Collaborative Project

Holistic Benchmarking of Big Linked Data

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Deliverable 9.3
Quality Assurance & Risk Assessment Plan

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Abstract: This deliverable serves as handbook for project partners and describes processes and instruments adopted within the project for the regular quality monitoring and risk assessment.

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Executive Summary

This deliverable presents a handbook for the Hobbit project partners. It aims to outline rules, mechanisms and processes that are established in order to maintain a certain quality level in the whole project structure and its outcomes. Another focus is laid on how to identify and monitor potential project risks as well as on describing steps and actions needed to set up and implement appropriate contingency plans.

In doing so, the main goal of the handbook is to provide guidance to all partners with regard to questions of management and quality control as well as to facilitate their cooperation within the project. It aims to depict efficient ways of collaboration between management team and Work Package (WP) leaders necessary for the successful implementation of the instruments and techniques described in the following sections. It will support partners through clear and concise management and quality procedures to achieve their specific missions and tasks. In conjunction with D9.1 Project Management Plan, this guide serves as a core reference for the consortium's organisation and delivery of the day-to-day work throughout the project and will be updated, if required.

In the following sections the deliverable comprises an overview of guidelines for quality planning and controlling. These directives are drafted by defining criteria, methods and responsibilities of those involved. Tasks addressed cover, for instance, the preparation and review of a deliverable, the management of a problem, the request for change or the decision making within the project. The final section will specifically deal with the work of risk management and outline processes and procedures that the project, for instance, adopts to handle unforeseen changes such as amendments.

Abbreviations and Acronyms

CO Coordinator

DoA Description of Action

EB Executive Board

EC European Commission

EU European Union

GA Grant Agreement

PB Project Board

PC Project Consortium

PO Project Officer

WP Work Package

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1 Quality Approach

1.1 Quality Planning

This task is about defining the outcomes targeted within the project as well as about outlining criteria, assessment methods and partners' responsibilities to ensure a high-level quality of the project results. It aims to enable agreement and a common understanding among the consortium members on the quality expectations and the tools and means by which to achieve and assess the quality defined for the varied project results. Moreover, it serves the management in communicating and controlling the standards laid down for the purpose of quality assurance.

1.2 Quality Responsibilities

Effective coordination, communication and collaboration are central to the successful implementation of the project. The general structures set up for these areas of activity are detailed in D9.1 Project Management Plan and while everyone in the consortium is responsible to deliver high-quality project results, there are various project roles with a specific quality assurance responsibility.

As the consortium's ultimate decision-making body, the Project Board (PB) is also responsible for the overall assessment of the project's progress and consequently for defining a set of expectations, criteria and means that help to verify the progress of work, the quality of results and their correspondence with the overall project objectives and time scheduling.

The Coordinator (CO) oversees the quality management on a day-to-day basis, which includes the following tasks:

- To ensure that project results meet the quality expectations and acceptance criteria defined within the consortium in such a way that they (e.g., deliverables) can be submitted to the European Commission (EC)
- To ensure that WP leaders implement quality control measures
- To ensure internal consensus about and compliance with the rules and principles that are established for the purpose of quality assurance
- To ensure that rules and mechanism for problem management and conflict resolution are applied in case of potential disputes

A number of specific roles assigned in the Hobbit project on a more operational level also adopt responsibility in the project's quality management. In guiding and supporting partners in their community-building efforts, the Outreach Manager is responsible for the efficient and successful outreach of Hobbit in all the relevant communities. This task involves mainly the supervision of dissemination activities as well as requirements elicitation processes so as to make sure that the goals and targets set within this project area are achieved and also met in a timely and effective fashion.

The Technical Manager is responsible for the technical vision of the project and its successful implementation. This task is largely about monitoring the technical development and the integration of all deployed services, in particular, in view of expected quality, innovation and impact.

Consisting of all WP leaders, the Executive Board (EB) contributes to the project's quality management by ensuring that all activities are executed in accordance with the Description of Action (DoA).

If needed, the EB takes appropriate actions to adjust the activities of a WP or task and reports proposed changes to the PB and CO.

It is in particular the task of each WP leader to coordinate the work in their WP. Based on an appropriate work plan initially defined by the WP leaders, they monitor the work and progress of partners involved making sure that tasks are completed in a timely manner. They also identify and manage deviations from schedule and other problems that may affect other tasks and initiate, possibly with the PB and CO, corrective actions. In this respect, they ensure an accurate and effective project implementation to meet targeted outcomes and objectives. They also provide assessment of achievements such as milestones and deliverables and ensure that project results meet the expected quality. Following the reporting strategy adopted in the project, they give feedback to the PB and CO about the development and progress of work on a regular basis, advise on known or potential problems that require management action and propose changes in future plans.

1.3 Quality Assurance and Control

The aspect of quality is managed on two levels in the project. Quality assurance comprises techniques and practices that help monitor the progress of the project and ensure quality in the processes by which results are achieved. That is, this task involves looking at how outputs were achieved and evaluating activities that drive the project implementation. In practice, the focus will be on monitoring milestones and targets that largely reflect the requirements of the DoA in the following project areas:

- Effective project management
- Adoption of standards
- Code quality (e.g., continuous integration)
- Dissemination and outreach activities (e.g., engagement level of target audiences, website and social media channels)
- Sustainability and exploitation network (esp. potential users of project outcomes, potential members of the Hobbit Association)
- Deliverables (peer-review)
- Milestones

By contrast, quality control circumscribes techniques and practices that serve to evaluate the different output types of the project (e.g., content, technical/software, evaluation/validation, dissemination/valorisation, scientific publications). This task means to determine whether the project's achievements fulfill the quality requirements and represent ultimately success or failure pertaining to contractual targets. Thus, it is simultaneously also about identifying ways to eliminate causes of unsatisfactory performance. Depending on the type of project result, quality control may additionally assess project results by aspects such as innovation (has anything genuinely new been developed?) and impact (e.g., number of systems benchmarked using the Hobbit platform, increase in performance over the project's lifetime).

1.4 Quality Implementation

1.4.1 Actions and Decisions

Actions present specific directives and instructions for individual project members or project teams to implement the project successfully and on time. They result from plans, agreements and decisions made during meetings, telcos or via email and correspond to important deadlines laid down in the DoA. Meeting minutes will generally contain a list of new and ongoing actions with the following data:

- WP/task (i.e., number and possibly title)
- Responsible person (i.e., personal and beneficiary's name)
- Description of action (i.e., what is to do)
- Deadline for action (i.e., when is it expected to be done)

Decisions are official statements that are taken and approved at the PB level. They may involve adjustments in terms of work plan, schedule, budget and responsibilities and can be of the following type:

- Accept
- Accept with comments and special conditions
- Reject
- Defer (not approved, but left for consideration later)

Decisions are documented in meeting minutes and communicated via email including the following references:

- WP/task (i.e., number and title)
- Responsible person (i.e., personal and beneficiary's name)
- Description of decision
- Voting details

Decisions are regarded as implemented when the issue has been solved and corrective action has been taken.

1.4.2 Change Control

This process is a relevant part of the project management to ensure an adequate administration and controlling of change proposed during the project. It describes how to request, review and approve change before implementation. Change control involves the following steps:

- Request change

- Evaluate impact
- Make a decision
- Implement change
- Close change

Two aspects related to changes will be clearly documented during the project. Changes requested and decisions made are recorded, while details of each change are also documented.

Any participant in the HOBBIT project may suggest a change to the project by providing a description of the change and a justification. The CO will ensure that it is documented and recorded as required as well as proactively managed. Initially, the need for change will be examined and its overall effect on the project be evaluated. That is, a recommendation of whether a change should eventually be carried out or not will be based on the assessment of the following aspects:

- Quantifiable cost savings and benefits
- Legal, regulatory or other unquantifiable reason for change
- Estimated cost of the change
- Impact on timescales
- Extra resources needed
- Impact on other project activities
- New risks and issues

This assessment is made by the most appropriate member of the Project Team in close collaboration with the project manager (and when fitting the CO). Based on their conclusions, an approved authority will consider the change request and make a decision. Authorities may differ according to the type of change to be dealt with:

- Minor changes within scope can be approved by the CO.
- Changes affecting the deadline of a deliverable or other project results need to be reviewed by the CO and the PB who will confirm the necessary revisions to get the project back on course.
- Changes of scope and contract revisions will require the approval of the EC.

If the change is approved, it is planned, scheduled and executed as agreed with the relevant project members. A post-implementation review is foreseen for changes with major impact on the project. Once implemented, the person who proposed the change checks and agrees on its implementation, and it is marked as closed in the project records by the project manager.

1.4.3 Collaboration Infrastructure

In order to easily share, coordinate and collaboratively work on project-related activities (e.g., WP tasks, deliverables, reports, data sets, source codes, agendas and meeting minutes as well as guidelines) the HOBBIT consortium mainly uses a GitLab repository and wiki. Google services are also used in some instances when primarily dealing with non-confidential documents and information.

The project's Google Event Calendar HOBBIT allows the coordination and common scheduling of project activities (e.g., internal conference calls, reports, deliverables, workshops etc). A general as well as WP-related mailing lists are used continuously to address HOBBIT-relevant topics and activities within the consortium as well as within individual groups dedicated to different fields of project work. It is recommended to start the subject of project e-mails with the project acronym HOBBIT to allow recipients to filter e-mails by using their e-mail client facilities. Another recommendation is to mind the difference between addressees and cced recipients. Addressees are directly concerned and should respond within the next two business days whereas the message is merely informative for those listed in Cc.

1.4.4 Templates

Among the various formats in which project work is implemented in the HOBBIT project, there are three distinct document types that are provided for the following purposes:

- Documents for the EC, including deliverables, periodic reports, explanation of the use of resources and financial statements.
- PowerPoint/Latex presentations for internal and external use, e.g., for project meetings, reviews, presentations during workshops, exhibitions, conferences etc.
- Latex/web-based documents for internal use: e.g., agendas, minutes, other contributions etc.

Templates for deliverables have been created in LaTex and Word. These and other documents for the EC are made available via the project's GitLab repository. Front covers and initial pages will contain essential project information as well as document-specific details. Included will be the following pieces of content:

- Project title, project acronym, Grant Agreement (GA) number, program and type of action as well as European Union (EU) emblem and project logo (in accordance with Art. 29.4)
  This information is for referential purpose as well as to acknowledge the receipt of funding from the EC.
- Dissemination level
  This field indicates whether the document is for public use (i.e., fully open) or of confidential kind (i.e., restricted under conditions set out in the Model Grant Agreement to, for instance, consortium members, Project Officer (PO) and project reviewers) or is marked as CI (i.e., classified, information as referred to in Commission Decision 2001/844/EC).
- Due date and actual date of submission
  This field shows contractual deadlines and real completion dates.
- WP/task number
  This information of the relevant WP/task is for referential purpose only.

- Nature of foreground
  This field indicates the type of result produced in the project and comprises examples such as report, demonstrator, pilot, prototype, websites, press & media actions, and software.
- Approval status
  This field is to confirm the final status of the document at issue, indicating its acceptance by the person responsible for approval.
- Version
  In this field the version of the document is indicated in a numerical fashion, while the verbal reference 'final' should be used for the submitted version.
- Number of Pages
  This information is to ensure completeness in all digital formats.
- Filename
  A recommended format is to start with the project acronym and GA number in brackets which should be followed by a short content description (e.g., deliverable title) and the correct version number. This form would look as follows: Hobbit(688227)_ContentDescription_v0.1
- History
  This table will report version, date, modification reason, as well as name and organisation affiliation of responsible persons that have performed the respective modification. Versioning will be kept as follows:
  - Version integers are kept for document submission to the Agency. The first submission of a document to the Agency will be marked as v. 1.0 If a second submission is needed, this will be v. 2.0 etc.
  - Version decimals (i.e., releases) will be used for communication between partners. The first draft version to be communicated within the Consortium will be v. X.1, the second v. X.2 etc.
- List of authors
  This table displays names, organisation affiliation and emails of all persons responsible for the document as well as making contributions to it.

Documents will generally contain the following sections:

- Abstract
  This section describes the main task or question to be dealt with in the given document in about two to three sentences.
- Executive Summary
  This section is usually up to two pages long and presents a condensed version of the document. That is, it outlines the objectives and scope of the document as well as the methodology and main results in a concise and brief manner.

These sections should be followed by a table of contents and, if applicable, a list of figures, tables and abbreviations and terms. The subsequent main body of the document contains the following parts:

- Introduction
  This section states the purpose and goals of the document at issue. It must extend upon and be consistent with the executive summary as well as briefly outline the structure of the subsequent document at the end.
- Main body
  This section forms the core part of the document. It explores the subject of the document in detail, also providing valid reasons and justifications. If an evaluation is given (1) the measures used must be explained, (2) the data sets must be presented, (3) an explanation of each figure must be given.
- References
  This section comprises a list of material which has been used as a source for writing the document. References are added either at the end of each document or at the end of the relevant section.
- Annexes
  These sections may contain collection of supplementary material.

Finally, in order to ensure consistency and quality of documents produced by the HOBBIT consortium, attention will be paid to the following criteria:

- Headers and footers will be formatted according to template guidelines.
- Fonts, paragraphs, bullets, numbered lists etc. will be formatted in the predetermined styles.
- Captions to all tables and figures will be used.
- References should be presented in a unified way.
- References in the main body should be in the form of [1], [2], etc.

2 Quality Methods

2.1 Milestones

To determine when and where key quality reviews need to take place, the project plan identifies five major key milestones with relevant dependencies between tasks as listed in Table 1:

No	Milestone Title	WP Involved	Due Date	Means of Verification
MS1	Completion of initial requirement elicitation	WP1, 2, 8 and 9	9	Initial requirements have been gathered from the community. The requirements for the HOBBIT platform have been collected. (D1.2.1, D2.1, D8.1, D8.5.1, D9.1, D9.3)
MS2	First version of platform and benchmarks	WP1-9	18	The first versions of platform and benchmarks are available on the project repository. (D1.1.1, D1.1.2, D1.3.1, D1.4, D2.2.1, D2.3.1, D3.1.1, D3.2.1, D4.1.1, D4.2.1, D5.1.1, D5.2.1, D6.1.1, D6.2.1, D7.1.1, D8.2, D8.5.2, D9.2.1)
MS3	Completion of first challenges and workshops	WP1, 7 and 9	26	The first series of challenges and workshops has been completed. (D1.1.3, D7.1.1, D7.2.1, D7.3.1, D7.4.1, D9.2.2)
MS4	Second version of platform and benchmarks	WP1-7	30	The second versions of platform and benchmarks are available on the project repository. (D1.2.2, D2.2.2, D3.1.2, D3.2.2, D4.1.2, D4.2.2, D5.1.2, D5.2.2, D6.1.2, D6.2.2, D7.1.3)
MS5	Completion of second challenges and workshops	WP1 and 7	34	The second series of challenges and workshops has been completed. (D1.3.2, D7.1.4, D7.2.2, D7.3.2, D7.4.2)
MS6	Project completion	WP2, 8 and 9	36	The project has been completed. (D2.3.2, D8.3, D8.4, D8.5.3, D9.2.3)

Table 1: List of Milestones

At these milestones, the PO needs to analyse progress in all tasks against the DoA to ensure work is on track and results achieved so far correspond to what is expected in terms of quality. If necessary, any changes or deviations will need to be reviewed and approved by the PB (see Section 1.4.2).

2.2 Deliverables

Deliverables are important project results that are delivered to the EC. They are created throughout the project to provide the required project output and impact. In total, 52 deliverables are scheduled in the HOBBIT project. 25 of these are due between M1-M18 and 27 deliverables are due between M19-36. The assignments of deliverable author(s) and reviewer(s) are determined well in advance for at least an entire project year. Table 2 presents the expected deliverables and the partners which are responsible for reviewing the corresponding deliverable.

No	Deliverable Title	Reviewers
D1.1.1	Preliminary Community Member List, Use Cases, and Datasets	InfAI
D1.1.2	Intermediate Community Member List, Use Cases, and Datasets	NCSR-D
D1.1.3	Final Community Member List, Use Cases, and Datasets	AGT
D1.2.1	Requirements Specification from the Community	NCSR-D
D1.2.2	Requirements Specification from the Association	NCSR-D
D1.3.1	Preliminary Association Mission Statement and Business Scenarios	Fraunhofer-IAIS
D1.3.2	Final Association Mission Statement and Business Scenarios	USU
D1.4	Reachout Strategy Plan	Fraunhofer-IAIS
D2.1	Detailed Architecture of the HOBBIT Platform	AGT
D2.2.1	First Version of the HOBBIT Platform	AGT
D2.2.2	Second Version of the HOBBIT Platform	AGT
D2.3.1	First Maintenance and Update Report of the HOBBIT Platform	NCSR-D
D2.3.2	Second Maintenance and Update Report of the HOBBIT Platform	IMINDS
D3.1.1	First Version of the Data Extraction Benchmark for Sensor Data	Fraunhofer-IAIS
D3.1.2	Second Version of the Data Extraction Benchmark for Sensor Data	Fraunhofer-IAIS
D3.2.1	First Version of the Data Extraction Benchmark for Unstructured data	NCSR-D
D3.2.2	Second Version of the Data Extraction Benchmark for Unstructured data	NCSR-D
D4.1.1	First Version of the Linking Benchmark	InfAI
D4.1.2	Second Version of the Linking Benchmark	InfAI
D4.2.1	First Version of the data Analytics Benchmark	Fraunhofer-IAIS
D4.2.2	Second Version of the data analytics benchmark	Fraunhofer-IAIS
D5.1.1	First Version of the Data Storage Benchmark	FORTH
D5.1.2	Second Version of the Data Storage Benchmark	FORTH
D5.2.1	First Version of the Versioning Benchmark	AGT
D5.2.2	Second Version of the Versioning Benchmark	IMINDS

D6.1.1	First Version of the Question Answering Benchmark	FORTH
D6.1.2	Second Version of the Question Answering Benchmark	FORTH
D6.2.1	First Version of the Faceted Browsing Benchmark	FORTH
D6.2.2	Second Version of the Faceted Browsing Benchmark	FORTH
D7.1	First Preparations Report	Openlink
D7.1.1	First Workshop Proceedings	FORTH
D7.2.1	First Workshop Organization Report	TomTom
D7.2.2	Second Workshop Organization Report	TomTom
D7.3	Second Preparations Report	TomTom
D7.3.1	First Challenge Results Overview	IMINDS
D7.3.2	Second Challenge Results Overview	IMINDS
D7.4	Second Workshop Proceedings	USU
D7.4.1	First Challenge Evaluation	USU
D7.4.2	Second Challenge Evaluation	USU
D8.1.1	Initial Online Presence	InfAI
D8.1.2	Project Fact Sheet, Press Releases and Online Presence	Ontos
D8.2	First Dissemination Report	InfAI
D8.3	Final Dissemination Report	InfAI
D8.4	Standardization Report	Openlink
D8.5.1	Initial Data Management Plan	USU
D8.5.2	Intermediate Data Management Plan	InfAI
D8.5.3	Final Data Management Plan	USU
D9.1	Project Management Plan	USU
D9.2.1	Annual Public Report of the First Year	TomTom
D9.2.2	Annual Public Report of the Second Year	TomTom
D9.2.3	Annual Public Report of the Third Year	TomTom
D9.3	Quality Assurance & Risk Assessment Plan	USU

Table 2: List of Deliverables

2.2.1 Production of Deliverables

Each deliverable will be created through a similar process. Figure 1 presents the phases and timeframes for the timely and effective production of deliverables:

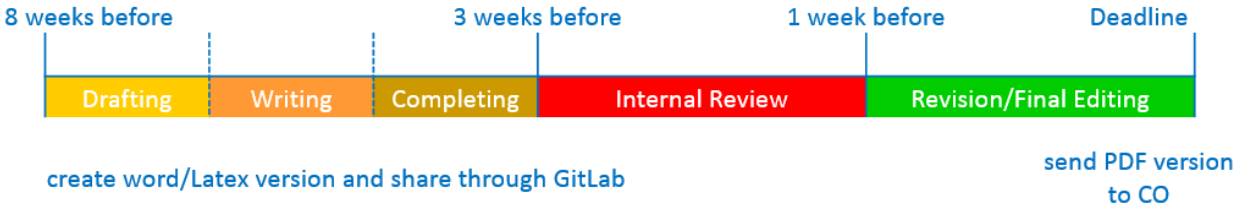

Figure 1: Deliverable Production Process

Firstly, the main author(s) of a deliverable are assigned in agreement with the WP leader responsible for the final approval of the deliverable. Then the structure of a deliverable and the task allocation of partners involved are discussed and confirmed with the WP leader. Those assigned to contribute will focus on providing appropriate content to the partner responsible for writing the deliverable. Based on the received input, the author(s) will prepare a final draft of the deliverable and will circulate it to the relevant peer-reviewers for feedback. Additionally, the review process is announced via the general mailing list informing also other partners who are not involved in the given work and inviting for voluntary feedback. The review period for the reviewers takes one week. Based on received comments, the responsible partner will have a period of one week to undertake all necessary improvements and changes in the document and prepare a final version to be sent for review and approval to the WP leader. When officially approved, the CO submits the final PDF version to the EC and, unless it is of confidential nature, makes the deliverable publicly available on the project's website.

The progress of deliverables is regularly checked and discussed with the WP leader and within the consortium. This process allows the main author(s) to communicate problems and delays that need to be addressed for the successful completion of the deliverable and that may require appropriate intervention through the WP leader. Any need to replan and reschedule work should be handled in agreement with the CO as outlined in Sections 1.4.2 and 3. The CO informs the PO accordingly if encountering more than a one-month delay and provides feedback from the partners involved in the WP and deliverable at issue.

2.2.2 Assessment of Deliverables

Deliverables are assessed for completeness and fitness. A quality assessment may happen through an evaluation/test (if results are objective and quantifiable) as well as a review. Both are conducted in a systematic and documented fashion. A review marks the completion and approval of a deliverable. Evaluations or tests may complement a review by providing objective means to assess the results presented in the deliverable (e.g., unit tests). A clearly structured review process has been defined by the consortium. This process is based on minimal rules which are implemented in cooperation between main author(s), WP leader and CO. Each deliverable will have at least one reviewer who is designated by the main author(s) in agreement with the WP leader and CO. One can, of course, choose more reviewers if one thinks it suitable. The peer reviewer(s) should be chosen from an organisation other than the one(s) responsible for the deliverable. The approval delegate is usually the WP leader. When

starting to write up a deliverable, the WP leader will evaluate the Deliverable Development Plan based on the following indicators:

Quality Indicators	Reference
The proposed contents reflect the objectives stated in the DoA.	HOBBIT DoA
The allocation of tasks corresponds to the roles and abilities of the partners involved in the WP/task.	HOBBIT DoA
The proposed timetable matches the expected submission date to the EC.	HOBBIT DoA

Table 3: General Quality Indicators

During the process of drafting, the main author(s) will be responsible for checking the quality of the deliverable as it progresses (according to the same indicators in the table below). Reviewers will be asked to comment on the deliverable draft and undertake an overall assessment by evaluating the deliverable against the DoA as well as by evaluating the general quality of the deliverable. The WP leader will also evaluate the final draft of each deliverable in terms of content and quality, while the CO will additionally perform a final editing of language and style before the deliverable is submitted to the EC. Table 4 provides a short list of indicators that reviewers, WP leader and CO will use to assess the general quality of each deliverable.

Quality Indicators	Reference
The deliverable reflects the objectives stated in the DoA.	HOBBIT DoA
The deliverable fully documents relevant work carried out in the corresponding WP/task.	HOBBIT DoA, project meetings
Templates are used as provided by the CO and as outlined within D9.1 Management Plan.	HOBBIT DoA, D9.1
The deliverable is clear and legible.	Editing in terms of language, formal structure and presentation of contents
The deliverable is complete.	Checking for missing parts, non-existent references, topics not covered and unclear arguments
The deliverable is useful for the target reader/audience.	HOBBIT DoA, Project Dissemination Plan
Version history is clear and well-documented.	Versioning is based on Git and version numbers are explicitly mentioned in the document.

Table 4: Deliverables Quality Indicators

Based on this list, the reviewer(s) will prepare their comments and circulate them to the authors and partners involved including the WP leader and CO. This process will be repeated until the deliverable's quality is considered satisfactory. When all comments have been addressed and integrated, the final version will be officially approved by the WP leader and sent to the CO with a request for submission.

2.3 Dissemination

Disseminating project results is an important process to make the project known and outcomes available to the project's stakeholder and a wider audience. It can drive the take-up and sustainability of the project's outputs in the long run. Dissemination activities are generally overseen by the Outreach Manager who can also be consulted on how to disseminate project results successfully. Part of the basic form required for the purpose of dissemination is the appropriate placement of logos and a clear textual reference to the project's funding. Unless otherwise agreed with the EC or unless it is impossible, any dissemination of project results must display the EU emblem and contain the following text in accordance with Art. 29.4: "This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 688227." In addition, the project logo should be visibly included. Information for further guidance can be found in the project's dissemination plan.

2.4 Work Packages

The WP leader is in charge of making sure that project work is carried out according to schedule and targeted outcomes are achieved within the given timeframes. WP progress is evaluated on the basis of the quality indicators listed in Table 5. In addition, this quality assurance and control allows to discover delays and errors as early in the project lifecycle as possible. As soon as any risk is identified, the WP leader will define a mitigation strategy as outlined in Section 3.

Quality Indicators	Reference
The WP and task activities correspond to what is planned and outlined in the DoA.	HOBBIT DoA
Development is consistent with results of requirements elicitations.	Requirements specifications
The WP and task activities are based on a work plan.	HOBBIT DoA, WP work plan
Progress is regularly documented.	Monitoring reports (Periodic Reports, Annual Public Reports), internal reports (general and WP-specific telcos and minutes, etc.), deliverables
Architecture is available.	Internal documents, deliverables
If necessary, a realistic risk assessment and recovery plan are provided.	Internal documents

Table 5: Work Package Quality Indicators

2.5 Benchmarking Platform

The Benchmarking Platform is the core technical result of the HOBBIT project and central for the achievement of the project goals (e.g., development of benchmarks, challenges). It will be evaluated according to the international standards for software development and products as set down in [1]. This document prescribes a set of characteristics for external and internal quality assessment as shown in Table 6:

Quality Indicators	Reference
Functional Suitability	The capability of the software product to provide functions that meet stated and implied needs when the software is used under specified conditions.
Performance Efficiency	The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.
Compatibility	The capability of the software product to have two or more of its systems or components exchange information and/or perform their required functions interact with one of more specified systems while sharing the same hardware or software environment.
Usability	The capability of the software product to be understood and used by specific users to achieve specific goals with effectiveness, efficiency and satisfaction in a specific context of use.
Reliability	The capability of the software product to maintain a specified level of performance when used under specified conditions for a specified time.
Security	The capability of the software product to protect information and data so that unauthorised persons or systems cannot read or modify them and authorised persons or systems are not denied access to them.
Maintainability	The capability of the software product to be modified. Modifications may include corrections, improvements or adaptation of the software to changes in environment, and in requirements and functional specifications.
Portability	The capability of the software product to be transferred from one hardware, software, or other operational or usage environment to another.

Table 6: Technology Quality Indicators

3 Risk Management

This part of the project management deals with identifying, evaluating and eliminating or minimizing potential risks that may jeopardize the success of the project. While the consortium has initially described relevant project risks and how to address them in the DoA, risk management will be conducted throughout the project. It is a continuous process in which known risks will be regularly reviewed and new risks will need to be recognized so as to handle and control them adequately. Their assessment will lead to the formulation of appropriate mitigation measures that should help to prevent and overcome a risk or reduce its effects to an acceptable level. The process behind risk management can be broken down as follows:

1. Risk identification (i.e., recognize and describe risks)
2. Risk analysis (i.e., analyse likelihood and consequences of risks)
3. Risk assessment (i.e., determine magnitude/acceptability of risks for the project)
4. Risk response planning (i.e., create and execute action plan to prevent or minimize risks)
5. Risk control (i.e., monitor, track and review risks and mitigation actions)

In general, the approach and implementation of risk management is overseen by the Project Consortium (PC) in collaboration with the CO and project management. Risk management is specifically carried out on both the strategic and operational project levels to ensure that risks identified with the project are handled adequately. At the strategic level risk management focuses on the WPs' contribution to the project objectives which is the responsibility of the PB. At the operational level risk management focuses on the activities within WPs, which is the responsibility of each WP leader.

The following basic risk factors may apply to any level of the Hobbit project:

- Complexity, i.e.,, , activities may be too complex to be realized.
- Scope, i.e., number of activities may be too large for partners to realize and/or manage at once.
- Capacity, i.e., one or more partners may not be able to complete their tasks without other partners being able to take over.
- Reliability, i.e., project methods and strategies applied could be inappropriate to realize the intended outcomes.
- Validity, i.e., outcomes may not reflect the real needs and priorities of the stakeholders.
- Sustainability, i.e., project outcomes may not lead to a sustainable outcome.

These factors will be detailed further in terms of: identified and quantified risks; contingency action per identified risk; monitoring mechanism; quantified threshold level; and line of action when threshold is overstepped. Mitigation measures developed by the team members involved will need to reflect the risk policy that the PB and PC are responsible for and will be decided upon as shown in Table 7.

Including partners from several countries and with different expertise, the consortium identified a number of management and technical risks prior to the project start. In order to minimize these

	Risks	Actions	Decision Makers
Complexity	Activities may be too complex to be realized.	Review activities and scale down project ambitions	PB (in agreement with PO)
Scope	Number of activities may be too large for partners to realize and/or manage at once.	Prioritize and scale down ambitions	PB (in agreement with PO)
Capacity	One or more partners may not be able to complete their tasks without other partners being able to take over.	Replace defaulting partners	PB (in agreement with PO)
Reliability	Project methods and strategies applied could be inappropriate to realize the intended outcomes.	Adjust project methods and strategies	WP leader (in agreement with PO)
Validity	Outcomes may not reflect the real needs and priorities of the stakeholders.	Adjust project activities and outputs	PB (in agreement with PO)
Sustainability	Project outcomes may not lead to a sustainable outcome.	Adjust project activities and outputs	PB (in agreement with PO)

Table 7: Sample Risk Methodology

foreseen risks, the partners have concretized the project as much as possible and have agreed on the global project tasks. Furthermore, an elaborate project management structure has been defined in order to monitor the cooperation between the partners and identify and investigate potential as well as new emerging risks as soon as possible. The list of already known potential risks and corresponding contingency plans can be found in Table 8.

Our approach to risk management has already been proven efficient in the HOBBIT project. In M5 the consortium faced the termination of Ontos' participation due to bankruptcy. Due to this loss Annex 1 had to be changed in respect to the reallocation of resources and work, which also led to an amendment. This process and prior preparations were closely discussed and agreed on between the PB, the CO and PO.

No	Description of Risk	WP No	Proposed Risk Mitigation Measures
R1	Data variety: the required formats and data sources are extremely diverse in terms of formats and structure.	WP2-6	The HOBBIT generator will be developed with the stakeholders and provide means to convert data into RDF. Moreover, we will reuse the LOD2 Stack components which facilitate heterogeneous data integration through the use of vocabularies and Linked Data.
R2	Data volume & velocity: The amount of data or speed with which data has to be processed exceeds capabilities.	WP2-6	The HOBBIT platform and its components will be cluster-enabled, thus allowing the increase of the number of cluster nodes when a higher throughput is needed.
R3	Failure to meet user requirements. The software functionalities do not meet user requirements (KPIs, data sources, etc.).	WP1-6	In order to avoid misspecification of software functionalities, HOBBIT will follow an iterative development process and receive community input in all stages of the development.
R4	Future incompatibility: Components in the platform are incompatible with a future need.	WP2	Component interfaces will use recognised standards, particularly W3C standards that guarantee long-term stability and interoperability.
R5	Demand for the latest fashion: Technologies go through fashions and technologists, especially young technologists, are keen to be seen to be using the latest thing, irrespective of how it fits in with everything else.	WP1 and WP3-6	We will be driven by industrial requirements and ensure that we develop benchmarks that are indeed required and requested in real use cases using real data. We will consider the development of benchmarks for new steps and requirements if sufficient demand from the community exists and if the project resources permit.
R6	Usability: The complexity of the data and software architecture hinder effective and efficient handling.	WP2	The HOBBIT platform will comprise generic and domain-specific blueprints for the development and integration of benchmark components as well for the extension of the platform itself. By these means, HOBBIT will provide solutions to common requirements and specific purposes.

R7	Community acceptance: Risk to develop benchmarks that are not deemed relevant by the communities that rely on BLD.	WP1	HOBBIT is designed so as to involve the relevant communities from the beginning of the project on. Our already large networks of companies and academics will ensure that the voice of the relevant actors is heard in the project from the beginning onwards. Moreover, the consortium consists to 50% of companies. Therewith, we have ensured that the basic requirements behind this proposal are of high relevance of modern data-driven companies.
R8	Hardware resources from third parties not available.	WP7	HOBBIT is designed so as not to depend on any third parties. Correspondingly, the hardware available to the project is sufficient to carry out all evaluations foreseen in the project description. The supplementary resources (especially hardware) provided by third parties (SCADS, BioASQ, Computing centre at the University of Leipzig) would allow the challenge participants to carry out concurrent training and tests remotely, i.e., on hardware premises provided by HOBBIT. The non-availability of third-party hardware would be met with a reduction of the number of remote tests that participants can carry out and would not endanger the execution of the project.
R9	Critical Path Awareness. Within the critical path a delay of a deliverable would result in delays of the following development, prototypes, tasks and work packages.	WP9	Monitoring the effort spent and regularly comparing actual and planned achievements, the management team will identify any slippage and ensure that any underestimation of effort is dealt with as early as possible. In the unlikely event of delays or underestimated effort remaining unnoticed for longer periods, the management team - in consultation with the EC services - will appropriately adjust the work plan and / or allocated effort.
R10	Underestimation of the required effort.	WP9	Monitoring the effort spent and regularly comparing actual and planned achievements, the management team will identify any slippage and ensure that any underestimation of effort is dealt with as early as possible. In the unlikely event of delays or underestimated effort remaining unnoticed for longer periods, the management team - in consultation with the EC services - will appropriately adjust the work plan and / or allocated effort.

R11	Loss of key personnel and delays due to re-hiring.	WP9	Each partner is responsible for making sure that the case of personnel turnover can be sufficiently handled.
R12	Beneficiary goes out of business or relevant unit of a beneficiary is shut down within the duration of the project.	WP9	If possible, we will aim at finding a suitable replacement partner and rearrange the tasks within the project in agreement with the Project Officer. If this is not possible, a contract amendment will be aimed for.
R13	Datasets from third parties not available.	WP7	HOBBIT is designed so as not to depend on any third parties. The supplementary datasets that are to be provided by third parties (Weidmüller) would allow for more versions of the data generators to be created. However, we deem the number of datasets available through project partners sufficient to cover a significant variety of use cases through the corresponding benchmarks. Moreover, in cases the third-party datasets become unavailable, they will be replaced by datasets gathered through the calls for participation in WP1.

Table 8: Critical Implementation Risks and Mitigation Actions

References

[1] ISO/IEC 25010:2011 (E). (2011) *Systems and Software Engineering - Systems and Software Quality Requirements and Evaluation (SQuaRE) - System and Software Quality Models.*