framework that supported optimised secure deployment of cloud applications and offer run-time orchestration.[31] Through pilots and demonstrations, the project demonstrated the applicability and impact of the solution and defined how the innovation could be delivered to the market.

MiCADO, the framework developed by the project, aims to enable public sector organisations and SMEs to deploy and run applications in the Cloud in a cost effective, flexible and secure way, increasing the number of prospective Cloud users and improving services provided to European citizens and companies. By the end of the project, the framework provided access to the several academic and commercial cloud providers.

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[23]   https://ec.europa.eu/programmes/erasmus-plus/projects/eplus-project-details/#project/586541-EPP-1-2017-1-FI-EPPKA1-JMD-MOB

[24]   https://ec.europa.eu/programmes/erasmus-plus/projects/eplus-project-details/#project/610619-EPP-1-2019-1-FR-EPPKA1-JMD-MOB

[25] https://www.microsoft.com/en-us/learning/azure-exams.aspx

[26] https://cloud.google.com/certification/cloud-engineer

[27] https://aws.amazon.com/certification/

[28] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0103&from=EN

[29] https://cordis.europa.eu/project/id/731574

[30] https://project-cola.eu/cola-project/

[31] https://project-cola.eu/wp-content/uploads/D1.5-Final-Project-Report.pdf

5.2.2 Red.es

Red.es is a public corporate entity based in Spain (belonging to the Ministry of Energy, Tourism and the Digital Agenda) which, by making use of the European Regional Development Fund (ERDF), aims at promoting cloud solutions to SMEs by assisting in the migration or development of new SaaS solutions.[32] Targeting SMEs and freelancers in the ICT sector, the project offered financial aid of between 50-80% of their requested budget. At the time of writing, this has directly benefited over 360 SMEs and freelancers and has offered subsidies amounting to 18.3 million euros.[33]

Their funding aids the financing of personnel expenses, subcontracting of technological services and contracting of technological evaluation services of the developed software solutions.

5.2.3 Clouding SMEs[34]

Clouding SMEs is a now defunct Research and Innovation project funded by the European Commision which aimed to act as a catalyst for the accelerated and successful adoption of cloud computing by European SMEs. The project was a joint effort of SME Associations, SMEs and cloud computing experts and took a holistic approach to cloud computing, considering both the supply side and demand side of SME needs. Along with the production of a best practices guide[35] and road maps, the project focused on short, medium and longer-term activities, which were undertaken by SME communities, cloud computing communities and policy makers.[36]

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[32] https://www.red.es/redes/es/que-hacemos/cloud-computing

[33] https://www.red.es/redes/sites/redes/files/Relaci%C3%B3n%20Beneficiarios%20C05715ED_1.pdf

[34] https://cordis.europa.eu/project/id/609604

[35] Website now offline. Archived version accessed at: https://web.archive.org/web/20181115220824/http://www.cloudingsmes.eu/wordpress/best-practice/

[36] Website now offline. Archived version accessed at: https://web.archive.org/web/20181115221045/http://www.cloudingsmes.eu/wordpress/about-us/concept/

6 CONCLUSIONS - CHALLENGES AND RECOMMENDATIONS

6.1 D-S Challenge 1: Lack of skills and resources to help SMEs adopt and exploit cloud technologies.

Challenges include migration of legacy applications to the cloud especially when these have been created several years ago and it is not worth it to migrate to cloud environments as the investment would be too prohibitive for small and medium companies.

- **D-S Recommendation 1.1:** Help SMEs build skills and competence in the labour force. Foster collaboration projects between SMEs and vocational educational colleges or universities to address this issue. Create a pool of cloud experts that could work freelance at a subsidised or low level cost to give services to SMEs. These could be students in the last years of Universities or entry level employees that are looking to build their curriculum. Similar solutions have been deployed in Nordic countries with good success.
- **D-S Recommendation 1.2:** Create deployment calls that focus on SME issues and not on supply or research. These can be focused on verticals within the SMEs daily issues for example…. Accounting in the cloud or inventory management in the cloud or HR or similar.These calls should look at micro and small traditional companies and not just at medium innovative or high end ones.
- **D-S Recommendation 1.3:** Financial assistance for SMEs transitioning from legacy systems to web / cloud based solutions. Create a fund to assist with these efforts, perhaps in the form of vouchers, but instead of buying innovations or consulting, they can buy cloud services. Care however needs to be taken that these vouchers will be used with local providers that can give support to the small companies in their local language and understanding their local requirements.
- **D-S Recommendation 1.4:** Creation of secure data spaces where trusted data can be shared between business and governments. Usage-rights will need to be reviewed to ensure fair use and eliminate any possible disadvantages for SMES.

6.2 D-S Challenge 2: The suitability of cloud services and contracts.

The adverse cost of cloud services for large uses. SMEs who don't have the purchase expertise, end up with discriminatory contracts. The lack of access to local eGov from hyperscale customers.

- **D-S Recommendation 2.1:** Setup contractual frameworks which are not discriminatory for SMEs. Use the "Think Small First" principle in order to make it a mandatory check for contracts and ensure that SMEs would not be impacted negatively.

- **D-S Recommendation 2.2:** Support for SME access to eGov services. Help SMEs access the structural funds that would allow them to Integrate eGov services in a simple way using country based public cloud. Incentivise member states to use local bottom up funds and to make available their public cloud to give an option to the big cloud providers.

- **D-S Recommendation 2.3: Provide interoperability between software and cloud providers.** Ensure that small companies that might use a variety of off-the-shelf cloud based solutions will be able to transfer data seamlessly between them. Promote such solutions on a European marketplace aimed for SMEs.

- **D-S Recommendation 2.4: Creation of a Cloud services marketplace.** Require that the ability for providers to list their services on such a market place would be conditional to the use of transparent and fair contract conditions. This would offer service providers with a visible presence on a platform which SMEs could use to acquire cloud solutions in full confidence.

6.3 D-S Challenge 3: How to guarantee IP protection in the cloud, allowing lower cost technology to be used with confidence.

- **D-S Recommendation 3.1:** Innovative IP/Copyright pilot projects Support projects that investigate IP / copyright issues of materials placed in the cloud.
- **D-S Recommendation 3.2:** Build SME confidence in cloud deployments Encourage high-tech SMEs to create bridges from private to public clouds using strong protection measures (encryption or other). Promote such deployments and services to the low-tech SMEs.