EGI-Engage

Quality plan for Period 2

D1.5

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Abstract

This document describes changes in the quality process implementation for EGI-Engage made in the second reporting period to ensure that outputs generated are high quality, timely and fit-for-purpose. The document reports on the status of the ISO 9000 and ISO 20000 compliant Integrated Management System that was introduced in EGI during 2016 with a focus on its Continual Improvement process and quality verification activities. Last but not least, it provides a summary of the risk management process, and provides information about metrics and KPIs with the related analysis. Metrics and KPIs were updated in October 2017 to provide an overview that takes into account activities during the whole duration of the project.

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Contents

1 Introduction

This document defines how the quality management processes for the project EGI-Engage. Based on experience gathered during two years of the project activities, policies and procedures have been adjusted. Quality management has been implemented to ensure that the project outputs are delivered and satisfy the specified quality requirements. This has been achieved by ensuring that all project management processes are conducted in a quality manner (quality assurance) and by developing quality criteria for the outputs themselves (quality control).

Project Quality Management, according to Project Management Body of Knowledge 5th edition[1], includes all the processes and activities performed that determine quality policies, objectives and responsibilities to ensure the project will satisfy the requirements. It uses policies and procedures to implement the quality management system and supports a continuous improvement process. It addresses both quality management of the project and quality of deliverables of the project.

The goals of Quality Management as defined in Project Management Body of Knowledge are:

- **Customer satisfaction:** to ensure customer expectations are properly recognized and met.
- **Prevention:** to prevent mistakes.
- **Continuous improvement:** to identify and recommend necessary changes.
- **Management responsibility:** to ensure participation of all members of the project consortium to meet project objectives.

It also contains three processes:

- **Plan Quality Management:** the goal is to identify the quality requirements of the project and document steps required to demonstrate project compliance. It provides guides and directions on how quality will be managed and validated.
- **Quality Assurance:** it is a systemic pattern of action to ensure that the product conforms to quality requirements and standards defined by the previous process. It is a management function such as reviews, or a process for checking work items. It is the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention. It ensures the availability of quality project management processes.
- **Quality Control:** it monitors and checks the correctness of the project outcomes to assess performance and recommend necessary changes. It inspects the accomplished work to ensure its alignment with the project scope.

EGI-Engage project used the structure of the quality processes defined in Project Management Body of Knowledge to plan and organize quality management activities as described in the next section.

[1] http://www.pmi.org/PMBOK-Guide-and-Standards.aspx

2 Quality Management

The Quality Manager role was assigned to Małgorzata Krakowian – Quality Manager at the EGI Foundation. The Quality Manager is responsible for the creation and management of quality processes within EGI-Engage within task NA1.3 Quality and Risk Management.

2.1.1 Plan Quality Management

Within this process, the Quality Manager is responsible for creation and maintenance of the EGI-Engage Quality Plan[2] to provide clear guidelines for all work package leaders on how quality will be managed and validated. The guidelines provided to the project cover topics such as communications within the project, deliverable and milestone management and review process.

On a yearly basis the quality plan is reviewed and a report on quality status is produced to meet changed conditions or objectives during the project life span according to the following schedule:

- Project month 03: D 1.1 Quality plan for Period 1 (M01-M12)
- Project month 14: D 1.3 Report of quality status and quality plan for Period 2 (M13-M30)
- Project month 29: D 1.5 Report of quality status for Period 2 (M13-M30)

2.1.2 Quality Assurance

The Quality Assurance process is responsible for assessing if quality guidelines (see section 3), defined in the Quality Plan, are being followed and whether these are still appropriate for the project.

Communication with Activity Managers is ensured through the Activity Management Board (AMB)[3], which is responsible for regularly monitoring the progress of the project and of the day-to-day management of the individual activities within the project, which are undertaken by the Activity Managers. AMB has representation from all the work packages.

The Project Management Board (PMB)[4] – acting as the executive and supervisory body of the project, reporting and accountable to the Collaboration Board – participate in all the processes of the project quality management.

2.1.3 Quality Control

The Quality Control process collects and monitors the Key Performance Indicators (KPIs) and activity metrics (see section 2). Based on results, the process identifies necessary improvements

[2] https://wiki.egi.eu/wiki/EGI-Engage:Quality_Plan

[3] https://wiki.egi.eu/wiki/EGI-Engage:AMB

[4] https://wiki.egi.eu/wiki/EGI-Engage:PMB

and suggests implementation actions to the relevant project boards. It is also responsible for collection of lessons learned, i.e. the learning gained from performing the project.

Project outputs (Milestones and Deliverables[5]) are being reviewed according to the review process for deliverables and milestones.

The regular review of the project outputs is performed via periodic reports, produced according to following schedule:

- Project Month 06: Milestone 1.2 First intermediate report (M01-M06)
- Project Month 12: Project Periodic Report (first period, M01-M12)
- Project Month 18: Milestone 1.3 Second intermediate report (M13-M18)
- Project Month 30: Project Periodic Report (third period, M13-M30)
- Project Month 30: Project Final report (M01-M30)

Building regular reviews ensures that quality improvement can be carried out throughout the life of the project.

[5] https://wiki.egi.eu/wiki/EGI-Engage:Deliverables_and_Milestones

Table 1. EGI-Engage quality management processes.

Plan Quality Management	Quality Assurance	Quality Control
It identifies the quality requirements of the project and document steps required to demonstrate project compliance. It provides guides and directions on how quality will be managed and validated.	Execution of actions to ensure that the product conforms to quality requirements and standards defined by the previous process. It is a management function such as reviews, or a process for checking work items. It is the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention. It ensures the availability of quality project management processes.	It monitors and checks the correctness of the project outcomes to assess performance and recommend necessary changes. It inspects the accomplished work to ensure its alignment with the project scope.
Activities		
• Determine quality requirements • Create project specific policies and procedures • Create quality plan	• Update quality plan • Find and share good practise • Perform continuous improvement • Report on quality to AMB and PMB • Collect improvement suggestions • Collect lessons learned	• Collect KPIs and activity metrics • Evaluate root cause of quality problems • Identify the need for quality improvements • Verify deliverables and milestones • Update lessons learned • Perform project review via project reports

3 Plan quality

3.1 Quality requirements

All quality requirements defined in D1.3[6] have been kept and enforced during the project lifetime.

The following changes have been introduced:

Deliverables and milestones template

To all deliverables and milestones a new mandatory section was added describing the plan for exploitation and dissemination of the project outputs described in the document. The change is part of the improved procedures for Innovation Management and the gathered information was used to maintain and update the catalogue of project results, and to develop an overall Project Exploitation and Dissemination of Results plan for the whole project. The following table shows the additional information requested to characterize the relevant project results.

Table 2. Description of exploitable results and the related exploitation plan including IPRs, dissemination channels and communication activities aiming at increasing the impact produced by the result.

Name of the result	*Short name for the result (results generated under the project could be any tangible or intangible output, more particularly data, knowledge or information whatever its form or nature, whether it can be protected or not.)*
DEFINITION	
Category of result	• *Technical input to standards: Technical specifications or extensions to standards adopted within the project* • *Policy & Procedure developments: Technical procedures directed at users, service and infrastructure providers (for example to govern access and allocation to resources), policy reports and recommendations, and strategic analysis* • *Software & service innovation: Software developments: (e.g.: workflows, Virtual Machines, applications), new software services deployed for the direct benefit of researchers (e.g.: web portals, gateways), e-Infrastructure Commons such as accounting, AAI, and the Federated Cloud platform and the Open Data platform, demonstrators and prototypes.* • *Business model innovation: Business and sustainability-related outputs (the EGI Service Marketplace concept, the contribution to the Innovation space for the big data value chain, sustainability plans, pay-for-use models)* • *Know-how: Includes all results from fact-finding activities (e.g. surveys, requirement gathering), but also the results from internal exercises (e.g. security challenges) and outputs that can be used for knowledge transfer as*

[6] https://documents.egi.eu/document/2785

	training materials.
Description of the result	*Description of the result*
EXPLOITATION	
Target group(s)	*Describe who will use those results. Es: RIs, international research collaborations and the long-tail of science, industry/SMEs, service providers, Funding agencies and decision/policy makers, Standardisation bodies"*
Needs	*What are the needs of the target groups that the results aims to fulfil?*
How the target groups will use the result?	*How the project result will be used? How are you going to achieve the best benefits from the project outcomes? How can you make sure the results they owned are used:* • *in further research activities other than those covered by the project concerned* • *in developing, creating and marketing a product or process* • *in creating and providing a service* • *in standardisation activities* *Note: The exploitation does not need necessarily to be done by participants, who may prefer to ensure its use by another entity. Such indirect exploitation can be performed by licensing the results or assigning them to third parties, in accordance with the requirements established in the grant agreement "*
Benefits	*What are the expected benefits of the result when this will be used by the target groups?*
How will you protect the results?	*Protection of results is indeed essential in Horizon 2020, since an effective exploitation depends on it. Thus, participants must assess the possibility of protecting their results once these are generated. Please, describe what IP protection approach will you put in place for this result. This can range from simple attribution via open source license to full copyright for commercially exploitable results. (For more information you can read "How to manage IP in Horizon 2020: project implementation and conclusion" https://www.iprhelpdesk.eu/sites/default/files/newsdocuments/FS_IP_Management_h2020_implementation_0.pdf*
Actions for exploitation	*Please, describe the concrete actions that need to be executed to make the result reusable by the target group (e.g., for a software, this can include software packaging for distribution, documentation for the installation, etc). Once executed, the target groups should be able to use the results without barriers.*
URL to project result	*Link where the result will be made available*
Success criteria	*What are the success criteria in terms of adoption by the end of the project?*

DISSEMINATION	
Key messages	*What messages will you tell to the target groups when informing about the results?*
Channels	*What channels will you use to deliver the messages to the target? (e.g. Scientific publications, EGI web site, EGI newsletter, participation in conferences or trade fairs)*
Actions for dissemination	*Describe the concrete set of actions that will be put in place to disseminate this project output. When this result is ready, how will you reach to target group to ensure uptake of the result? (You can list the preliminary list of events where you plan to promote the results or material that will be produced or any other concrete actions that will be put in place during the project)*
Cost	*What is the expected cost of dissemination actions?*
Evaluation	*How will you evaluate the impact of the dissemination actions?*

3.2 Procedures

During first two years of the project the following procedures were defined:

1. Deliverable and milestones review procedure
2. Software Quality check procedure
3. Requesting change in DoA procedure
4. Financial and effort review procedure

In addition following procedures were created:

3.2.1 Risks review

The procedure was extracted from the Risk Management plan. The goal of this procedure is to identify risks and plan proper response to prevent risk occurrence.

Step	Responsible	Action
1	Quality manager (QM)	Organize face to face meetings with all WP leader
2	WP leaders	With QM review risks assigned to WP. • identifying deprecated risks • reassessment of impact and probability of existing risks • reviewing of risk response • identification of new risks
3	Technical Coordinator (TC)	Approve/reject/suggest changes in Risk registry
4	Quality manager	Inform WP leader about outcome of TC review

5	Quality manager	Circulate final version of risk registry to AMB and PMB
6	Quality manager	If no comments were provided by AMB and PMB: Circulate final version of risk registry to CB

3.2.2 Review of project outputs

Purpose of this procedure is to:

- Ensure the register of project outputs is kept up to date through continual update of existing and addition of new entries
- Make sure that every project output is properly communicated (approved activities have to be part of a dissemination plan)
- Make sure that every project output is properly exploited by relevant customer groups

Entities involved in the procedure and responsibilities

- **All WP Managers:** ensure the register of outputs is complete and up to date and that dissemination and exploitation plans are defined
- **Authors of deliverables and milestones:** define a dissemination and exploitation plan for every project output in scope
- **WP2 strategy, policy and communications, WP manager**: validates the proposed exploitation plan and makes sure that in case of outputs intended to be adopted for new services or to update services of the EGI service portfolio, the relevant Service Portfolio Management activities take place and Continual Improvement activities take place

Step#	Responsible	Action
1	**Authors** of deliverables/milestones/intermediate and periodic reports	Define the dissemination and exploitation plans for each project output in scope in the deliverable/milestone/report
2	**WP2 manager** (strategy, policy and communications)	During the deliverable/milestone review process checks the proposed dissemination and exploitation plans with the support of the EGI communications team
3	**WP2 manager** (strategy, policy and communications)	Updates the dissemination and exploitation plan.
4	**AMB**	Review the dissemination and exploitation plan execution every quarter

3.3 Metrics

The objectives of EGI-Engage project are as follows:

- Objective 1 (O1): Ensure the continued coordination of the EGI Community in strategy and policy development, engagement, technical user support and operations of the federated infrastructure in Europe and worldwide.
- Objective 2 (O2): Evolve the EGI Solutions, related business models and access policies for different target groups aiming at an increased sustainability of these outside of project funding. The solutions will be offered to large and medium size RIs, small research communities, the long tail of science, education, industry and SMEs.
- Objective 3 (O3): Offer and expand an e-Infrastructure Commons solution
- Objective 4 (O4): Prototype an open data platform and contribute to the implementation of the European Big Data Value.
- Objective 5 (O5): Promote the adoption of the current EGI services and extend them with new capabilities through user co-development;

In order to achieve these objectives and to monitor and control the impact achieved by the exploitation of the project key exploitable results, a number of Key Performance Indicators (KPIs) have been defined to support management to follow up on project's activities quality and project's activities progresses.

In addition, each of the activity set within a specific work package is managed by an Activity Manager who will ensure provision of a list of activity metrics, which will provide progress status against the activity. The Quality Manager with Activity Manager will control that the defined metrics are Specific, Measureable, Attainable, Relevant and Time-bound (SMART) prior to allowing activity participants to report against them.

Values are either collected manually or extracted as applicable from a number of EGI tools. Metrics are gathered every 6 months as part of report process. KPIs are also reported in intermediate and periodic reports; relevant metrics and KPIs are analysed as applicable.

3.3.1 Key Performance Indicators

Key performance indicators support the monitoring of the impact of the project results tracked in the PEDR database, and help controlling the effectiveness of the planned dissemination and communication activities to maximize the benefits produced.

Various impact areas were identified, as illustrated in the following figure.

Figure 1. EGI-Engage Impact Areas: the project key exploitable results contributed to support science, the development of society and economy, digital innovation for science, the implementation of the European Research Area and the definition of the European Open Science Cloud roadmap.

The following section analyses the measured KPIs in relation to relevant project impact areas. Not every impact area has directly measurable KPIs as in some cases benefits can only be measured in the long-term like in the case of the exploitation of scientific results for the production of commercial products, services and processes. A detailed impact report is available in the second periodic report of the project.

Following the first project year review, KPIs were updated and prioritized. The following table illustrates these by mapping selected KPIs to the related impact area. For each KPI the performance is measured as the relative deviation of the achieved performance compared to the expected target.

Table 3. Project impacts, related KPIs and performance analysis.

KPI	Target Value and Baseline (2014)	Performance PM1-PM30
Impact on Science: EGI-Engage enables scientific discoveries with advanced computing services *Achievement: with more 5,000 scientific papers published in 2015 and 2016, EGI-Engage supported science at all scales*		
Number of published open access peer reviewed scientific publications per year supported by the project (based on OpenAIRE open access monitor portal statistics) M.NA2.Communication.8	**Target/year: 1,500** **Baseline: 791**	2015: +25% (2,000) 2016: +50% (3,000)
Impact on Digital Innovation for Science, Industry and SMEs *Achievement: EGI-Engage contributed to the innovation of services with advanced Grid, Cloud and by increasing the availability of big data analytics software and scientific tools and application, the adoption of advanced computing and storage, the increased availability of data, a more efficient use of IT and by avoiding lock-in to particular hardware and software platforms*		
Capacity of compute and storage facilities in the EGI Federation (Petabyte) M.SA1.Operations.7	Target (PM30): 580 Baseline: 490	+24.6% in PY2 (650)
Number of CPU cores available to international research communities and long tail of science (including HTC and Cloud) M.SA1.Operations.6	Target (PM30): 775,000 Baseline: 650,000	-5.8% (732,000 of which Cloud" 7,000)
Number of PaaS and SaaS providers that are EGI partners in the EGI Marketplace partners as thematic service provider KPI.19.NA2.Partnerships	Target (PM30): 27 Baseline: NA	+15% (33)
Number of providers offering compute and storage capacity accessible through open standard interfaces KPI.4.SA1.Cloud	Target (PM30): 28 Baseline: 20	-27% (22)
Impact on the ERA *Achievement: Transnational access to national e-Infrastructures, knowledge circulation with the Competence Centres, transnational scientific cooperation*		

Number of estimated users (registered in EGI Virtual Organizations or in SaaS scientific applications and gateways enabled by EGI) KPI.5.SA2.Users	Target (PM30): 50,000 Baseline: 38,000	+18% in PY2 +38% from PM01 (61,074)
Number of RIs, large research collaborations and e-Infrastructures integrated with EGI KPI.2.SA1.Integration	Target (PM30): 31 Baseline: 9	+52% in PY2 (31)
Impact on Society and Economy *Achievement: Indirect contribution to climate change, biodiversity conservation, marine health, health and wellbeing through research collaborations active in each specific field. Expanding collaborations with industry and SMEs.*		
Number of SME/Industry that successfully implemented a use case involving EGI services KPI.18.NA2.Industry	Target (PM30): 4 Baseline: 0	+72% (11)

3.3.1.1 Impact on Science

The scientific production enabled by EGI services and EGI-Engage key results, amounts to approximately 2,000 peer-reviewed papers in 2015 and 3,000 ones in 2016[7].

In total, an estimated number of 18,500 publications can be attributed to projects and research collaborations supported by the EGI Federation since 2008.

During EGI-Engage (March 2015 till August 2017) the number of registered users increased from 23,520 to 30,508.

A similar trend was observed for users accessing EGI services via thematic services and community-specific portals, which offer data, data products, software and collaborative tools on top of generic EGI services. The total number of users increases to approximately 61,000 users (+30% during EGI-Engage) – see for more information the KPI.5.SA2.Users metric below. The number of users was boosted in the period PM24-PM30, during which various Federated Cloud thematic services started their production activities.

The project supported the engagement with 40 new research communities. Among these, 19 are Research Infrastructures and 13 are projects and platform developers/providers supported by national and H2020 funding. The target number of communities to engage with was exceeded by +106% as indicated by KPI.2.SA1.Integration (see the KPI.2.SA1.Integration table in section 3.3.1.4).

[7] Source: OpenAIRE Monitor https://www.openaire.eu/egi-stats

KPI.5.SA2.Users. Estimated total number of researchers served by EGI Baseline March 2015: 38,000 Relative increase from beginning of the project: +30%			
Target PM12	40,000	**Value PM12**	37,250 (-7%)
Target PM24	48,000	**Value PM24**	41,703 (-15%)
Target PM30	50,000	**Value PM30**	61,074 (+18%)

KPI.7 below provides an indication of the number of new projects and/or collaborations (Virtual Organizations – VOs) registered during the project. A new VO is registered when no existing project or NGI (in case of the long tail of science) can host the new collaboration. The VO registration is one of the operational activities that are triggered by the successful establishment of a Service Level Agreement at the beginning of the production phase. For this reason KPI.7 is a good indicator of the technical maturity of the supported new research communities. The negative deviation from the target (see table below) shows that the +30% users recorded in EGI-Engage, are associated to existing registered collaborations and the long tail of science. This is due to the fact that because of the early implementation stage of many of the supported Research Infrastructures, the 30 month duration of EGI-Engage allowed to reach the co-development, evaluation and testing phase, but only a subset reached the final production stage.

KPI.7.SA2.Users. Number of new virtual organizations registered Total created during project: 36 Cumulative target: 50			
Target PM12	20	**Value PM12**	19 (matched target)
Target PM24	20	**Value PM24**	16 (-25%)
Target PM30	10	**Value PM30**	1 (-90%)

3.3.1.2 Society and economy

Scientific results have a long-term influence on society and sustainable development of our economy. The full impact of the research supported by advanced computing can be appreciated only in the long term. Thanks to the variety of disciplines supported by EGI, we believe many sectors of our society will be positively influenced by EGI-Engage in the future.

In the life sciences communities of EGI most researchers are working in small teams on very specific problems often linked to food and health issues. While it is difficult to point to one specific scientific breakthrough such as the discovery of the Higgs particle, the many projects enabled by the use of an e-Infrastructure – for example those in structural biology – are each contributing to

increasing our knowledge about life and its functioning at cellular and atomic details. This fundamental knowledge lays, on the long term, the foundation to improved crops, new drugs and personalized medicine to fight disease, which will have a major impact our daily life. Taking drug discovery as an example, one should realize that the pathway from the initial basic research to the marketing of a new drug is extremely long, typically taking between 10 and 15 years, with many projects abandoned along the way. Life science researchers currently making use of e-Infrastructure resources such as those provided by EGI, contribute to the initial stage of this long process.

Some of the scientific software offered as services on EGI resources is also used in industry settings. One example of such software used by pharmaceutical companies is HADDOCK, whose web portal is offered as scientific application under EGI[8]. While pharma companies will typically not use the public grid-based web portal because of IP issues, they do benefit indirectly from the software developments catalyzed by projects like EGI-Engage. One example of this is the design using HADDOCK of new bispecific antibodies for the development of anticancer drugs by Merus N.V., a Dutch biotech company[9]. The indirect impact of e-Infrastructure on industry is difficult to measure directly. The impact measurement for project like EGI-Engage should be conducted in the long term, over a sufficiently long interval that exceeds the lifetime of the project or even of a EU H2020 framework.

Thanks to the engagement programme in total, 150+ business related contacts (100+ of which are SMEs) have led to at least eight concrete use cases[10] with about 20 actively ongoing (about 90 added since the end of PY1) – further details are provided in D2.14[11]. Three new MoUs with industry were established in PY2: Terradue[12], CloudSME[13] and TUW/EODC[14] (for in total including UberCloud from PY1).

As indicated by KPI.18, the number of business organizations that were successfully supported by EGI services for their activities amounts to 11 and the list includes: UberCloud (Case Study through SME CFD-Support), NUMECA, IBM Research (paid service), Peachnote (supported by an EGI SLA), 100%IT (certified EGI FedCloud Provider, OLA in place), Terradue (SLA in place), e-CEO via ESA (Terradue), TEISS via ESA stimulus (with the participation of Thales, CloudEO), Earth Observation data exploitation on cloud (involving RHEA, SixSq, EOproc), mITSM (Joint Promotion agreement of FitSM trainings) and FitSM paid trainings by private companies (Pure Purpose LLC, Terradue Ltd/Srl).

[8] https://www.egi.eu/use-cases/scientific-applications-tools/haddock/

[9] doi: 10.1074/jbc.M117.793497

[10] https://www.egi.eu/business/business-use-cases

[11] https://documents.egi.eu/document/3036

[12] MoU: https://documents.egi.eu/document/2887

[13] MoU: https://documents.egi.eu/document/2942

[14] MoU: https://documents.egi.eu/document/3191

KPI.18.NA2.Industry. Number of SME/Industry that successfully implemented a use case involving EGI services			
Target PM12	Not available*	**Value PM12**	Not available*
Target PM24	2	**Value PM24**	4 (50%)
Target PM30	3	**Value PM30**	11 (72%)

* The KPI was introduced in PY2 following the reviewers' recommendations.

3.3.1.3 Digital Innovation for Science

3.3.1.3.1 Grid Computing and Cloud Computing

One of the expected impacts of the project is to increase the adoption of advanced compute and storage services based on new technological solutions leveraging today's megatrends, i.e. large-scale social, economic, political, environmental or technological changes that are transforming research activities and processes, like Grid computing, Cloud computing and big data analytics tools. A number of EGI services from the external catalogue are based on these: HTC Compute, Cloud Compute and Cloud Container Compute, the Applications on Demand service and the integrated thematic services.

Thanks to the EGI-Engage support, at project PM30 EGI compute services were being tested and/or used for production-level data analysis by eight ESFRI Landmarks (BBMRI, DARIAH, ELI, ELIXIR, EMSO, HL-LHC, INSTRUCT and LifeWatch) and three Projects (CTA, EPOS and KM3NeT 2.0). The sharing and co-development of digital solutions ensures a more efficient use of investments, and a faster innovation pace.

EGI accounting data shows that among the 31 large-scale research initiatives currently supported, those which reached maturity and full service adoption in 2015, have been largely increasing usage in 2016 and 2017 (see table Table 4).

An additional group of research collaborations and infrastructures is currently involved in service co-design and testing. The group involves: EISCAT-3D, BBMRI, ELIXIR, EPOS, ICOS and SKA.

During EGI-Engage the number of active use cases that benefited from project technical support exceeded the defined annual thresholds defined in KPI.16 (table below) and reached the peak value of 63 business cases at the end of PM24. The KPI is tracked by measuring the number of active/open tickets in technical-support-cases internal tracking system. At PM30 the number decreased thanks to the successful completion of various support cases that terminated with the successful negotiation of a SLA.

KPI.16.SA2.Support. Number of international support cases (for/with RIs, projects, industry)			
Target PM12	30	**Value PM12**	38 (+21%)
Target PM24	30	**Value PM24**	63 (+52%)
Target PM30	50	**Value PM30**	50 (target matched)

The number of SLAs established with large user communities amounts to 11. These SLAs are supported in total by 36 providers who collectively provide:

- more than 152 Million of CPU hours
- more than 170 TB of storage
- more than 3,926 GB of RAM
- more than 1,410 vCPU cores

The Applications on Demand service specifically tailored for the long tail of science, started its production phase in the second year of the project, and in the last few months it allowed the creation of 37 corporate SLAs (see table below).

KPI.8.SA1.Users. Number of VO SLAs established and number of long tail of science SLA (num1/num2) **Baseline: 0**			
Target PM12	4	**Value PM12**	4 (target matched)
Target PM24	10	**Value PM24**	5 (-100%)
Target PM30	15	**Value PM30**	48 (+69%)

Table 4. Status and trends in adoption of advanced compute and data management services by large-scale international research initiatives and infrastructures from 2015 to 2017. Source: EGI Accounting Portal.

PRODUCTION Infrastructures and yearly increase in CPU consumption
1. WeNMR/INSTRUCT (INSTRUCT, Integrated Structural Biology Infrastructure for Europe): + 84%
2. BBMRI.NL (Biobanking and Biomolecular Resources Research): starting, constant
3. Icecube (IceCube Neutrino Observatory): +398%
4. CTA (Cherenkov Telescope Array): +51%
5. KM3NeT (The next generation neutrino telescope): constant

6. LOFAR (Low-Frequency Array): +70%
7. Zeus (ZEUS detector at DESY): constant
8. Hess (H.E.S.S. - The High Energy Stereoscopic System): -39%
9. VIRGO (The Virgo detector for gravitational waves): +623%
10. ALICE/LHC: +73%
11. ATLAS/LHC: +50%
12. CMS/LHC: +36%
13. LHCb/LHC: +68%
14. Magic (Major Atmospheric Gamma Imaging Cherenkov): +25%
15. LifeWatch (European Infrastructure for Biodiversity and Ecosystem research): constant

PRODUCTION e-Infrastructures

1. Asia Pacific region
2. Africa Arabia region
3. China
4. India
5. Latin America
6. Ukraine

NEW Research Infrastructures and Platforms

1. ELI-NP (Extreme Light Infrastructure - Nuclear Physics): new → early adoption
2. LSST: new → early adoption
3. D4Science and iMarine platforms: new → production
4. EXTRraS (Exploring the X-ray transient and Variable Sky): new → early adoption
5. VERCE/EPOS (European Plate Observing System): new → early adoption
6. DARIAH: new → early adoption
7. NBIS: new → early adoption
8. ELIXIR: new → early adoption
9. GEOSS: new → early adoption
10. EMSO: new → early adoption

Modelling Simulation and Big Data Analytics

Scientific applications providing simulation, data processing and analysis functionalities, data visualization etc. are key enablers for a broad adoption of EGI Compute services. These capabilities are often delivered in the form of scientific gateways and Virtual Research Environments for a web-based access of different digital artifacts like data, software, and processing resources that are managed by diverse systems in separate administration domains.

EGI-Engage supported the setup of 33 thematic services, as well as 17 scientific applications within the Applications on Demand Service. These production services and applications came from 4 Competence Centres:

- MoBrain (8): AMBER, Rosetta, DISVIS, FANTEN, GROMACS, HADDOCK, Powerfit, UNIO
- DARIAH (1): DARIAH Science Gateway
- LifeWatch (7): Collaborative platform for observatories, Modelling Water Masses, GBIF data access biogeographic context, Citizen Science Services, Image Classification Deep Learning Tools, R Services, Digital Knowledge Preservation Framework
- Disaster Mitigation (2): gWRF and iCOMCOT simulation portals from 7 communities:
- BioISI (4): One from each of the BioISI areas: Biomedicine, Biotechnology & Bioresources, Condensed Matter & Biological Physics and Bioinformatics & Modelling
- D4Science (2): gCube, VREaaS • ExTRAS (1): ExTRAS web portal
- NBIS (7): Boctopus, Pcons, PconsC3, ProQ3, SHINY, SCAMPI, TOPCONS
- Peachnote (1): Music score sheet search engine
- VIP (1): Virtual Imaging Platform
- Applications on Demand long-tail community (17): Molecular Docking, Workflow and parameter study tool (WS-PGRADE portal). Galaxy, Docker, Octave, Apache Tomcat, GnuPlot, NAMD, Hadoop, Marathon, Chronos, Jupyter Notebook, Cloud orchestrator (in the EC3/IM portal). Chipster, ClustalW2, Semantic Search, the Statistical R for Computing (in the Catania Science Gateway).

KPI.19.NA2.Partnerships. Number of PaaS providers that are EGI partners: EGI Marketplace partners/Technology partners			
Target PM12	Not available*	**Value PM12**	Not available*
Target PM24	20	**Value PM24**	27 (+26%)
Target PM30	28	**Value PM30**	33 (+15%)

* The KPI was introduced in PY2 following the reviewers' recommendations.

3.3.1.3.2 Adoption of storage and computing infrastructures

The EGI Federation is designed to allow data and software portability across multiple heterogeneous facilities. Via reference standards and interoperability best practices, the federated

model allows the combination of resources (data, software, applications, publications and other digital artefacts) and services from multiple suppliers.

During EGI-Engage 14 international research collaborations and their research platforms became active tester and adopters of federated cloud services. A broad range of scientific disciplines (natural sciences, health and medicine, agricultural sciences and humanities) benefited from this.

These research communities in this list include 5 Landmarks (ELI, DARIAH, ELIXIR, EMSO and LifeWatch) and one Project (EPOS) in the ESFRI Roadmap 2016. Adoption was possible thanks to the piloting activities conducted by the Competence Centres, and to technical support activities towards external projects and Research Infrastructures.

The EGI-Engage exploitation plan and related communications activities aimed at promoting the usage of the enabled platforms in the context of community events like ESFRI Cluster Project meetings (e.g. CORBEL and ENVRI+). The following list provides information about the increase in yearly usage rates for each community.

Natural sciences

Biological Sciences/Structural biology

WeNMR (+43% 2015-2016) - EGI-Engage competence centre

Biological Sciences/Bioinformatics

NBIS (starting platform)

Biological Sciences

ELIXIR (started in 2017, EGI-Engage competence centre

Biological Sciences/Marine and Freshwater Biology and Earth Sciences

EMSO (European Multidisciplinary Seafloor and water-column Observatory): starting, +44.6%

Biological Sciences/Biodiversity conservation

LifeWatch (active user since 2014) – EGI-Engage competence centre

Physical Sciences/Nuclear Physics

ELI-NP (starting community, 2017)

Astronomy and Astrophysics

EXTRaS (starting community, 2017)

Earth Sciences

Geohazards ESA exploitation platform (starting platform, +6,100%)

Seismology: VERCE (staring platform 2017) – EGI-Engage Competence Centre

NEXTGEOSS platform (started in 2017)

Health and Medicine

Basic Medicine/Neuroscience: biomed (starting, +288%)

Agricultural Sciences

Agriculture, Forestry and Fisheries (starting community, +826%) – EGI-Engage infrastructure integration action of the D4Science platform

Humanities

Arts/Musicology: peachnote (production platform, constant usage)

Arts: DARIAH Research Infrastructure (semantic annotation platform, starting, +607%) – EGI-Engage Competence Centre

The EGI Federated Cloud is a multi-national cloud system that has been services to all disciplines, including Natural Sciences, Health and Medicine and Art and Humanities (Figure 2) by providing a yearly average of 7 Million CPU hours. EGI-Engage established a blueprint consisting of best practices and reference standards to achieve interoperability across multiple publicly funded and commercial cloud providers. To date, the EGI Federated Cloud is the only existing distributed research cloud in Europe.

The EGI Federated cloud ingrates community, private and/or public clouds into a scalable computing platform for research. EGI-Engage developed key software components, services and policies to enable federated access to multiple cloud providers via federated identity provisioning, authentication and authorization, and to enable portability of applications and data across a hybrid cloud federation. To date, the EGI Federated Cloud comprises 22 certified cloud providers (19 publicly funded and 1 commercial) across Europe. Additional providers are in evaluation phase following the achievements of the competence centres and other project e-Infrastructure integration activities.

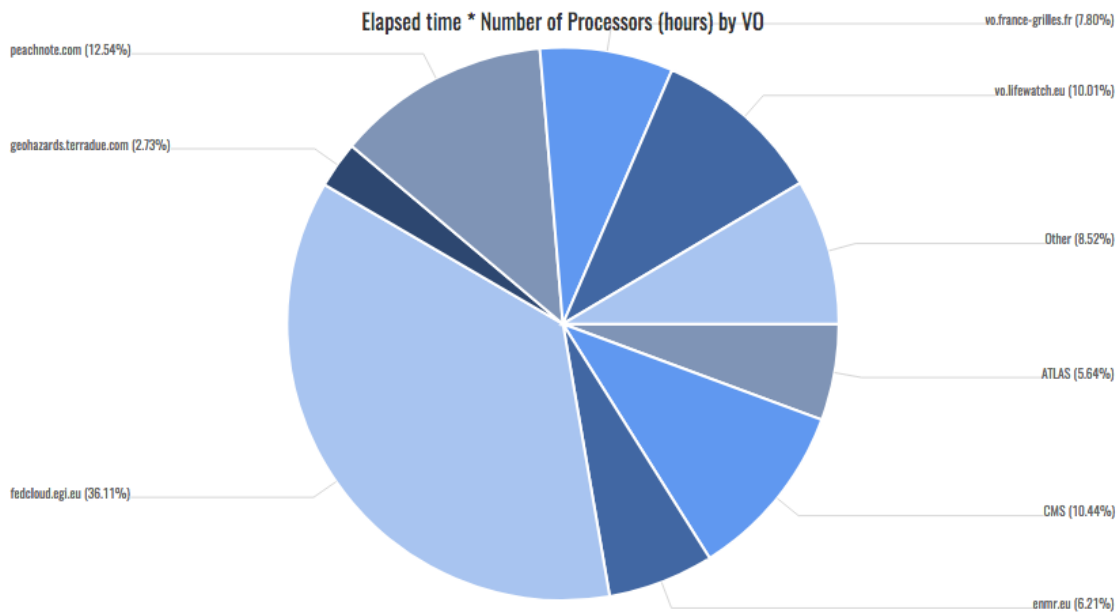

Figure 2. Utilization of Cloud Compute across the main EGI Federated Cloud research communities including the fedcloud catch all group (Unit: Elapsed time * Number of Processors (hours) by VO and Year, Jan 2015-August 2017). Source: EGI accounting portal.

The Federation pools IaaS, PaaS and SaaS services from a heterogeneous set of cloud providers using a single authentication and authorization framework that allows the portability of workloads across multiple providers and enable bringing computing to data. EGI follows a Service Integration and Management (SIAM) approach to manage the federation with processes that cover the different aspects of the IT Service Management.

Increasing uptake of cloud computing was observed during 2016 and 2017. In various Competence Centres effort was allocated to the definition of suitable computing models for different scientific use cases. Because of the low level of maturity of the computing models at the beginning of the project, design and co-development required more effort and time than originally anticipated, and various communities only reached the piloting stage in 2017. This is reflected in the number of additional cloud providers who joined the EGI Federated Cloud, and the number of cloud virtual appliances registered in the Applications Database. Both did not meet the expected thresholds as indicated by the KPIs below.

In KPI.3 software includes generic applications, tools, science gateways, workflows, and middleware products, while Virtual Machine appliances refers to ready-to-run virtual machines packaged with an operating system and software application(s). At the beginning of EGI-Engage the Application Database included 510 software items and 40 appliances[15].

[15] https://appdb.egi.eu/

KPI.3.SA1.Software. Number of *new* registered software items and Virtual Machine appliances			
Target PM12	50/50	**Value PM12**	19 (-163%)/62 (+19%)
Target PM24	30/90	**Value PM24**	12 (-150%)/29 (-210%)
Target PM30	70/70	**Value PM30**	-28 retired/18 (-288 %)

KPI.4.SA1.Cloud. Number of providers offering compute and storage capacity accessible through open standard interfaces*			
Target PM12	25	**Value PM12**	21 (-19%)
Target PM24	25	**Value PM24**	24 (target matched)
Target PM30	28	**Value PM30**	22 (-27%)

In addition to the 22 providers, five additional cloud providers are currently in pre-certification status: EBI - ELIXIR, INAF - Italy, BITP – Ukraine, RAL - UK, NAS – Ukraine, and EODC - Austria (commercial). CSC – Finland, and SURFSara – Netherlands are in evaluation stage.

* The metric reports on the number of certified cloud providers in production stage. It does not include providers in integration phase, pre-certification phase or in scheduled downtime maintenance at the time of the measurement. Oscillations are possible in case of temporary downtime.

3.3.1.3.3 More Efficient Use of IT Equipment for research

EGI-Engage addressed this challenge through the coordinated offer of scientific applications, federated computing and storage. The EGI Federation comprises to date about 730,000 cores, 300 PB of online storage and 346 PB of nearline storage.

The compute capacity increased by +23% in the first reporting period, and by +12.3% in the latter one. Online and nearline storage experienced a similar trend: +12% and 42% respectively in the first reporting period, and +5% and +23.3% in the last one. Today more than 200 research collaborations are benefitting by the resulting baseline technical infrastructure.

3.3.1.4 European Research Area

EGI-Engage contributed to the advancement of the implementation of the European Research Area by strengthening the national systems – the national e-Infrastructures (NGIs), which were better 'connected' to an increasing number of international research collaborations. Transnational cooperation was optimized by enabling access to national resources and services via an integrated service management system and an internal catalogue of services for providers of the EGI

Federation. The project also supported the knowledge circulation and sharing by connecting experts from different research infrastructures, service providers and technology providers in a network of 10 Competence Centres.

A tangible indicator of the cooperation and integration of national, regional and international digital infrastructures is provided by KPI.2.SA1.Integration, which provides information on the number of e-Infrastructures and research infrastructures that adopted EGI services for piloting, scientific pre-production and production activities.

KPI.2.SA1.Integration. Number of RIs and e-Infrastructures integrated with EGI			
Target PM12	9	**Value PM12**	15 (+40%)
Target PM24	13	**Value PM24**	17 (+23%)
Target PM30	15	**Value PM30**	31 (52%)

3.3.2 Activity Metrics

This section lists the activity metrics for each of EGI-Engage activity.

3.3.2.1 NA1 – Project Management

Metric ID	Metric	Target PM12	Value PM12	Target PM24	Value PM24	Target PM30	Value PM30
M.NA1.Quality.1	Number of days of Deliverable, milestone delay per WP	0	42 days average	0	Wp1 - 20 Wp2 - 5 Wp3 - 34 Wp4 - 18 Wp5 - 10 Wp6 - 37	0	Wp1 - 13 Wp2 - -42 Wp3 - 31 Wp4 - 12 Wp5 - 13 Wp6 - 22
M.NA1.Quality.2	Percentage of delayed deliverables and milestones per WP	---	---	0	Wp1 - 100% Wp2 - 33% Wp3 - 80% Wp4 - 100% Wp5 - 50% Wp6 - 80%	0	Wp1 - 67% Wp2 - 33% Wp3 - 77% Wp4 - 67% Wp5 - 50% Wp6 - 94%

3.3.2.2 NA2 – Strategy, Policy and Communication

Metric ID	Metric	Target PM12	Value PM12	Target PM24	Value PM24	Target PM30	Value PM30

M.NA2.Communication.1	Percentage of articles, news, blog posts about or contributed by user communities and NGIs/EIROs with respect to the total of items published in EGI's channels	30%	24.7%	40%	25%	50%	30%
M.NA2.Communication.2	Number of unique visitors to the website	NA	82489	NA	48850	NA	82423
M.NA2.Communication.3	Number of pageviews on the website	NA	172980	NA	115240	NA	254283
M.NA2.Communication.4	Number of news items published	52	42	52	32	27	25
M.NA2.Communication.6	Number of case studies published	10	2	10	16	5	3
M.NA2.Communication.7	Attendee-days per event	NA	2400	NA	1785	NA	663
M.NA2.Communication.8	Number of scientific publications supported by EGI	NA	791 Source: manual collection	NA	2152 Source: OpenAIRE	NA	3,000 Source: OpenAIRE
M.NA2.Strategy.1	Number of EGI impact assessment reports circulated to the stakeholders	1	0	2	1	2	2
M.NA2.Strategy.2	Number of MoUs involving EGI.eu or EGI-Engage as a	3	5	6	9	8	7

	project						
M.NA2.Strategy.3	Number of contracts established with paying customers	0	0	4	1	5	2
M.NA2.Strategy.4	Number of relevant authorities informed of the policy paper on procurement	0	0	0	0	20	32
M.NA2.Industry.1	Number of engaged SMEs/Industry contacts	20	60	90	148	100	166
M.NA2.Industry.2	Number of establish collaborations with SMEs/Industry (e.g. MoU)	4	5	8	18	12	21
M.NA2.Industry.3	Number of requirements gathered from market analysis activities	10	19	25	30	NA	NA
M.NA2.Industry.4	Number of services, demonstrators and project ideas running on EGI for SMEs and industry	20	36	30	48	40	50

3.3.2.3 JRA1 – E-Infrastructure Commons

Metric ID	Metric	Target	Value	Target	Value	Target	Value

		PM12	PM12	PM24	PM24	PM30	PM30
M.JRA1.AAI.1	Number of communities adopting federated IdP	0	1	3	48	5	9
M.JRA1.Marketplace.1	Number of entries in the EGI Marketplace (i.e. services, applications etc.)	50	0	200	5	400	37
M.JRA1.Accounting.1	Number of kinds of data repository systems being integrated with the EGI accounting software	0	0	0	22	5	1
M.JRA1.Accounting.2	Number of kinds of storage systems being integrated with the EGI accounting software	0	2	0	1	5	2
M.JRA1.OpsTools.1	Number of new requirements introduced in the roadmap	NA	50	NA	2	NA	9
M.JRA1.OpsTools.2	Number of probes developed to monitor cloud resources	NA	5	NA	20	NA	5

3.3.2.4 JRA2 – Platforms for the Data Commons

Metric ID	Metric	Target PM12	Value PM12	Target PM24	Value PM24	Target PM30	Value PM30

M.JRA2.Cloud.1	Number of VM instances managed through AppDB GUI	0	0	50	490	100	630
M.JRA2.Cloud.2	Percentage of cloud providers providing snapshot support	0	0	50%	4%	100%	100%
M.JRA2.Cloud.3	Percentage of cloud providers providing VM resizing support	0	0	50%	0	100%	5%
M.JRA2.Cloud.4	Number of OCCI implementation supporting OCCI 1.2	0	1	3	1	3	2
M.JRA2.Integration.1	Number of European cloud providers in the federated Astronomy community cloud	0	0	3	0	4	1
M.JRA2.Integration.2	Number of virtual appliances shared	0	76	50	104	100	114
M.JRA2.Integration.4	Number of EUDAT services integrated with the HTC and Cloud platforms of EGI	1	2	2	2	3	3
M.JRA2.Integration.6	Number of research clouds that interoperate with EGI federated cloud: community clouds, integrated, peer	2	2	4	2	6	2
M.JRA2.Integration.7	Number of models executed on Federated Cloud resources	-----	-----	15	0	30	8
M.JRA2.Integratio	Number of CPUs consumed on	-----	-----	150	164 VMs,	300	197VMs -

n.8	Federated Cloud resources				17766 CPU hours		349 CPUs - 267665 CPU hours
M.JRA2.AcceleratedComputing.1	Number of batch systems for which GPGPU integration is possible to be supported through CREAM	1	1	3	5	NA	5
M.JRA2.AcceleratedComputing.2	Number of Cloud Middleware Frameworks for which GPGPU integration is supported and implemented	1	1	2	2	NA	2
M.JRA2.AcceleratedComputing.3	Number of level 3 disciplines with user applications that can use federated accelerated computing	2	2	3	3	NA	3
M.JRA2.OpenData 1	Number of open research datasets that can be published, discovered, used and reused by EGI applications/tools	0	5	10	1	20	1

3.3.2.5 SA1 – Operations

Metric ID	Metric	Target PM12	Value PM12	Target PM24	Value PM24	Target PM30	Value PM30

M.SA1.Operations.3	Amount of allocated resources (storage) allocated through a EGI centrally managed pool of resources to Long tail of science	100	Not available	500	3TB	1000	173
M.SA1.Operations.4	Amount of allocated resources (logical cores) allocated through a EGI centrally managed pool of resources to Long tail of science	5000	4300	10000	3460	20000	2546
M.SA1.Operations.5	Number of new products distributed with UMD	5	1	5	3	10	6
M.SA1.Operations.6	Number of CPU cores available to international research communities and long tail of science (all user communities included, HTC and Cloud) [HTC/Cloud]	----------	651748	760 000	HTC: 634779 Cloud: 6634	775 000	HTC:731824. Cloud: 6982
M.SA1.Operations.7	Number of storage available to international research communities and long tail of science (disk and tape, HTC and Cloud) [PB] [HTC/Tape/Cloud]	----------	disk: 264.18 PB tape: 239,8 PB	d: 285 t: 250	HTC Disk: 268.6 PB. HTC Tape: 292.1 PB. Cloud: 370,6 TB.	d: 310 t: 270	HTC Online Storage: 299.2 PB. HTC Archive Storage: 346.4 PB. Cloud: 399 TB.

M.SA1.Operations.8	Number of user requests handled in e-GRANT	10	2	10	2	10	3
M.SA1.Operations.9	Number of compute resources available to the long tail of science	300	16144	500	20480	500	20344
M.SA1.Operations.10	Number of CPU time consumed by robot certificates	--------	--------	NA	623035737	NA	642907611
M.SA1.SecurityOperations.1	Number of security policies and procedures updated reviewed and adapted to support new services	6	6	10	8	12	10
M.SA1.Platforms.1	Number of gCUBE VREs instantiated on the Federated Cloud for the iMARINE community	0	0	2	2	3	2
M.SA1.Platforms.2	Number of CPU time consumed by e-CEO challenges (hours * cores)	0	1445	150000	3141	300000	208798
M.SA1.Platforms.3	Amount of computing resources used by long tail of science, both Cloud and HTC	---------	---------	100000	25500	150000	70172
M.SA1.Users1	User satisfaction	4	4.5	5	4	5	4.25

3.3.2.6 SA2 – Knowledge Commons

Metric ID	Metric	Target PM12	Value PM12	Target PM24	Value PM24	Target PM30	Value PM30
M.SA2.UserSupport.1	Number of training modules produced and kept up-to-date	6	9	13	15	15	17
M.SA2.UserSupport.2	HTC Absolute normalized CPU time to a reference value of HEPSPEC06 (excluding OPS and dteam) per 1 level disciplines IN HOURS	NA	Engineering and Technology: 72,981,746 Humanities: 7,130,542 Medical and Health Sciences: 82,007,687 Natural Sciences: 646,578,599 Social Sciences: 7,130,542 Support Activities: 1,642,259	NA	Agricultural Sciences: 4,346,511.00 Engineering and Technology: 679,018,695.00 Humanities: 9,381,520.00 Medical and Health Sciences: 22,252,751.00 Natural Sciences: 3,327,911,875.00 Other: 13,679,659.00 Social Sciences: 9,381,520.00 Support Activities: 3,133,170.00 TOTAL 4,064,759,190.	NA	Engineering and Technology: 358950 Medical and Health Science: 5593177 Natural Science: 1838406496 Others: 1311763 Support Activities: 3784844

					00		
M.SA2.UserSupport.3	HTC Relative increase normalized CPU time to a reference value of HEPSPEC06 (excluding OPS and dteam) per 1 level disciplines	NA	Engineering and Technology 140% Humanities 3121% Medial and Health 141% Natural Sciences 112% Social Sciences 3121% Support Activities 380%	NA	Agricultural Sciences: -65% Engineering and Technology: 9% Humanities: -42% Medical and Health Sciences: -58% Natural Sciences: 23% Other: -50% Social Sciences: -42% Support Activities: -42%	NA	Engineering and Technology: 207% Medical and Health Science: 96% Natural Sciences: 3% Others: 37% Support Activities: 57%
M.SA2.UserSupport.4	Relative increase of users per 1 level disciplines	NA	Engineering and Technology 13% Medical and Health Sciences 6% Natural Sciences 122% Agricultural Sciences 15% Social Sciences 10%	NA	Engineering and Technology: 17% Medical and Health Sciences: 15% Natural Sciences: 6% Agricultural Sciences: 27% Social Sciences:	NA	Agricultural Sciences = 0% Engineering and Technology = 2% Humanities = 0% Medical and Health Sciences = 2% Natural Sciences = -26%

			Humanities 10% Support Activities -10% Other 4%		29% Humanities: 28% Support Activities: 1% Other: -17%		Social Sciences = 0% Support Activities = -1% Other = 0%
M.SA2.UserSupport.5	HTC Number of Low/Medium/High Activity VOs and total	NA	Low: 20 Medium: 10 High: 115	NA	Low: 10 Medium: 10 High: 90	NA	Low: 110-120 Medium: 55-60 High: 100
M.SA2.UserSupport.6	Number of VM instantiated in Federated Cloud per 1 level discipline	NA	141896	NA	436030	NA	139719
M.SA2.UserSupport.7	Number of delivered knowledge transfer events	15	21	20	10	15	4
M.SA2.UserSupport.8	Number of robot certificates used in EGI Infrastructure	NA	157	NA	178	NA	87

4 Integrated management system

During the project lifetime, the EGI Foundation defined and implemented an Integrated Management System (IMS), which is to ensure a systematic and professional operation and delivery of services.

The requirements for the management system were taken from international standards:

- ISO 9001:2005 Requirements for a quality management system
- ISO 2000-1:2011 Requirements for an IT service management system

The EGI Foundation was certified against both standards in December 2016[16] in order to:

- Increase trust and confidence.
- Increase competitiveness.
- Show commitment to professionalism.
- Speed-up the time to implementation of a baseline level of effective and systematic control over business and service management processes.
- Increase the overall level of organisational maturity.
- Improve readiness for future business development, new opportunities, organisational change.

The IMS has been designed in a way to better support service management for both IT and non-IT services. A set of processes was scoped to an appropriate set of services:

- Core management: The management system implemented to plan, implement, monitor and continually improve all business processes under the responsibility of the *EGI Foundation*.
- General Service management: The management system implemented to deliver *all services covered by the service catalogue of the EGI Foundation*.
- IT Service management: The management system implemented to deliver *all IT services covered by the service catalogue of the EGI Foundation*.

The following processes have been implemented as part of the IMS:

Process	Description/Goal	Scope
Risk Management	Perform systematic and regular identification, assessment and treatment of risks of any type, including risks related to information security, (IT) service continuity and overall quality.	Core
Finance, Administration and HR	Ensure effective management of finance, business and office administration as well as human resources.	Core

[16] https://www.egi.eu/about/egi-foundation/certifications/

Business development and stakeholders	Support the identification of new (potential) business opportunities and partnerships and to effectively manage expectations and requirements from interested parties (a.k.a. stakeholders).	Core
Information security management	Manage information security effectively through all activities performed to deliver and manage services, so that the confidentiality, integrity and accessibility of relevant information assets are preserved.	Core
Continual Improvement	Identify, prioritize, plan, implement and review all improvements subject to the Continual Improvement policy.	Core
Service portfolio management	Manage the service portfolio in order to ensure its regular review and to align new or changed services with business decisions as part of the overall organisation strategy.	General
Service level management	Maintain a service catalogue, and to define, agree and monitor service levels with customers by establishing meaningful service level agreements (SLAs), supportive operation level agreements (OLAs) and underpinning agreements (UA).	General
Service reporting management	Specify all service reports and ensure they are produced according to specifications in a timely manner to support decision-making.	General
Customer relationship management	Turn prospective customers into active users of EGI services by configuring / integrating / developing relevant components and new services. (Accessing services though a VO SLA); direct users to ready use services and configurations to satisfy service orders. (Accessing services through Corporate SLA); support the customers in reaching long-term operational setups at EGI Service Providers. (Securing resources through SLA-OLAs using the SLM process; and maintain a good relationship with active customers. (Regular satisfaction and service reviews; Handling complaints).	General
Supplier, Federation Member Relationship Management	Establish and maintain healthy relations with suppliers supporting the service provider in delivering services to customers, to ensure that the required capacity is provided, and monitor their performance.	General
Budgeting, Accounting for Services	Ensure effective management of budgeting, accounting for Services	General
Capacity management	Ensure sufficient capacities are provided to meet	IT

	agreed service levels and performance requirements for services that are part of the catalogue.	
Service Availability & Continuity Management	Ensure sufficient service availability to meet agreed requirements and adequate service continuity in case of exceptional situations.	IT
Incident & Service Request Management	Restore normal / agreed service operation within the agreed time after the occurrence of an incident and to respond to user service requests, namely user request for information, advice, access to a service or a pre-approved change.	IT
Problem Management	Investigate the root causes of (recurring) incidents in order to avoid future recurrence of incidents by resolving the underlying problem, or to ensure workarounds / temporary fixes are available.	IT
Configuration management	Provide and maintain a logical model of all configuration items and their relationships and dependencies.	IT
Change management	Ensure changes to Configuration Items are planned, approved, implemented and reviewed in a controlled manner to avoid adverse impact of changes to services or the customers receiving services. All EGI branded services are covered by this process - both externally facing services and internal services that in turn can affect externally facing services.	IT
Release & Deployment Management	Identify one or more changes of one or more configuration items to releases, so that these changes can be tested and deployed to the live environment.	IT

All project results were managed following the IMS processes mentioned above. They were designed, defined, planned and deployed according to ISO 9001 and/or ISO 2000-1 standards. The project applied as well key principles from the standards:

- Process-oriented approach
- Customer focus
- Healthy relationships with interested parties
- Continual improvement
- Leadership
- Decision-making based on facts
- Involvement of people
- Systematic approach

This has allowed being more efficient and effective in activities as well to produce outputs that better satisfy current and future customers.

4.1 IMS Quality control

As part of IMS Quality Control the Key Performance Indicators (KPIs) are collected and monitored, as well as, a number of reviews and audits are performed.

The regular review of the IMS is performed with:

- External certification audit performed by TÜV-SÜD auditor
- Internal audits performed by external expert
- Process reviews performed by process owner
- Management reviews performed by IMS owner (Top management)

Based on results, necessary improvements are identified and recorded. Continual improvement process manager is responsible for managing all audit and review findings – takes care of its assignment and timely resolution.

During reporting period following audits and reviews have been performed:

Name	Date	By	No. of findings
Internal FitSM/ISO20k Audit	20/05/2016	Thomas Schaaf	21
Internal IMS audit / pre-audit	20/09/2016 – 22/09/2016	Thomas Schaaf	40
Management review	11/10/2016	Yannick Legre	8
External IMS certification audit ISO 9001 & ISO/IEC 20000-1 (stage 1)	28/10/2016	Marcus Giese (TÜV-SÜD)	9
Management review	12/12/2016	Yannick Legre	4
External IMS certification audit ISO 9001	21/122016 -	Marcus Giese	22

& ISO/IEC 20000-1 (stage 2)	23/12/2016	(TÜV-SÜD)	
All process review	05/2017	Yannick Legre Tiziana Ferrari	Not available
Internal Audit - ITSM Processes	30/06/2017	Thomas Schaaf	16
Management review	27/07/2017	Yannick Legre	7

5 Risk management

The Project Risk management process includes conducting risk management planning, identification, analysis, response planning and control. The objective is to detect threats and decrease their likelihood and impact by proper treatment as well as to collect lessons learned from risks occurrence to facilitate continuous learning of project management team.

The Risk registry has been reviewed by the Work Package leaders and the Project Management Board five times during the project lifetime: 10.2015, 3.2016, 9.2016, 2.2017 and 8.2017.

During the project all risks related to the EGI governance, complementing project risks, have been tracked within the Integrated Management System (IMS), where a risk management process has been designed based on the EGI-Engage experience. The last project risk registry review aimed to detect those risks that after the project should be tracked by IMS risks management as relevant and useful to the exploitation of project results. 21 risks were identified as those needed to be followed up after the end of the project. The ownership of those risks will be reassigned to appropriate services owners or process owners and reviewed periodically.

16 risks were marked as deprecated and kept together with previously deprecated risks for future references, as lessons learned for future projects.

From the 21 risks which are be still valid after the project, in terms of risk level:

- 12 are at low risk level
- 4 are at medium risk level
- 5 are at high risk level

In terms of ownership:

- 2 were owned by WP1
- 4 were owned by WP2
- 3 were owned by WP3
- 9 were owned by WP4
- 3 were owned by WP5

6 Gender plan

Mainstreaming genders in a project is a task that falls under the responsibility of the project's coordinator. However, the actual gender mainstreaming within activities allows for considering that all project's partners are to consider how they will mainstream gender issues within and outside their projects' activities. Most of the partners in EGI-Engage are organisations with an established policy of equal gender opportunities. The EGI-Engage management is committed to ensure equal opportunity, according to EU rules and guidelines, when hiring new project staffs. In parallel, the project coordinator will strive to keep the institutions that are part of the consortium positively motivated towards gender issues by raising awareness at management level.

7 Conclusions

The quality plan within EGI-Engage project identified the quality requirement of the project and documentation steps required to demonstrate project compliance. It provided guidance and directions on how quality has been managed and validated. It also described Quality Assurance and Quality Control processes within the project.

The Quality Assurance process was responsible for assessing if quality guidelines defined in Quality Plan, have been followed and weather were appropriate during the project lifetime.

A phased review mechanism has been put in place to ensure that the formal output of the project is of a high quality. This took place through technical review within the activity responsible for the initial work, review external to the producing activity to groups within the project that are consumers of the work, review across all activities of the project through the Activity Management Board, and then finally alignment with the managerial aspects of the project through the Project Management Board. While specifically focused on the project's milestones and deliverables, this process of open review was used across all aspects of the project.

Quality Control process collected and monitored the Key Performance Indicators (KPIs) and activity metrics, these provided a continuous approach to monitoring the performance of an activities or tasks.

This document provided final status of quality within the project as well as number of activities that have been performed during the reporting period. In addition a separate section on Integrated Management System has been provided. This management system will take care of operation and delivery of project results after the project lifetime.