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P8_TA(2017)0052

European Cloud Initiative

European Parliament resolution of 16 February 2017 on the European Cloud Initiative (2016/2145(INI))

(2018/C 252/26)

The European Parliament,

- having regard to the Commission communication of 19 April 2016 entitled ‘European Cloud Initiative — Building a competitive data and knowledge economy in Europe’ (COM(2016)0178) and the accompanying Commission staff working document (SWD(2016)0106),
- having regard to the Commission communication of 6 May 2015 entitled ‘A Digital Single Market Strategy for Europe’ (COM(2015)0192) and the accompanying Commission staff working document (SWD(2015)0100),
- having regard to the Commission communication of 2 July 2014 entitled ‘Towards a thriving data-driven economy’ (COM(2014)0442),
- having regard to the Commission communication of 10 October 2012 entitled ‘A stronger European industry for growth and economic recovery’ (COM(2012)0582),
- having regard to the Commission Communication of 27 September 2012 entitled ‘Unleashing the potential of cloud computing in Europe’ (COM(2012)0529),
- having regard to the Commission communication of 15 February 2012 entitled ‘High-Performance Computing: Europe’s place in a global race’ (COM(2012)0045),
- having regard to Council conclusions of 27 May 2016 on the transition towards an Open Science system,
- having regard to Council conclusions of 29 May 2015 on open, data-intensive and networked research as a driver for faster and wider innovation,
- having regard to its resolution of 5 May 2010 on a new Digital Agenda for Europe: 2015.eu⁽¹⁾,
- having regard to Decision (EU) 2015/2240 of the European Parliament and of the Council of 25 November 2015 establishing a programme on interoperability solutions and common frameworks for European public administrations, businesses and citizens (ISA² programme) as a means for modernising the public sector⁽²⁾,
- having regard to Directive 2013/37/EU of the European Parliament and of the Council of 26 June 2013 amending Directive 2003/98/EC on the re-use of public sector information⁽³⁾ (PSI Directive),

⁽¹⁾ OJ C 81 E, 15.3.2011, p. 45.

⁽²⁾ OJ L 318, 4.12.2015, p. 1.

⁽³⁾ OJ L 175, 27.6.2013, p. 1.

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- having regard to its resolution of 10 March 2016 on ‘Towards a thriving data-driven economy’⁽¹⁾,
- having regard to its resolution of 19 January 2016 on ‘Towards a Digital Single Market Act’⁽²⁾,
- having regard to its resolution of 15 January 2014 on ‘Reindustrialising Europe to promote competitiveness and sustainability’⁽³⁾,
- having regard to its resolution of 10 December 2013 on unleashing the potential of cloud computing in Europe⁽⁴⁾,
- having regard to the opinion of the European Economic and Social Committee of 16 January 2013 on the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on ‘Unleashing the Potential of Cloud Computing in Europe’(TEN/494),
- having regard to the opinion of the European Economic and Social Committee entitled ‘European Cloud Initiative — Building a competitive data and knowledge economy in Europe’ (2016 TEN/592 EESC-2016),
- having regard to the opinion of the Committee of the Regions entitled ‘European Cloud Initiative and ICT Standardisation Priorities for the Digital Single Market 2016’ (SEDEC-VI-012),
- having regard to the Commission communication of 10 June 2016 entitled ‘A new skills agenda for Europe: Working together to strengthen human capital, employability and competitiveness’ (COM(2016)0381),
- having regard to Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)⁽⁵⁾,
- having regard to Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union⁽⁶⁾ (NIS Directive),
- having regard to the Commission’s proposal of 14 September 2016 for a Directive of the European Parliament and of the Council establishing the European Electronic Communications Code (COM(2016)0590),
- having regard to the Commission communication of 25 May 2016 entitled ‘Online Platforms and the Digital Single Market Opportunities and Challenges for Europe’ (COM(2016)0288),
- having regard to the Commission communication of 9 December 2015 entitled ‘Towards a modern, more European copyright framework’ (COM(2015)0626),
- having regard to the Commission communication of 19 April 2016 entitled ‘ICT Standardisation Priorities for the Digital Single Market’ (COM(2016)0176),

⁽¹⁾ Texts adopted P8_TA(2016)0089.

⁽²⁾ Texts adopted P8_TA(2016)0009.

⁽³⁾ OJ C 482, 23.12.2016, p. 89.

⁽⁴⁾ OJ C 468, 15.12.2016, p. 19.

⁽⁵⁾ OJ L 119, 4.5.2016, p. 1.

⁽⁶⁾ OJ L 194, 19.7.2016, p. 1.

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- having regard to the report ‘Open Innovation, Open Science, Open to the World — A vision for Europe’, published in May 2016 by the Commission’s Directorate-General for Research & Innovation (RTD),
 - having regard to Rule 52 of its Rules of Procedure,
 - having regard to the report of the Committee on Industry, Research and Energy and the opinions of the Committee on the Internal Market and Consumer Protection and the Committee on Civil Liberties, Justice and Home Affairs (A8-0006/2017),
- A. whereas the current cloud capacity available in the EU is insufficient and data produced by EU research and industry is therefore often processed elsewhere, making EU researchers and innovators move to places outside the EU, where high data and computing capacity is more immediately available;
- B. whereas the lack of a clear structure of incentives to share data, the lack of interoperability of scientific data systems and the fragmentation of scientific data infrastructures across disciplines and borders hamper the full potential of data-driven science;
- C. whereas the EU is lagging behind on the development of high-performance computing (HPC) as a result of its under-investment in establishing a complete HPC system, when countries like the USA, China, Japan and Russia are seriously investing in such systems, making them a strategic priority, with national programmes to develop them;
- D. whereas the full potential of cloud computing for Europe can only be realised when data can flow freely across the Union with clear rules, and when international data flows play an increasingly important role in the European and global economy;
- E. whereas the ability to analyse and exploit big data is changing the way scientific research is carried out;
- F. whereas the Commission communication entitled ‘European Cloud Initiative — Building a competitive data and knowledge economy in Europe’ recognises the transformative potential of open science and cloud computing as part of Europe’s digital economy;
- G. whereas access policies for networking, data storage and computing differ between Member States, creating silos and slowing down the circulation of knowledge;
- H. whereas the General Data Protection Regulation, the NIS Directive and the Digital Single Market Strategy can provide the basis for a competitive and thriving European digital economy that is open to all market players who abide by the rules;
- I. whereas data are the raw material of the digital economy, and whereas the use of data is essential for the digitisation of European science and industry, for the development of new technologies and for the creation of new jobs;
- J. whereas the recently adopted General Data Protection Regulation provides strong safeguards for personal data protection, and a harmonised approach to its implementation should be ensured;
- K. whereas the Commission’s 2015 Digital Single Market Strategy promised to tackle restrictions on the free movement of data and unjustified restrictions on the location of data for storage or processing;

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- L. whereas it is necessary for the Commission to bring forward firm proposals to remove restrictions on the free movement of data if it is to create and deliver the best possible Digital Single Market;
- M. whereas the deployment and development of cloud services are confronted with challenges, given the insufficient availability of necessary high-speed infrastructure and networks in Europe;
- N. whereas the aim to facilitate and support the implementation and long-term sustainability of the research and data infrastructures, including world-class High Performance Computing Centres and other research infrastructure networks, will, through intensified cooperation and exchange of results, help efforts to respond to the great challenges faced in science, industry and society;
- O. whereas the volume of data is growing at an unprecedented pace, with 16 trillion gigabyte of data expected to be available by 2020, corresponding to an annual growth rate of 236 % in data generation;
- P. whereas a data-driven economy depends on a wider ICT ecosystem to succeed, including an internet of things (IoT) for sourcing, high-speed broadband networks for transporting and cloud computing for processing data, as well as skilled scientists and employees;
- Q. whereas cooperation among European scientists, the use and exchange of data, always in accordance with the data protection authorities, and the use of new technological solutions, including cloud computing and digitisation of European science, are key to the development of the Digital Single Market; whereas the European Open Science Cloud (EOSC) will have positive effects on scientific development in Europe; and whereas the EOSC must be developed and used with due regard for the fundamental rights enshrined in the Charter of Fundamental Rights (CFR);

General

1. Welcomes the EOSC as a model for the use of a cloud in the private and public sectors; welcomes the Commission's plan to extend the user base to the industry and to governments as fast as possible;
2. Welcomes the Commission communication entitled 'European Cloud Initiative — Building a competitive data and knowledge economy in Europe', and believes that this is the first step in setting the proper basis for open and competitive European actions in the field of cloud computing and high-performance computing;
3. Welcomes the Commission's European Cloud Initiative as part of the implementation of the Digital Single Market (DSM) Strategy and the Digitising European Industry Package, thus fostering the growth of the European digital economy, contributing to the competitiveness of European businesses and services and enhancing global market positioning; calls on the Commission to ensure, by means of clearly defined measures, that this initiative is fit for purpose, outward-looking and future proof, and that it does not create disproportionate or unjustified barriers;
4. Underlines the importance of making the European Union a centre for global research, gaining critical mass and creating clusters of excellence; stresses that in order for the Union to attract world-leading research, both capacity in terms of resources and an attractive environment is required; highlights, furthermore, that in order for the EU to become the most competitive knowledge-based economy in the world, openness towards international researchers, thereby attracting international investments, is of utmost importance;
5. Stresses that work on standardisation in cloud computing should be accelerated; emphasises that better standards and interoperability will enable communication between different cloud-based systems and will avoid vendor lock-in effects for cloud products and services; calls on the Commission to cooperate closely with commercial cloud providers in developing open standards for this domain;

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6. Stresses that the added value of this European initiative is based on the sharing of open data and on developing a trusted, open environment for the community for storing, sharing and re-using scientific data and results;

7. Stresses that creating more awareness of the benefits of cloud computing is crucial, as demand for cloud services is still too low in Europe; points out that cloud computing will lead to economic growth as a result of its cost-efficiency and scalability; reiterates that SMEs are Europe's most important engine for jobs and growth; underlines that cloud benefits can be particularly substantive for SMEs as they frequently lack the resources to invest in extensive, on-site physical IT systems;

8. Welcomes the Open Science approach and the role it plays in building a European knowledge economy, and in further stimulating the quality of research and its development in the European Union; stresses that, at present, the value of collected research data is not being utilised in an optimal manner by the industry, especially by SMEs, owing to the lack of free cross-border data flows and of access to a single platform or portal, and notes that the Commission aims to make all scientific data produced by the Horizon 2020 programme open by default;

9. Emphasises that the EOSC should be accompanied by a comprehensive cyber-security strategy, because the scientific community has a need for a reliable data infrastructure that can be used without exposing research work to data loss, corruption or intrusion; calls on the Commission to take into account cyber-security issues from the very first stage of all its IT initiatives;

10. Urges the Commission to lead by example, and to make all research data funded by European programmes — such as Horizon 2020, the European Fund for Strategic Investments (EFSI), the European Structural and Investment Funds (ESI) and others — and its results to be open by default, based on the findable, accessible, interoperable and reusable (FAIR) principles;

11. Is concerned by the EUR 4,7 billion financing gap of the European Cloud Initiative; calls on the Commission to identify appropriate financing mechanisms for the EOSC and the European Data Infrastructure (EDI); calls, furthermore, on the Commission to provide sufficient resources for this policy area in Horizon 2020 and in its proposal for the Ninth Framework Programme;

12. Recommends the Commission to ensure that the EOSC benefits all regions of the Union, exploring the use of regional development funds for widening the initiative;

13. Highlights that, at present, only 12 % of the financing committed under EFSI goes to digital-related actions; urges the Commission to present targeted steps which could genuinely enhance the involvement of all EU funds, in particular EFSI, in DSM-related projects, including data-sharing initiatives, digital accessibility, infrastructure and Union-wide digital connectivity, and to direct more resources towards boosting European research, development and innovation, including, among other things, in the field of privacy-enhancing technologies and open-source security; believes that this initiative should be developed in synergy with other Horizon 2020 programmes, including on private cloud computing and e-government services;

14. Believes that the private sector should be involved in the user base of the EOSC from the beginning, for example through offering Software as a Service (SaaS); points out that European business is expected to contribute to closing the EUR 4,7 billion financing gap of the European Cloud Initiative; notes that it is unlikely that businesses will invest in the programme if they will be unable to reap its benefits as well;

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15. Underlines that a state-of-the-art supercomputing infrastructure is crucial for the EU's competitiveness; calls on the Commission to realise the availability of operational exascale computers in the EU by the year 2022;
16. Calls on the Commission to incentivise the participation of European SMEs and industries in the manufacturing of the hardware and software of the EDI, boosting the EU's economy and promoting sustainable growth and job creation;
17. Invites the Commission to engage with the Member States, and with other research funders, in the design and implementation of the roadmap for governance and funding, ensuring that appropriate resources are allocated to the initiative, and to facilitate the coordination of national efforts, avoiding unnecessary duplication and spending;
18. Agrees that interoperability and data portability is key to addressing grand societal challenges that require efficient data sharing and a multidisciplinary and multi-actor approach; notes that the action plan foreseen in the Commission's communication on the European Cloud Initiative (COM(2016)0178) is a necessary tool for reducing fragmentation and for ensuring the use of research data under the FAIR principle;
19. Asks the Commission to present an action plan, based on the principles of full transparency and disclosure, with clear working packages and timelines, defining the results to be achieved, the sources of financing and the stakeholders involved throughout the process;
20. Supports the EOSC as part of the European Cloud Initiative that will create a virtual environment where scientists and professionals from all regions can store, share, manage, analyse and reuse their research data, including publicly funded research data, across disciplines and borders, thus helping to remove fragmentation of the Single Market; urges the Commission to apply a comprehensive approach towards open science that is inclusive towards the open science community and independent scientists, to provide more clarity on the definitions used in the communication and, in particular, to create a clear distinction between the European Cloud Initiative and the EUSC, and in accordance with this, to update legislation to facilitate the re-use of research results;
21. Believes that the European Cloud Initiative ensures investments in the science and research sectors in order to create the incentives and tools to share and use data as widely as possible, underpinned by the building of a strong cloud and data infrastructure in the European Union;
22. Stresses that SMEs are at the heart of the EU's economy, and that more actions are needed to promote the global competitiveness of SMEs and start-ups with a view to creating the best possible environment, with high-quality data, data analytics, secure services and expected cost efficiency for the uptake of new promising technological developments;
23. Calls on the Commission to establish an economically viable basis for a European Cloud, and to take clear steps to encourage SMEs to offer competitive solutions for data processing and storage in facilities based in the Member States;
24. Recalls the positive results achieved by existing pan-European structures and the open data available in the national data storage facilities; acknowledges that there are still many barriers in the Single Market that prevent the full deployment of this initiative; calls on the Commission and the Member States to examine the potential of already available data, and to ensure a coherent strategy on open data and the reusability of this data across Member States; notes that the Commission and the Member States must explore the need for further investments in cross-border physical infrastructure, with special focus on combining HPC, high-speed broadband networks and mass-data storage facilities in order to realise a thriving European data-driven economy; calls on the Commission to analyse global industry-led and other international partnerships with regard to this matter;

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25. Notes that the uptake of cloud services among European SMEs needs to be encouraged further; notes that European Cloud providers need further coordinated support in participating in the digital world, in widening trust on the user side and in raising awareness on the benefits of adopting cloud computing;
26. Stresses that access to broadband internet for businesses and citizens is an indispensable element of a competitive data and knowledge economy in the EU; believes, in this regard, that the development of the cloud should go hand in hand with initiatives that increase access to broadband internet for businesses and citizens, especially in rural areas;
27. Notes that digital education actions across generations, including cyber skills, are critical for cloud development in order to identify and act on top technical and effectiveness skills gaps to achieve digital goals; welcomes the proposals presented within the framework of the Commission's recently adopted New Skills Agenda for Europe, and underlines the need for proper financial resources;
28. Believes that cloud start-ups are emerging with niche solutions to make cloud computing faster, easier and more reliable, flexible and secure;
29. Stresses that HPC, which is important for cloud development, should be treated as an integral part of the European Data Infrastructure across the whole ecosystem, and that the benefits should be promoted widely;
30. Notes that the involvement of academic and research institutions, and of other stakeholders, should be encouraged with a view to maintaining and supporting integrated scientific data infrastructures and HPC;
31. Notes that, with the existing services, and those which will be offered in the future by the private sector and by countries outside the EU, the EOSC needs to provide both incentives and new services to break the long-formed habit of relying on existing research practices;
32. Calls on the Commission and the Member States to ensure that there is a focus on future-oriented European growth in order to build a competitive cloud industry in the EU; emphasises the importance of ensuring that the market demand for cloud solutions continues to increase, and that cloud adoption is encouraged in vertical industries such as finance, taxation and social security, manufacturing, banking, health, media and entertainment, and agriculture;
33. Believes that the General Data Protection Regulation provides a framework for the protection of personal data; notes, however, that fragmentation in its implementation across Member States would make it more difficult for researchers to carry out their work and share their findings, which in turn would undermine efforts to establish the cooperation between researchers enabled by cloud computing; calls, therefore, for the proper implementation and enforcement of that Regulation;
34. Stresses that solutions under the European Cloud Initiative should be developed with due regard for the fundamental rights enshrined in the CFR, in particular the rights of data protection, privacy, liberty and security;
35. Notes that the data economy is still in its very early stages, that business models are still in development and that those that exist are already being disrupted and evolving; calls on the Commission to ensure that any legislation in this field will be in line with the technology-neutral 'innovation principle' and will not impose serious hurdles to innovation, the digitisation of industry or the development of new technologies such as IoT and artificial intelligence (AI) in the EU;

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36. Calls on the Commission to work with the Member States, and with all stakeholders, to participate in identifying the necessary implementing actions needed to maximise the potential offered by the European Cloud Initiative; believes that open innovation and open science involve far more actors in the innovation process, from researchers to entrepreneurs, users, governments and civil society;

The open science cloud

37. Notes the under-representation of key stakeholders in the discussions and in large-scale pilot projects; considers that, while avoiding administrative burdens, the active involvement of public and private sector stakeholders, and civic society, at local, regional, national and Union levels must be a precondition for an effective exchange of information; stresses that the European Cloud Initiative should meet the needs of and benefit not only the scientific community, but also industry, including SMEs and start-ups, public administrations and consumers;

38. Stresses that the development of the EOSC must take place with due regard for the fundamental rights enshrined in the CFR, with particular attention to the rights of data protection, privacy, liberty and security, and that it must abide by the principles of privacy by design and by default, and the principles of proportionality, necessity, data minimisation and purpose limitation; recognises that the application of additional safeguards, such as pseudonymisation, anonymisation or cryptography, including encryption, can reduce risks and enhance protection for the data subjects concerned when personal data are used in big data applications or cloud computing; recalls that anonymisation is an irreversible process, and calls on the Commission to prepare guidelines on how to anonymise data; reiterates the need for special protection for sensitive data in compliance with existing legislation; stresses that the aforementioned principles, together with high standards of quality, reliability and confidentiality, are needed to ensure consumers' confidence in the European Cloud Initiative;

39. Stresses that the Open Science Cloud Initiative should lead to a trusted cloud for all: scientists, businesses and public services;

40. Notes that there is a necessity to foster an open, trusted collaborative platform for the management, analysis, sharing, reuse and preservation of research data on which innovative services can be developed and delivered under certain terms and conditions;

41. Calls on the Commission and the Member States to explore appropriate governance and funding frameworks, taking sufficient consideration of existing initiatives, their sustainability and their ability to foster a European-wide level playing field; stresses that Member States should consider integrating their national funding programmes with EU funding programmes;

42. Calls on the Commission to analyse the full range of financial sources for establishing the EOSC and to strengthen existing instruments to ensure faster development, focusing in particular on best practices;

43. Asks the Commission to ensure that all scientific research and data produced by the Horizon 2020 programme is open by default, and asks the Member States to adapt their national research programmes accordingly;

44. Understands that the EOSC will promote digital science by mainstreaming IT as a service to the public research sector in the EU; calls for 'a science cloud federal model' that brings together public research organisations, stakeholders, SMEs, start-ups and e-infrastructures with commercial suppliers in order to build a common platform offering a range of services to the EU's research communities;

45. Calls on the Commission and the Member States, in cooperation with other stakeholders, to establish a roadmap to give as fast as possible a clear timescale for the implementation of the actions envisaged by the EOSC;

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46. Calls on the Commission to assess carefully the needs of European public researchers in order to identify possible gaps in the supply of cloud infrastructure in the EU; believes that, if gaps are identified, the Commission should invite European cloud infrastructure providers to share their development roadmaps in order to assess if private investments are sufficient to address such gaps, or if further public funding is needed to bridge them;

47. Asks the Commission to ensure that all scientific research and data produced by the Horizon 2020 programme should benefit European businesses and the public; advocates a change in the incentive structures for academics, industry and public services for sharing their data and improving data management, training, engineering skills and literacy;

48. Welcomes the fact that the Cloud Initiative focuses on building high-bandwidth networks, large-scale storage facilities, high-performance computing and a European big data ecosystem;

49. Stresses that 5G development, as well as the rules of the European Electronic Communications Code, should make the EOSC more attractive by offering a high-quality internet and new, top-quality infrastructure;

50. Approves the Commission's ambition for the Union to be capable of handling large amounts of data, with infrastructures operated by services using real-time data from sensors or applications that link data from different sources; notes that the European Cloud Initiative aims to ensure better and more harmonised work on infrastructure development;

51. Supports further development of GÉANT network with the aim of making it the most advanced international network and maintaining the EU's leadership in research;

52. Calls on the Commission and the Member States to coordinate with stakeholders in order to reduce the fragmentation of digital infrastructures by establishing a roadmap for actions and a robust governance structure involving funders, procurers and users, and stresses the need to promote the open science principles for data management and sharing without hampering innovation and without violating privacy and intellectual property in the digital age;

53. Stresses the importance of founding the European Cloud Initiative on the basis of the Connecting Europe Facility building blocks, in particular eIDs and e-signatures, with a view to reinforcing the trust of users in secure, interoperable and seamless electronic communications across the Union;

54. Calls on the Commission to direct more resources towards boosting European research, development, innovation and training in the field of cloud computing, stressing the need for infrastructure and processes that safeguard the open data and the privacy of users;

55. Insists that standards should enable easy and complete portability, and a high degree of interoperability, between cloud services;

56. Strongly believes that the Open Science Cloud initiative should rely on open standards to ensure interoperability and seamless communication, and to avoid lock-in;

57. Stresses that the use of open standards, and free and open-source software, are especially important in guaranteeing the necessary transparency about how personal and other sensitive types of data are in fact being protected;

58. Notes that the European economy is increasingly relying on the power of supercomputers to invent innovative solutions, reduce cost and decrease time to market for products and services; supports the Commission's efforts to create an exascale supercomputer system based on European hardware technology;

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59. Believes that Europe needs a complete HPC ecosystem to acquire leadership-class supercomputers, secure its HPC system supply and provide HPC services to industry and SMEs for simulation, visualisation and prototyping; considers that it is of utmost importance for the EU to rank among the top supercomputing powers in the world by 2022;

60. Believes that the European Technology Platform and the contractual Public-Private Partnership (cPPP) on HPC are crucial to defining the EU's research priorities in developing European technology in all segments of the HPC solution supply chain;

61. Welcomes the Commission's proposal, in line with the Quantum Manifesto, to launch a EUR 1 billion flagship-scale initiative in quantum technology;

62. Reminds the Commission that the cloud services industry has already invested billions of euros into building top-of-the-art infrastructure in Europe; points out that EU scientists and researchers can today use a cloud infrastructure that offers them the ability to experiment and innovate quickly by accessing a wide variety of services, only paying for what they use, thus improving time-to-science fast; notes that the EU's critical support to research and development should not be spent on duplicating existing resources, but instead on encouraging breakthrough in new scientific areas that can boost growth and competitiveness;

63. Stresses that the scientific community needs a secured, safe and open-source high-capacity infrastructure in order to advance research and to prevent potential security breaches, cyber-attacks or misuse of personal data, especially when large amounts of data are collected, stored and processed; calls on the Commission and the Member States to support and incentivise the development of the necessary technology, including cryptographic technologies, taking into account the 'security by design' approach; supports the Commission's efforts to enhance cooperation — among public authorities, European industry (including SMEs and start-ups), researchers and academia in the area of big data and cybersecurity — from the early stages of the research and innovation process in order to enable the creation of innovative and trustworthy European solutions and market opportunities, while ensuring an adequate level of security;

64. Believes that the development of clear standards for cloud interoperability, data portability and service level agreements will ensure certainty and transparency for both cloud providers and end-users;

65. Stresses that reliability, security and protection of personal data is needed for ensuring consumer confidence, such trust being a basis for healthy competitiveness;

66. Notes that industry should play a key role in developing widely accepted standards fit for the digital age, and that such standards would give cloud providers confidence to keep innovating, and users confidence to adopt cloud services further at Union level;

67. Calls on the Commission to take the lead in promoting intersectoral, cross-lingual and cross-border interoperability and cloud standards, and in supporting privacy-friendly, reliable, secure and energy-efficient cloud services as an integral part of a common strategy focusing on maximising the opportunities to develop standards that have the capacity of becoming worldwide standards;

68. Notes that an action plan on data interoperability is needed to harness the high quantity of data that European scientists produce and to improve the reusability of this data in science and industry; calls on the Commission to work with key scientific stakeholders to produce effective systems to make data — including meta-data, common specifications and data object identifiers — findable, accessible, interoperable and reusable (FAIR);

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69. Notes that the EU is failing to invest in its HPC ecosystem to the same degree as other regions of the world are doing, and that this is not in line with its economic and knowledge potential;

70. Calls on the Commission to promote interoperability, and to prevent vendor 'lock-in', by encouraging multiple cloud infrastructure providers in Europe to offer a choice of competitive, inter-operable and portable infrastructure services;

71. Calls for measures to preserve a high-quality standardisation system that can attract the best technology contributions; asks the Commission to adopt policies that remove excessive barriers in innovative sectors in order to incentivise investments in research and development, and in Union-wide standardisation;

72. Urges the Commission to maximise its efforts to avoid the possibility of vendor lock-in on the digital market from start, especially in emerging areas such as the European Cloud Initiative;

73. Acknowledges the importance of interoperability and standards in boosting competitiveness in the ICT sector; asks the Commission to identify gaps in standards in the EOSC, including as regards SMEs, start-ups and key European sectors; supports the development of market-driven, voluntary, technology-neutral, transparent, globally compatible and market-relevant standards;

74. Considers that the ISA² programme offers an opportunity to develop interoperability standards for big data management within public administrations and in their dealings with businesses and citizens;

75. Recognises that standards should respond to a demonstrated need from the industry and other stakeholders; stresses that it is essential to develop, and agree on, common high standards to ensure efficient use and sharing of data, going beyond individual disciplines, institutions and national borders; calls on the Commission to identify, where appropriate, the best certification schemes across the Member States, with a view to laying out, with the involvement of relevant stakeholders, a demand-driven, pan-European set of standards that facilitates data sharing and is based on open and global standards whenever justified; stresses that actions taken with regard to the European Cloud Initiative must ensure that the needs of the Single Market are reflected, and that it remains globally accessible and responsive to technological evolution;

76. Supports the Commission's intention to remove barriers, especially technical and legal ones, to the free movement of data and data services, to remove as well disproportionate data localisation requirements, and to promote the interoperability of data by linking the European Cloud Initiative to the Free Flow of Data Initiative; considers that, in order to achieve a digital society, the free flow of data must be regarded as the fifth freedom within the Single Market; notes that a clear legal framework, sufficient skills and resources related to the management of big data, as well as the recognition of relevant professional qualifications are prerequisites for unleashing the full potential of cloud computing; urges the Commission to engage with stakeholders, especially the industry, in identifying big data, as well as coding-related training opportunities, also in the scope of the New Skills Agenda, and to create incentives for stakeholders, in particular SMEs and start-ups, to use, open and share data in the Single Market;

77. Welcomes the Commission's proposal, in line with the Quantum Manifesto to launch a EUR 1 billion flagship-scale initiative in quantum technology; stresses, however, that in order to accelerate their development and bring commercial products to public and private users, transparent and open stakeholder consultation is crucial;

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Sharing open data, sharing research data

78. Welcomes the fact that the development of the EOSC will allow researchers and science professionals a place to store, share, use and re-use data, and can set the foundation for data-driven innovation in the EU; stresses that the benefits of data sharing have been widely recognised;

79. Notes that data has become essential for decision making at the local, national and global level; notes that sharing data has also important benefits for local and regional authorities, and that opening up government data enhances democracy and provides new business opportunities;

80. Supports the Commission's efforts, together with those of European industry researchers and academia, to develop the Big Data Value Public-Private Partnership (PPP), in synergy with the cPPP on HPC that enhances community building around data and HPC and sets the grounds for a thriving data-driven economy in the EU; supports the cybersecurity PPP that fosters cooperation between public and private actors at early stages of the research and innovation process in order to access innovative and trustworthy European solutions;

81. Stresses that the Commission should liaise closely, and as early as possible, with industry partners, especially SMEs and start-ups, in order to guarantee that business and industry requirements are addressed and integrated adequately in the later stage of the initiative;

82. Encourages public administrations to consider safe, reliable and secure cloud services by providing a clear legal framework and by working further to develop cloud-specific certifications schemes; notes that business and consumers need to feel confident in adopting new technologies;

83. Believes that public administrations should have open access to government public data by default; call for progress to be made in determining the degree and pace of releasing information as open data, in identifying key datasets to be made available and in promoting the re-use of open data in an open form;

84. Notes that the staggering growth in digital technologies is the key driver for generation of massive raw data streams in cloud environments, and that this huge collection of raw data streams in big data systems increases computational complexity and resource consumption in cloud-enabled data mining systems; notes further that the concept of pattern-based data sharing enables local data processing near the data sources and transforms the raw data streams into actionable knowledge patterns; points out that these knowledge patterns have dual utility of availability of local knowledge patterns for immediate actions as well as for participatory data sharing in cloud environments;

85. Endorses the May 2016 Council conclusions on the transition towards an open science system, in particular the conclusion that the underlying principle for the optimal reuse of research data should be 'as open as possible, as closed as necessary';

Text and data mining

86. Stresses that full availability of public data within the EOSC will not be sufficient to remove all barriers to data-based research;

87. Notes that the initiative needs to be complemented by a modern copyright framework that should allow for the removal of fragmentation and lack of interoperability from the European data research process;

88. Believes that the initiative should preserve the balance between the rights of researchers and those of rights holders and other actors in the scientific sphere, with full respect ensured for the rights of authors and publishers, while at the same time supporting innovative research in Europe;

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89. Believes that research data can be shared within the EOSC without prejudice to copyright owned by researchers or research institutions, by establishing licensing models where necessary; believes that best practices in this regard are being established within the Horizon 2020 Open Research Data pilot;

90. Believes that the Database Directive 96/9/EC, which needs to be reviewed, limits the use of data without evidence of creating added economic or scientific value;

Data protection, fundamental rights and data security

91. Urges the Commission to take action to promote the further harmonisation of laws in the Member States in order to avoid jurisdictional confusion and fragmentation, and to ensure transparency in the digital single market;

92. Believes that the European Union is leading the way in privacy protection, and advocates a high level of data protection worldwide;

93. Stresses that a coordinated approach is needed to be taken by data protection authorities, policy makers and industry, to the benefit of organisations in this transition by providing compliance toolkits and uniform interpretation and application of obligations, and by raising awareness about the key issues for citizens and the business;

94. Stresses that the EU is a global importer and exporter of digital services, and that it requires a strong cloud computing and data economy to be competitive; calls on the Commission to take a lead in striving towards the creation of uniform, globally accepted standards of personal data protection;

95. Believes that global data flows are vital to international trade and economic growth, and that the Commission's initiative on the free flow of data should enable companies operating in Europe — and in particular in the growing cloud computing sector — to be in the forefront of the global innovation race; stresses that the initiative should also aim to lift any arbitrary restrictions on where companies should locate infrastructure or store data, as such restrictions would hamper the development of Europe's economy;

96. Believes that current EU data protection legislation, in particular the recently adopted the General Data Protection Regulation and the Data Protection in Law Enforcement Directive (Directive (EU) 2016/680)⁽¹⁾, provides strong safeguards for the protection of personal data, including those collected, aggregated and pseudonymised for scientific research purposes and sensitive data related to health, together with specific conditions regarding their publication and disclosure, data subjects' right to object to further processing, and rules on access for law enforcement authorities in the context of criminal investigations; calls on the Commission to take these safeguards into account for the development of the EOSC and the implementation of rules governing access to data stored therein; recognises that a harmonised approach to the implementation of the General Data Protection Regulation, including guidelines, compliance toolkits and awareness-raising campaigns for citizens, researchers and businesses, is crucial, especially for the development of the EOSC and the facilitation of research cooperation, including by high-performance computing;

97. Believes that the free flow of data is beneficial to the digital economy and the development of science and research; emphasises that the Commission's initiative on the free flow of data should enable the growing European cloud computing sector to be in the forefront of the global innovation race, including for science and innovation purposes; recalls that any transfer of personal data to the cloud infrastructures or other recipients located outside the Union should respect the rules for transfers foreseen in the General Data Protection Regulation, and that the Commission initiative on the free flow of data should be in compliance with these provisions; stresses that the initiative should also aim to reduce restrictions as to where companies should place infrastructure or store data, as these would hamper the development of Europe's economy and

⁽¹⁾ OJ L 119, 4.5.2016, p. 89.

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prevent scientists from reaping the full benefits of data-driven science, while maintaining restrictions in compliance with the data protection legislation to prevent possible future abuses regarding the EOSC;

98. Strongly believes that the Union should be at the forefront as regards the security and protection of personal data, including sensitive data, and should advocate a high level of data protection and data security worldwide; believes that the EU data protection framework, together with an inclusive cybersecurity strategy that will ensure reliable data infrastructures which are protected against data loss, intrusion or attacks, could form a competitive advantage for European companies regarding privacy; urges the Commission to ensure that the EOSC will preserve scientific independence and objectivity of research, as well as protect the work of the scientific community within the Union;

99. Calls on the Commission to ensure that concerns with regard to fundamental rights, privacy, data protection, intellectual property rights and sensitive information are dealt with in strict compliance with the General Data Protection Regulation and the Data Protection Directive (95/46/EC); stresses that security threats to cloud infrastructure have become more international, diffuse and complex, are hampering its more intensive use, and do require European cooperation; urges the Commission and the Member States' national authorities, in consultation with the European Union Agency for Network and Information Security (ENISA), to cooperate in establishing a safe and trustworthy digital infrastructure and to build up high levels of cybersecurity in compliance with the NIS Directive;

100. Calls on the Commission to ensure that this initiative is fit for purpose, outward looking, future proof and technologically neutral, and highlights the fact that the Commission and the Member States must take their lead from the market and from the cloud computing industry itself in order to meet the current and future demands of the sector in the best way, and to drive innovation in cloud based technologies;

101. Notes the potential of big data for prompting technological innovation and building the knowledge based economy; notes that reducing obstacles to knowledge-sharing will boost the competitiveness of businesses while also benefiting local and regional authorities; highlights the importance of facilitating data portability;

102. Calls on the Commission and the Member States to work with industry-led standard-setting initiatives to ensure that the single market remains accessible to third countries and responsive to technological evolution, avoiding barriers which will hinder innovation and competitiveness in Europe; notes that standard-setting in relation to data security and privacy is closely related to the question of jurisdiction, and that national authorities have a key role to play;

103. Stresses that consideration must be paid to existing initiatives to avoid duplication that could hinder openness, competition and growth, and that market-driven, pan-European standards for data sharing must be in line with international standards;

104. Emphasises the need to find a balance between legitimate data protection concerns and the necessity to secure an untapped 'free flow of data'; calls on the need for existing data protection rules to be respected in an open big data market;

105. Supports the proposal to make open research data the default option for new Horizon 2020 projects, as publicly funded research data are a public good, produced in the public interest and should be made openly available, with as few restrictions as possible and in a timely and responsible manner;

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106. Notes that the European Cloud Initiative focuses on potentially sensitive sectors of R&D and government e-portals; reiterates that cyber security for cloud services is best dealt with under the framework of the NIS Directive;

107. Notes the importance of facilitating the interoperability of different equipment within networks, providing assurance of security and promoting component supply chains, all of which are important for the commercialisation of the technology;

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108. Instructs its President to forward this resolution to the Council and the Commission.
