EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR COMMUNICATIONS NETWORKS, CONTENT AND TECHNOLOGY

CNECT/C – Digital Excellence and Science Infrastructure
CNECT/C/01 – eInfrastructure and Science Cloud

GENERAL PROJECT REVIEW CONSOLIDATED REPORT

Grant agreement (GA) number:	777536
Project[1] Acronym:	EOSC-hub
Project title:	Integrating and managing services for the European Open Science Cloud
Type of action:	RIA
Start date of the project:	01/01/2018
Duration of the project:	36
Name of primary coordinator contact and organisation:	Yannick LEGRE (EGI Foundation)
Period covered by the report:	from 01/01/2018 to 11/11/2019
Periodic report/Reporting period number:	Assessment not linked to the end of a reporting period
Date of first submission of the periodic report (if applicable):	Not applicable
Amendments (latest AMD concerning description of the action)[2]	13/02/2019 (AMD-777536-42)
Date of meeting with consortium (if applicable):	08/10/2019 - 09/10/2019
Name of project officer:	Christos CHATZIMICHAIL
Name(s) of monitors:	– Totka CHERNAEVA • Ministry of Transport, Information Technologies and Communications – Emanuela SIRTORI • CSIL Centre for Industrial Studies • Innovation and Networks Executive Agency (INEA) • CSIL and University of Milan – Oscar CORCHO GARCIA • LocaliData • Universidad Politécnica de Madrid • Intelligent Software Components – WILLIAM JOHN WOMERSLEY • Science and Technology Facilities Council

[1] 'Project' means the same thing as 'action'.
[2] Only amendments to the description of the action (DoA; AT21) are relevant for general project reviews since they always have to be carried out against the latest version of the DoA

1. Overall assessment

1. Overall assessment
Project has achieved most of its objectives and milestones for the period with relatively minor deviations.
2. Significant results linked to dissemination, exploitation and impact potential
Project will likely provide results with significant immediate or potential impact in the next reporting period (even if not all objectives mentioned in the Annex 1 to the GA were achieved). The project has identified 9 key exploitable results (KERs), i.e. outputs which can be taken up, exploited and reused to support the future mature EOSC. During the progress review, an account was given as to the contribution of individual WPs to these KER. They are: 1. The EOSC Portal and Marketplace: it is the most tangible and visible result of the project. A prototype has been developed and is currently being improved. 2. Service Management System: comprehensive, coherent and standards-based set of procedures and processes to manage the complete life cycle of services in a complex environment. 3. Internal services in the Hub Portfolio: set of service interfaces providing basic enabling services for EOSC access. 4. Business and sustainability models to achieve compatibility of business and sustainability models of traditional and emerging EOSC stakeholder groups. 5. Services in the EOSC service portfolio: an open and integrated service catalogue covering different scientific fields were developed in WP6 and WP7, according to a model that combines a federated core and a service portfolio with common rules of participation. Currently, the service portfolio incorporates 86 services (76 researcher facing services and 10 internal services in the Hub Portfolio) plus many more in the process of onboarding. These services come from both project partners and research communities and external actors that registered their services through the Service Providers onboarding process (via the EOSC Portal). 6. Rules of participation the services to provide to onboard services into and make them discoverable and accessible through the EOSC Service Catalogue and Marketplace (including rules for policy integration, security policies, data sharing policies) (WP2). 7. Interoperability and integration guidelines aimed to remove fragmentation of RI service provisioning and allow technical integration of solutions to EOSC system (WP10). 8. Digital Innovation Hub, with 6 initial business pilots already supported. 9. Training courses and materials: Tools, consulting models and material that make it possible to provide training services tailored to optimally fit the needs of the diverse audience EOSC needs to reach. The progress review has shown that the project is on track to deliver these results. The key elements of the Hub, such as the EOSC service portfolio and service catalogue, the EOSC-Hub Marketplace, the EOSC Digital Innovation Hub and the Competence Centres are in a state assuring that in the next project period they will be directly exploitable. The service portfolio management process, in particular, the extended service description template, the services categorisation which is agreed with eInfraCentral, the already operational initial onboarding procedure, and practical rules of participation are well designed. The distinction between common and thematic services and the different levels of integration and engagement is logical, simple, and well described, and gives order and structure to a very complex landscape of services and needs/interests for federation. The project activities have already contributed to its expected impact, in terms of: • increased ability of national, regional and pan-European researchers to discover and access services and resources in different scientific disciplines; • increased interoperability and interconnection between the existing and new research digital infrastructures across Europe, by providing a thematic service catalogue for data exploitation, and a single sign-on, integrated access and order management system; • support to open science, by providing services to share and discover all types of research artefacts (publications, datasets, software, metadata, workflows, etc.) and their data sources (repositories, archives).
3. General comments
Good progress has been achieved in the development of the service architecture, operability and interoperability. There is a positive trend in the number of services onboarded and orders placed. Most of the technical work has been done in professional manner, with a service-oriented view. These activities are extremely important and challenging. Even if more work is needed to further develop the EOSC Portal and make it more user-friendly, the technical background architecture is there and this is already an important achievement of this project in the first implementation period. The EOSC portal is currently in a prototype stage and is undergoing further development to make it more attractive. The

dissemination efforts to promote the launch of the EOSC portal have been very significant and very successful. A wide set of materials (documents, presentation, videos) has been made available by the projects beyond the web site itself.

The project is contributing to the state of the art especially in terms of the integration of different services, and from a technical perspective by proposing interoperability specifications so that different services can be integrated easily into the architecture and framework. It is also contributing to ensuring better science in the supported research communities. The project has not yet had a strong impact on society, partially because of the complexity of the problems that are being tackled, which requires a lot of prior work. However, such impact is expected during the second period.

IPR management is adequately handled, with a detailed analysis of all the items subject to protection and the usage of adequate means to ensure IP protection in all cases, while ensuring open access and usage to as many results as possible with appropriate licenses.
The initial DoA was amended twice so far, and a third amendment is forthcoming in order to allocate some of the reserve budget to the Early Adopter Programme.

Some delays have occurred during the first project period. They were due to different reasons, from the late onboarding of all project participants, to the EC request to develop a prototype of the Portal by November 2018, to the extensive consultation and interaction process with other projects and stakeholders from the scientific communities and the EOSC ecosystem. These delays have been sufficiently explained. The project is huge, with 100 partners (linked third parties included) and over 150 staff working on it, and it is heavy to "move". The need to collaborate with other projects makes it even heavier. The capacity of the project management to coordinate and steer the activities is remarkable. Management is proceeding smoothly and in accordance with the principles of sound financial management.
In the first project period, the project spent 63% of resources for service integration, management and delivery (WP4,5,6,7,10,13), 22% for service adoption (WP8,9,11,13), 8% in service planning (WP2, 3, 12) and 7& for project administration, coordination and quality management (WP1). Service planning and adoption are behind schedule due to the late start of the project. Overall, the use of resources is coherent with the efforts made and results already achieved.

The project is now quite on track and no major delays are expected in the second period. However, it is acknowledged that the project still faces significant risks (especially the successful and "complete" onboarding of community-oriented services and the definition of the EOSC federating model and value proposition), which cannot be fully mitigated by the project itself (see below more on this).
The recommendations for the first informal review have been taken into account, in general, by the consortium, with a special mention to the increase in the collaboration with other ongoing initiatives and projects.

Most of the deliverables are accepted, except for some reports for which minor revisions are suggested (see Annex 1).

4. Recommendations concerning the period covered by the report

No major recommendations or corrective actions are suggested for the first project period. All resources are proposed to be accepted.
All deliverables are accepted with the exception of the following ones, for which some revisions are asked:
• D1.5 Data Management Plan
• D1.6 Data Management Plan (v.2)
• D5.2 First release of federation and collaboration services and tools
• D5.3 First Report on maintenance and integration of federation and collaboration services
• D6.1 First release of common services software
• D8.1 Report on progress, achievements and plans of the Competence Centres
• D10.4 EOSC Hub Technical Architecture and standards roadmap v2

Annex 1 provides more details on the improvements suggested for each of those deliverables. The revised deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
In some cases, even if the deliverable is accepted, suggestions are provided to improve the quality of the next versions to be submitted during the second project period (see again Annex 1 and Recommendation 6 below).

It was noted that some of the deliverables have been submitted with a few month delays. While the reviewers do not consider such delay very critical now, it is important that the delays do not accumulate. Some of the deliverables were submitted for review in the very last moment. More timely submission of deliverables is recommended (see also Recommendation 5 below).

5. Recommendations concerning future work, if applicable

Recommendation 1: Maintain strong focus on the development of an operational and user-friendly EOSC Portal
The project should keep a high focus on the Portal development, on service integration, backend and frontend services. An attractive and functioning Portal, that can be acknowledged as a best practice by more and more communities, would

help EOSC-hub to increase acceptance on the Portal itself and the EOSC. The following specific recommendations are put forward:
• Rec. 1.1: It is recommended to continue working to make sure that the Portal looks like a single Portal instead of two different frontends (Portal and Marketplace). For that purpose, the material from the Marketplace should be adequately integrated into the service catalogue.
• Rec. 1.2: It is recommended to run a good number of workshops and training activities, so as to get requirements for the Portal, co-design it with other interested parties, and improve the user experience with the Portal. More information on the feedbacks collected and if/how they were taken into account in the development of the Portal should be provided during the next review meeting.
• Rec. 1.3: It is advised to expose dashboards or statistics about the services involved in running the Portal, the computing resources, number of CPU hours involved in experiments, etc.; that is, all the relevant material that allows showing more clearly all the "work behind the scenes" to provide support to researchers and research communities.
• Rec. 1.4: The Portal should include a set of training material focused on EOSC use, distinguishing between different audiences, as a minimum, users vs. service providers (see also Recommendation 3).
• Rec. 1.5: The project should establish smooth collaboration with EOSC-enhanced project (INFRAEOSC-06-2019-2020) since its start.
• Rec. 1.6: The project should start making an effort towards rebranding most of the services (or at least the main building blocks identified in the architecture and implemented in the project) with the EOSC brand, so as to show an appropriate level of integration. If external complementary actions and decisions are needed, the project should bring the issue at the attention of the relevant stakeholders and decision-makers (see also Recommendation 4).

Recommendation 2: Increase service integration
The project needs to work to expand the service offerings beyond the HPC/cloud computing provision, which still seems the core product. More specifically:
• Rec. 2.1: Some work was done to engage with ESFRI clusters projects and connect with their communities, but this has not yet translated in the use of services through the Portal. While the Cluster projects have just started, EOSC-Hub should keep interacting with them in order to stimulate them to use the Portal in the next period, as the project implementation progresses.
• Rec. 2.2: Scientific Competence Centres are recommended to be brought into the Marketplace. Even if the DoA does not expect the Competence Centres to become EOSC service providers, in the effort of engaging more user communities and keep expanding the Marketplace, the project should actively promote their integration into the Portal.
• Rec. 2.3: There are still some data-intensive science user communities (e.g. medical research) that are not yet represented in EOSC. This may limit the usability of the services in the future for those communities. Continuous efforts should be done to engage other communities, at least by targeting them with communication and training activities or asking feedbacks on the Portal.

Recommendation 3: Adjust the training strategy to make it more focused
A clearer and more focused training strategy, target and goal of training are needed to prioritise actions. The training catalogue and materials should be enhanced with clear routes that should be used by interested scientists/communities when trying to understand how to use EOSC, as well as for service providers to be able to provide services in EOSC.

Recommendation 4: Ensure fluid and open communication with the European Commission
• Rec. 4.1: Considering the project is facing significant risks coming from a crowded external environment with still limited consensus on the EOSC federating model, branding and the Portal's value proposition, the project coordinator should promptly bring to the Commission's attention any significant communication problems with the EOSC Governance and working groups. At the same time, the project is advised to continue contributing to the EOSC Working Groups and try to create strong links with the EOSC Governance stakeholders. The project is invited to make specific proposals on how communication and exchange of information could possibly be improved, in the view of increasing the project impact.
• Rec. 4.2: The Portal metrics should be kept monitored on an ongoing basis and a periodic report should be sent to the EC. This report should contain info on services and providers (number of offered services and providers, how many the orderable services through the Marketplace are, requests for new services, service orders country distribution, service orders' fields, new communities involved) and views/visitors (number of visitors of Portal and Marketplace, visitors country distribution, page views plus unique page views of Marketplace/Catalogue, number of unique users making an order). The frequency of this reporting should be agreed with the EC. It would be advisable to create a dashboard to enable the automated extraction of this information.
• Rec. 4.3: It is recommended to send to the EC, once by December 2019 and once in December 2020, the average number of users per month for each provider (users of service in general, not through EOSC), in order to assess if EOSC has a positive effect on the usage of already on-boarded services through the traditional e-Infrastructure channels.

Recommendation 5: More timely deliveries

• Rec. 5.1: The project should make more efforts to ensure the timely submission of deliverables in the next project period. This includes the progress report, which should be made available, for further reviews, in advance to reviewers, to facilitate the understanding of the actions taken in each WP.
• Rec. 5.2: After the EOSC symposium, the project coordinator should submit to the European Commission a brief report to summarise the progress made on the Portal and the outcome of the discussion about the training materials and activities.
• Rec. 5.3: The third amendment should be submitted as soon as possible in order to have sufficient time to implement the new activities in the next project period.

Recommendation 6: Improve the quality of some deliverables
Even if most of the deliverables of the first project period are accepted, the project implementers are invited to take into account the comments by the reviewers in the deliverables for which a next version is foreseen. More detailed comments and suggestions are provided in Annex 1.

2. Objectives and workplan

1. Is the progress reported in line with objectives and work plan as specified in the DoA? If there are significant deviations, please comment.	Yes

EOSC-Hub made a good contribution towards the delivery of its key exploitable results and to the achievement of all objectives in the DoA. Respectively:
• The EOSC Service Portfolio contributes to Objective 1 'Simplify access to a broad portfolio of products, resources and service provided by the major pan-European and international organisations through an open and integrated service catalogue' and to Objective 3 'Consolidate e-Infrastructures by expanding capacity and capabilities and improving service quality'.
• The Hub contributes to Objective 2 'Remove fragmentation of service provisioning and access to high-quality digital services in Europe and beyond through the technical integration and adoption of standards for interoperability of computing, storage, data and software platforms'.
• The Digital Innovation Hub and the Competence Centers contribute to Objective 4 'Widen the access to services to all user groups including researchers, high-education, business organizations and expand the user base' and to Objective 6 'Increase innovation capacity of Research e-Infrastructures'.
• The service integration, training and training resources, documentation and best practices contribute to the achievement of Objective 5 'Provide a knowledge hub'.

The project is generally progressing according to the DoA, even if some deviations from the work plan were observed (resource usage, deliverables and milestones timing). There is good interaction between WPs (especially between technical WPs and user-focused WPs). The level of integration is quite high.

WP1 - Good progress on the management of the project, quality assurance and risk management. The management has run smoothly, even if it is the case that this is a complex project because of the number of partners involved. However, many deliverables have been submitted late.

WP2 - This WP is concerned with the overall policy, business and service strategy of the project. The strategic part of this WP has been addressed adequately, identifying clearly the overall context in which EOSC-Hub is operating, and the current situation, together with the next steps. It is good to see that some of the documents from EOSC-Hub have been used as inspiring sources for the EOSC working groups. The Final EOSC-hub strategy plan (D2.2) is a key deliverable. It recommends 15 strategic actions that will contribute to the facilitation of developing sustainable EOSC beyond 2020, which respond to the expectations of various stakeholders.

WP3 – The stakeholder and innovation management plans have been delivered with sufficient quality. The interim report on dissemination and exploitation is less detailed and should be improved in its final version to provide better details of all the dissemination activities that have been carried out over the project execution. EOSC-hub has actively engaged with the consortia of the projects that were awarded by the EC in the call INFRAEOSC-04-2018, targeted at Connecting ESFRI infrastructures through Cluster projects. However, this has not been yet translated in the use of service through the Portal.

WP4 – The policies and procedures for running the production infrastructure are well developed and very professional, showing a good degree of understanding of how this type of work needs to be done in a production infrastructure. The approach for onboarding services has been also clearly presented and explained.

WP5 - The objective of this WP is to maintain the federation and collaboration services and tools according to a maintenance plan, and ensure that they evolve according to the developing requirements. As such, this WP has achieved its objectives for the reporting period. Further integration of the federation services with common (WP6) and thematic services (WP7) will be fostered during the project lifetime. The main deviation in the first year was the unplanned significant amount of efforts by the Marketplace team requested for the preparation of the EOSC portal in the second half of 2018.

WP6 and WP7 – These WPs have focused on the release and deployment of common and thematic services. This has been done following a good technical approach, that shows a good understanding of the underlying technology and of the challenges to be handled, and tackling needed integrations. The reviewers appreciate the increasing emphasis placed on community requirements regarding service evolution.

WP8 – The network of competence centres has been created and has provided sufficient support for all the communities that it is addressing. Only one severe delay has happened with LifeWatch, which is now being amended and which is getting up to speed, and minor delays in others (e.g., Astronomy), which have not affected overall the progress in this WP and in the project.

WP9 – The work on supporting the initially selected business pilots, as well as the creation of the EOSC Digital

Innovation Hub, are commendable. The structure and organisation of the DIH are well thought and it is starting to provide interesting results that can serve to attract others.

WP10 - This work package has a fundamental role in describing the technical specifications and APIs that can be used in order to integrate with EOSC-hub services (generic, common, etc.). This WP has suffered from some delays, especially in relation to the deliverable that should describe in detail the technical architecture (D10.1, was due in M12 and was submitted in M21).). The Periodic Report explains that "it has been agreed to give priority on defining a generic framework to work on EOSC interoperability and integration guidelines" (D10.3 and D10.4), since it was considered preliminary to define the technical roadmap. However, the reviewers are not convinced that this delay was really justifiable.

WP11 – The WP has a good methodology for planning the development of training materials, as well as their delivery, with very clear guidelines on how to do it and for all the logistics associated to them. The training events that have been run are adequate and at the right level. However, the current training catalogue of materials is not well structured and requires further improvements in the future to make it really usable and used by third parties and meet the requirements of EOSC.

WP12 – The market analysis is of good quality. The conducted demand-side market research (D12.1) provides a realistic understanding of the level of demand for digital services for research, and the manner in which such needs and demand are currently satisfied. The content of the interviews may be made available as data managed by the project, and properly handled in the DMP.

WP13 – The reported measures for KPIs show a good understanding of how to measure the different services, and show the usage of the infrastructure. The results of the analysis of the impact of the Virtual Access to the EOSC-hub services shows substantial growth of the key common metrics and confirms that the Virtual Access mechanism is very effective for wide opening the access to EOSC services outside their usual user base.

2. Are the objectives of the project still scientifically and /or technologically relevant?	Yes

The European approach to developing open science by leveraging the digital revolution is unique in the world. This approach will be a unique enabler of research breakthroughs in all domains. Also, it will facilitate the launch of interdisciplinary initiatives. The objectives of EOSC-Hub are more relevant today than when the project started, given the adoption of the Implementation Roadmap for the European Science Cloud, the launch of the EOSC Portal and the set-up of the EOSC Governance. EOSC-Hub is a key contributor to make open science and the EOSC a reality in the future by providing the EOSC architecture, services, access and interfaces, guidelines, rules and governance.

The time and resources available to the project are adequate for its objectives to be achieved and even exceeded, provided that the collaboration with other European projects are properly leveraged and mechanisms are put place by the European Commission and EOSC Governance to secure a more prominent influencing role for EOSC-Hub in the development of EOSC.

3. Are the critical implementation risks and mitigation actions described in the DoA still relevant?	Yes

The Quality and Risk Management Plan D1.1 and its update D1.2 define the quality and risk management process for the EOSC-Hub project which includes conducting risk management planning, identification, analysis, response planning and control. Every 6 months project risks were reviewed as well as new risks were identified with all WP leader. All risks are collected in wiki.eosc-hub.eu with access restriction to project members.

With respect to the risks identified in the DoA, the progress shown in the first period indicates that the risk of lack of expertise within the project for maintaining services in the catalogue and the risk of inability to demonstrate the value of the Joint Digital Innovation Hub are now less critical than when the project started. In contrast, the project still faces at least three fundamental and intrinsic risks:
- The acceptance of the open data paradigm within European science communities;
- The successful and "complete" onboarding of community-oriented services;
- The successful agreements on the provisioning of resources to the EOSC by the national e-infrastructure systems.

In order for EOSC to be successful and the above risks to be properly managed, the engagement of Member States and agreement about EOSC and its value propositions are critical. EOSC will federate services that have been made available by the Member States in the past and will continue to be provided by Member States in the future. For the federation to add value, there will be a need for good cooperation between very different organizations. Those risks are well addressed by the project through the delivery and the operation of the EOSC Portal supported by the dissemination efforts, but they continue to exist.
The project acknowledges that these are important risks for the success of EOSC-Hub and, most importantly, its future

sustainability. In this respect, the Final EOSC-Hub Strategy Plan (D2.2) highlights the need for complementary action by the European Commission and the EOSC Working Groups.	
4. Have the pilots/case studies started to showcase innovative results as described in the DoA?	Yes
Different use cases have been already developed by the project and disseminated in different events. They include use cases and pilots of commercial services integration into the EOSC (Digital Innovation Hub). The success stories are very promising and they show that real added value is generated. The Digital Innovation Hub pilot studies up to now have focused mainly on making HPC compute cycles available to small businesses. While this is useful, the next round of calls should focus on connecting businesses to a broader offering of EOSC data and services.	
5. Have the ethics deliverables due for the current period been adequately addressed and approved?	Not applicable
The project has no ethics deliverables.	
6. Have the comments and recommendations from previous project reviews been taken into account?	Yes
The project coordinator has provided detailed information as to how the previous comments and recommendations of the expert board were taken into account. In general, the project made an effort to address all the recommendations. More specifically: • The project has made progress with its work plan by continuing engaging scientific communities and expanding the catalogue of service. More support has been given to implement the Early Adopter Programme in order to meet the needs of research communities with complex digital requirements. Commercial partners are also supported through the Digital Innovation Hub. The project has understood and taken on board the suggestion to keep the EOSC ecosystem in mind when prioritising the activities, by adopting a demand-oriented approach and interacting with all the relevant stakeholders. • The project has continued to interact with other projects and engaged in more active collaboration with FREYA to address the need for a standardised system in the use of persistent identifiers and with eInfraCentral to integrate the catalogue in the EOSC Portal (ongoing). • The EOSC-Hub and OpenAIRE-Advance Collaboration agreement was not revised, but the “EOSC Portal Collaboration Agreement” is being drafted, involving also eInfraCentral project. • A single open repository assembling all the specifications of the system (past, present and future) that support and define the EOSC federated architecture share them with the EOSC community for public comments has been set up. • The project was recommended to take a stronger steering role in future EOSC development. Some steps were taken in that direction, such as through participation in the EOSC Architecture Working Group and the drafting of the “EOSC Portal Concept 2.0” paper. Whether the project has succeeded in taking a real steering role, as it was advocated, is questioned. The evolving EOSC ecosystem, the lack of clarity and agreement in the scientific communities regarding what EOSC is and the Portal’s value proposition, the participation of EOSC-Hub in the EOSC ARCH Working Group only and the lack of direct involvement in the EOSC Governance, are external factors limiting project’s ability to influence the EOSC development.	

3. Impact

1. Does the work carried out contribute to the expected impacts detailed in the DoA?	Yes
The activities carried out by the projects are contributing to the expected impact, detailed in the DoA and to the EOSC implementation roadmap, of reducing the fragmentation of the IT facilities, services and tools for data-intensive research and innovation in Europe. During the first project period, significant progress was made to improve the components for an integrated service hub (software and services), develop the technical specifications for an open ecosystem, develop policies and procedures for service management, FAIR data management and security, carry out training and dissemination activities and draft technical and service roadmaps, identifying new organisational principles and business models for research sustainability.	
2. Does the work carried out follow the plan detailed in the DoA to enhance innovation capacity, create new markets opportunities, strengthen competitiveness and growth of companies, address issues related to climate change or the environment, address industrial and/or societal needs at regional level or bring other important benefits for society? Give information on the relevant innovation activities carried out (prototypes, testing activities, standards, clinical trials) and/or new product, service, reference materials, process or method (to be) launched to the market, if any.	Yes
The project has the potential to provide new tools for research in all domains and to enhance the quality of science that can be done in Europe. It also opens the possibility to engage in new interdisciplinary projects. The project directly contributes to the enhancement of SME innovation capacity and the creation of new market opportunities through the activities of the Digital Innovation Hub (WP9). Six pilots with SMEs have been kick-started and integrated with EOSC-hub services and now have been finalising their technical solutions, starting to use more intensively the EOSC-hub. The project also addresses issues in the domains of environmental sciences through the Competence Centres and the development of thematic services (WP 8), although their integration into the EOSC could be further expanded.	
3. Does the work carried out contribute towards European policy objectives and strategies and have an impact on policy making?	Yes
The work carried out is essential as a contribution to the European policy objectives and strategies. In order to face its challenges in all areas, Europe needs strong research communities. EOSC is bringing new assets for the European research results to be even more competitive. EOSC-Hub supports Open Science by providing services to share and discover research artefacts (publications, datasets, software, workflows etc.), research artefacts data sources (publication repositories, publishers, data archives, software archives, etc.). Furthermore, the project is creating and promoting harmonised policies for EOSC (data sharing policies, AUP, security policies).	
4. Does (or will) the work carried out have an impact on SMEs?	Yes
The Digital Innovation Hub initiative is aimed to reach out to SMEs and stimulate an ecosystem of industry/SMEs, service providers and researchers to support business pilots, market take-up and commercial boost strategies. The activities are progressing well. Six business pilot have been already carried out. The project participants are confident to be able to identify and support six new business pilots in the next months. The project has recently on-boarded two more pilots and aims to get more. Many requests are coming in, although not all the project ideas are relevant. Support activities include coaching for the commercialisation of the new services is provided, and marketing and dissemination activities.	
5. Have the beneficiaries reached gender balance at all levels of personnel assigned to the action? If not, have the reasons been explained in the periodic report?	Partially
During the progress review, no information on general balance has been provided. According to the data collected during the informal review meeting (January 2019), out of 368 people involved in the project, 100 are female (around 27%). The project has women in different coordinating roles, both at the level of the whole project and individual work packages. Overall the level of gender balance is adequate. More information on this aspect in the next review meeting would be welcome.	

4. Implementation

1. Has the project been efficiently and effectively managed?	Yes
Considering the size of the project and the complexity of the project activities, the project has been managed well and in a professional way. The use of resources has been effective and efficient. There have been delays associated with some deliveries, due to a longer than expected ramp-up phase and to the need, in many cases, to contact external communities to validate some of the results. Now the project's activities seem to be proceeding quite smoothly.	
2. Is the management of the project in line with the obligations of beneficiaries (including ethics and security requirements, risk and innovation management if applicable)?	Yes
No problems have been identified at this stage.	
3. Is the contribution of each beneficiary in line with the work committed in the DoA? (applicable only to multibeneficiary projects)	Partially
Overall, 72% of the partners have used 27% of the resources, while 28% of the partners have used 73% of the resources. While a lineal effort was foreseen in the DoA, in fact, the use of resources had been more scattered across the partners and followed a non-linear function. Different partners have started their activities later than what initially scheduled, because of a long time (7 months) needed to sign the consortium agreement with all the participants. Five partners have encountered more severe staffing issues which were solved by hiring contractors (EGI) or reshuffling resources between partners (SURFsara to JISC and GRNET). Five partners will be reclaimed the unused effort (~15.5 PMs in total). Detailed information is included in the progress report. The explanations provided by the project coordinator about the deviations occurred are sufficient.	
4. Have the beneficiaries disseminated project results (foreground) in scientific publications as planned in the DoA (including the deposition of publications in open access repositories)? Do they include a reference to EU funding?	No
The project does not have specific plans to disseminate project results in scientific publications. However, the project participants could consider the possibility to publish some outputs in specialised journals, as a way to increase knowledge on the technical challenges addressed by the project, or to disseminate some interesting results (for instance, the insights from the market survey carried out in WP12 to understand needs of digital services for research Identification of business models to acquire them in the EOSC context.	
5. Have the beneficiaries disseminated and communicated project activities and results by other means than scientific publications (social media, press-release, the project web site, video/film, etc) as planned in the DoA? Do they include a reference to EU funding?	Yes
The Communications and Stakeholder Engagement Plan (D3.1) of EOSC-Hub describes the strategy for communicating and engaging with all possible stakeholders: from ESFRI projects to users in the so-called long tail of science; from business organizations to Research Infrastructures; from governmental and policy bodies, to the general public. The document needs further updating and refining in the course of project implementation. The dissemination plan is outlined in the Innovation Management Plan (D3.2). In the first period of the project, the EOSC-hub Communications Team developed the main messages conveyed via the EOSC-hub projects website and newsletters (every 6 months) and set-up a lively social media presence on Twitter (+1000 followers), LinkedIn (+500 connections), SlideShare (+2900 views) and YouTube (200 views), able to support and amplify the projects communications activities. Three issues of the EOSC-hub Magazine where published with opinion pieces, in-depth interviews with community partners, announcements, use cases and achievements. Three major events were organised: the first EOSC-hub week (Malaga,16-20 April 2018), the 2018 edition of the Digital Infrastructures for Research (DI4R, in Lisbon, 9-11 October 2018), and the second EOSC-hub week (Prague, 10-12 April 2019). The latter event saw a 40% increased attendance rate.	
6. Has the plan for the exploitation and dissemination of the results (if required) been updated and implemented as described in the DoA, in particular as regards intellectual property rights? Is it appropriate?	Yes
The dissemination plan of EOSC-Hub is outlined in the Innovation Management Plan (D3.2). It describes the project results, which will be captured, classified and protected with respect to Intellectual Property Rights. It also outlines the exploitation routes suitable for each result (exploitation plan) and how these exploitable results can be deployed to	

generate an impact. The dissemination plan is executed through communication activities defined for each exploitable result in partnership with the result owners and according to target stakeholder group. Overall, the deliverable is quite generic and could be stronger. For instance, the work on the DIH is clearly showing potential for exploitation as well.	
7. Has the data management plan (DMP) (if required) been updated and implemented? Is it appropriate?	Partially
The Data Management Plan D1.5 of EOSC-Hub specifies how research publications and data will be generated and collected by the Competence Centers and how they will be processed, monitored, catalogued, and disseminated during the project lifetime. The document provides information relating to type, origin and scale of data, standards and metadata, data sharing (target groups, impact and approach) and archive and preservation. From this perspective, the plan is adequate and includes explicit reference to issues of compliance with the GDPR. However, the project itself generates a lot of other data, but the plan does not discuss how they should be handled. This issue affects, for instance, the interviews run in D2.1 or the market survey in WP12. In the next period, the DMP should be updated to reflect other types of data handled by the project itself, and not only by the research communities helped by the project.	
8. Have the proposed institutional changes been appropriately promoted?	Not applicable
N/A	

5. Resources

1. Were the resources used as described in the DoA and were they necessary to achieve its objectives? If there are deviations from planned budget, have they been satisfactorily explained? Have they been used in a manner consistent with the principle of sound financial management (in particular economy, efficiency and effectiveness)?	Yes
The project is funded at the level of 30M EUR for the period January 2018-December 2020. So far, they have spent 90% of what was planned in the first period (M1-M18), with a slower than planned ramp-up in staffing. Some deviations from the initial budget occurred, as presented and duly justified during the review meeting and in the progress report. Mitigation actions are underway to ensure the timely achievement of the project objectives. Two amendments to the Grant Agreement for EOSC-Hub took place so far. The consortium needed small adjustments and shifts of budget between partners and introduced new activities to be funded through the project reserve. A new request for amendment is going to be submitted. It foresees the allocation of some reserve budget for the Early Adopter programme, a priority for the second project period.	

Annex 1

Expert opinion on deliverables

Deliverable number	Deliverable name	Status	Comments
D1.1	D1.1 Quality and Risk Management Plan	Accepted	No comments
D1.2	D1.2 Quality and RIsk Management Plan	Accepted	Only a few comments regarding source code licenses and achievements of the KPIs that have been identified.
D1.5	D1.5 Data Management Plan	Request for revision	It only focuses on the data that is being handled by the pilots in WP8. However, there is no discussion about any data that is being generated/managed in the context of the project itself (for instance, the data collected through the interviews run in D2.1). The plan should be revised to mention these aspects too. The deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
D1.6	D1.6 Data Management Plan	Request for revision	It only focuses on the data that is being handled by the pilots in WP8. However, there is no discussion about any data that is being generated/managed in the context of the project itself (for instance, the data collected through the interviews run in D2.1). The plan should be revised to mention these aspects too. The deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
D1.7	D1.7 Report on EOSC-hub Service Management System	Accepted	Very detailed set of aspects that will be analysed. Following clear quality management procedures.
D2.1	D2.1 First EOSC-hub Strategy plan	Accepted	Well-structured document, staying at a high-level overview of the strategy of EOSC-Hub, with a clear methodology for deriving the strategy. Good discussion on the goals, results of the interviews with experts, and conclusions on the future of EOSC.
D2.2	D2.2 Final EOSC-hub Strategy plan	Accepted	Much better document on strategy than D2.1, with more clear indications on what is being proposed. The document relies on the opinions and evidence of interviews with different stakeholders. The analysis of the external factors influencing the construction of EOSC is particularly important and calls for action by the European Commission, the EOSC Working Groups (Recommended Strategic Action Plan).
D2.3	D2.3 First Governance and Sustainability implementation roadmap	Accepted	First Governance and Sustainability Implementation Roadmap (agreed by EGI, EUDAT and INDIGO-DataCloud for the provisioning of the EOSC Federating Core). The document describes clearly some of the main barriers that the project is addressing, and establishes a clear roadmap of activities, especially for the interrelation between

Deliverable number	Deliverable name	Status	Comments
			these three infrastructures, as well as indicating the relationships with other ongoing sister projects.
D2.6	D2.6 First Service roadmap, service portfolio and service catalogue	Accepted	A clear view of the service landscape in EOSC-Hub, with a clear distinction between the service hub portfolio (including also internal services) and the service catalogue (the ones offered to users). the methodology is very well described. The presentation during the review has been very useful to get a better understanding of the landscape of services and the strategy, and it is suggested that this is created as a video/presentation resource so as for interested parties to understand how it is structured.
D2.8	D2.8 First Data policy recommendations	Accepted	Very good deliverable with a clear set of recommendations on the policy to follow for data management in EOSC-Hub.
D3.1	D3.1 EOSC-Hub Communication & Stakeholder Engagement Plan	Accepted	No comments
D3.2	D3.2 Innovation management plan	Accepted	Generic deliverable describing the procedure for innovation management, as well as the roles and responsibilities in the context of the consortium. The appendix I is listing the background IP from the different beneficiaries of the project.
D3.3	D3.3 Interim report on dissemination and exploitation of project results	Accepted	Dissemination is relatively weaker in this report, whilst the part related to exploitation of project results is very detailed and well structured. However, this deliverable does not need to be revised. More information on dissemination is expected to be included in the final report D3.4.
D4.1	D4.1 Operational requirements for the services in the catalogue	Accepted	It outlines the operational requirements and recommendations for services wishing to join the European Open Science Cloud (EOSC-hub) Service Catalogue (both the internal and the external ones). A good characterisation of access enabling services, which should have a high quality, and research enabling services (which may be medium - common ones - or low - other -).
D4.2	D4.2 Operational Infrastructure Roadmap	Accepted	This deliverable state that EGI and EUDAT are the main infrastructures providing support, and no mention is done to INDIGO-DataCloud. During the review, it has been explained that INDIGO-DataCloud is not providing services, but only software, and this is the reason why it does not appear in this deliverable, which is acceptable.
D4.3	D4.3 Procedures and policies for the production infrastructure	Accepted	No comments
D5.1	D5.1 Initial maintenance and integration plan for federation and collaboration services	Accepted	This deliverable provides specific details of the services that are made available and will be maintained. This report, as well as other deliverables, lack a general overview of why those services are integrated and not others, and also

Deliverable number	Deliverable name	Status	Comments
			about the overlaps among some services (e.g, why so many AAI services are needed, to what extent they are compatible with each other or replaceable to each other). In the reviewers' opinion, this deliverable does not need to be revised, but the missing information should be included in the next Periodic Report and in any other relevant deliverable due in the second project period.
D5.2	D5.2 First release of federation and collaboration services and tools	Request for revision	A clear statement of the different degree of maturity of the different services should be provided, as well as a general roadmap for people who want to make use of them. The deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
D5.3	D5.3 1st Report on maintenance and integration of federation and collaboration services	Request for revision	There is a minor error in the generation of the table of contents. This report provides a very detailed summary of current state of integration, development and deployment. It would be good to see a final summary with the roadmap ahead, taken from the next steps sections of all these tools. This minor change should be made and the deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
D5.4	D5.4 Second release of federation and collaboration services and tools	Not submitted	Due in second project period
D6.1	D6.1 First release of common services software	Request for revision	A comprehensive description of the common services offered currently by EOSC-Hub. While the description is comprehensive and well-structured to provide the same information about all services, the GitHub repositories of each of the tools/services are not organised in the same manner, nor do they all acknowledge support by EOSC-Hub, but to the original funders only. An updated deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
D6.2	D6.2 First report on the maintenance and integration of common services	Accepted	Good deliverable summarising the use cases that drive the integration of different components from diverse communities. A final picture, such as the one provided for the access layer, for the whole set of integrations is missing. This deliverable does not need to be modified, but this figure should be included in the second report D6.4.
D7.1	D7.1 First Thematic Service software release	Accepted	No comments
D7.2	D7.2 First report on Thematic Service architecture and software integration	Accepted	No comments
D8.1	D8.1 Report on progress, achievements and plans of the Competence Centres	Request for revision	The content of the deliverable is not homogeneous. There are discrepancies on how things are presented in different communities (for instance, see the differences in presentation between

Deliverable number	Deliverable name	Status	Comments
			LOFAR and ICOS), in the user stories part. The organisational structure of the Competence Centers is missing and should be included in this deliverable. The final status expected for the figure that appears on page 28 and the level of integration expected for each Competence Centre should be made explicit. The deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
D9.1	D9.1 Initial Business Pilots Overview and Work Plans	Accepted	Sufficient description of the business cases and their characteristics.
D9.2	D9.2 Joint Digital Innovation Hub Intro and Strategy	Accepted	Good summary of what a DIH is. In terms of the actual proposals for the EOSC-Hub DIH, the concept of vouchers is really interesting. Good number of agreements with different organisations.
D9.3	D9.3 Business Pilots Results	Accepted	No comments
D10.1	D10.1 EOSC Hub Technical Roadmap v1	Accepted	It would require more developer-focused documentation, with clearer guidelines and descriptions of APIs, standards, etc. This missing information should be included in the second version of the Roadmap (D10.2).
D10.3	D10.3 EOSC Hub Technical Architecture and standards roadmap v1	Accepted	It would require more developer-focused documentation, with clearer guidelines and descriptions of APIs, standards, etc. This deliverable is considered accepted, but the second version (D10.4), which is expected to be richer and more developed, should include this missing information.
D10.4	D10.4 EOSC Hub Technical Architecture and standards roadmap v2	Request for revision	It would require more developer-focused documentation, with clearer guidelines and descriptions of APIs, standards, etc. The descriptions of the specifications, APIs, etc., should be improved, so that they are actually well maintained in the corresponding GitHub repositories (or alike) and can be used as reference documentation for developers. This deliverable should be updated to include this missing information. The deliverable should be resubmitted maximum 3 months after the consortium has received this review report.
D10.5	D10.5 Requirements and gap analysis report v1	Accepted	Good methodology based on user stories. Missing a final table like the one requested for D8.1. It should be included in the next version of the report (D10.6).
D11.1	D11.1 Training materials about common services and thematic services	Accepted	The current training catalogue of materials is not well structured and the intended targets of different materials are unclear. It requires further improvements to make it really usable and used by third parties and meet the requirements of EOSC. Also, it would be good to have some numbers of usage of the training materials. This deliverable is accepted, but the future deliverables (D11.2 and

Deliverable number	Deliverable name	Status	Comments
			D11.3) should be improved to take these comments into account.
D12.1	D12.1 Procurement requirements and demand assessment	Accepted	Important deliverable, with recommendations to the EOSC Executive Board, the future EOSC Entity, the Digital Service provider. The report acknowledges that further actions are needed in order to continue working towards a future sustainable business model.
D13.1	D13.1 Periodical assessment of the services	Accepted	No comments
D13.2	D13.2 Periodical assessment of the services	Accepted	No comments

Annex 2

Expert opinion on milestones

Milestone number	Milestone name	Achieved	Comments
MS1	M1.1 Initial SMS structure	Yes	No comments
MS2	M1.2 Majority of SMS completed	Yes	No comments
MS3	M2.1 Setup of Strategy advisory board, strategy consultation meetings with PMB and other relevant boards	Yes	No comments
MS4	M2.2 Process to submit major requests for changes to the service portfolio	Yes	No comments
MS5	M2.3 Service portfolio and service catalogue update	Yes	No comments
MS7	M3.1 EOSC-hub logo, templates and project brand	Yes	No comments
MS8	M3.2 EOSC-Hub Web Platform launch	Yes	No comments
MS9	M3.3 Workshop on innovation management	Yes	No comments
MS10	M3.4 Initial Evaluation of EOSC-hub Community	Yes	No comments
MS11	M3.5 Organisation of first EOSC-hub flagship event	Yes	No comments
MS12	M3.6 Intermediate evaluation of EOSC-hub Community	No	M3.4 Initial Evaluation of EOSC-hub Community was submitted at the end of October 2019. Having a similar report only 4 months later would not bring significant new contents. Furthermore, many of the EOSC related projects - especially the clusters - started during Q2/Q3 of 2019 and they represent key entities in the EOSChub community. For these reasons, it has been proposed to postpone M3.6 to the end of 2019. This request for change will be included in the proposal for the next amendment.
MS13	M3.7 Innovation Management Webinar	No	This webinar would be effective only after the completion of the D3.3 “Interim report on dissemination and exploitation of project results” that was delayed from M18 to M20. For this reason, it has been proposed to postpone M3.7 in Q4 of 2019. This request for change will be included in the proposal for the next amendment.
MS17	M5.1 Initial integration of AAI	Yes	No comments
MS18	M5.2 Marketplace allows to order baseline services from EOSC-hub service catalogue	Yes	No comments
MS19	M5.3 Accounting data from all used resources presented by the accounting portal	Yes	No comments

Milestone number	Milestone name	Achieved	Comments
MS20	M5.4 Consistent monitoring of all the employed EOSC-hub services	Yes	No comments
MS21	M5.5 Consistent Helpdesk system available with 1st and 2nd line support	Yes	No comments
MS22	M5.6 Order management system integrated with back-office management system	Yes	No comments
MS23	M6.1 Initial Rolling Maintenance Plan defined (all common services of initial service catalogue)	Yes	No comments
MS24	M6.2 Initial Rolling Integration Plan defined (all common services of initial service catalogue)	Yes	No comments
MS25	M6.3 Accounting and Monitoring Probes for all common services available	Yes	No comments
MS26	M6.4 1st WP6 developers meeting	Yes	No comments
MS27	M6.5 All common services from the initial service catalogue accessible via EOSC-hub Proxy IdPs (CheckIn or B2ACCESS)	Yes	No comments
MS28	M6.6 Demo of managing data transfers across EGI, EUDAT, INDIGO data and compute services	Yes	No comments
MS29	M6.7 Ingest points of two TDRs integrated with EOSC-hub data transfer services	Partially	Due in the second project period, although already described during the project review.
MS30	M6.8 B2NOTE connected to a new data management system (e.g. DataHub)	No	Delay of Milestone 6.8 from M18 to M22.
MS31	M6.9 Sensitive Data Services - Integration requirements analysis and integration plan	Yes	No comments
MS34	M7.1 Thematic Services Integration plan	Yes	No comments
MS35	M8.1 Technology assessment, architecture integration & validation plan for CCs	Yes	No comments
MS36	M8.2 Online platforms from Competence Centres are available	Partially	Ongoing. Missing only LifeWatch, which started later.
MS38	M10.1 Technical Roadmap first intermediate update	Yes	No comments
MS40	M11.1 Process is defined for allocating financial support for trainers to attend f2f events	Yes	No comments
MS41	M11.2 Online services for training	Yes	No comments
MS42	M11.3 Training programme of first project year	Yes	No comments

Milestone number	Milestone name	Achieved	Comments
MS43	M11.4 Training programme of second project year	Yes	No comments
MS45	M1.3 OPENAIRE collaboration agreement	Yes	No comments