D1.6 Quality Assurance & Risk Management Plan v3.0

DURAARK

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Executive Summary

In this report, we present the third and final version of the Quality Assurance & Risk Management Plan (QA&RM), which details the updated management structure, reports the adopted communication and quality assurance mechanisms and provides a revised and updated overview on the identified risks and contingency plans. In particular, risks and issues emerged during the second year and taken coningency actions are desribed, together with a revised overview of monitored risks. While all shown sections are revised to some extent and sections which did not require modification had been removed from this report, the most significant modification is the updated risk management plan and the reflection on contingency actions taken in year two. In addition, while a significant effort had been spent by the entire consortium to update the *Description of Work* to reflect the experiences and activities of the first year, taking into accounts the review recommendations received during the first review, these also represent essential quality assurance activities and are reported in this document.

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1 Introduction

In this deliverable, the third and final version of the Quality Assurance & Risk Management Plan (QA&RM), we describe the updated management structure, reports the adopted communication and quality assurance mechanisms and provides a revised and updated overview on the identified risks and contingency plans. In particular, risks and issues emerged during the second year and taken coningency actions are desribed, together with a revised overview of monitored risks.

It should be stressed that the QA&RM plan complements both previous versions of the same deliverable (i.e. D1.1.2 and D1.1.4) and existing agreements, such as the ones defined in the DURAARK description of work (DoW), Consortium Agreement and Grant Agreement.

To avoid redundancies, all sections which did not require modification had been removed from this report. While some sections in this document strongly overlap with the ones reported in earlier versions, we only included the subsections and paragraphs containing relevance changes and updated. The most significant modification is the updated risk management plan and the reflection on contingency actions taken in year two. Updated risks and contingency plans, particularly from a more technical and WP-specific point of view, had been gathered with the help of all WP leaders, and are consolidated in this document. In addition, while a significant effort had been spent by the entire consortium to update the *Description of Work* to reflect the experiences and activities of the first year, taking into accounts the review recommendations received during the first review, these also represent essential quality assurance activities and are reported in this document.

2 Updated Management Structure

The management structure of DURAARK maintains the original hierarchy since the beginning of the project. However, due to a number of reasons, most notably fluctuation in corresponding partner institutions, the appointed experts covering the key management roles varied. Hereafter, we report the personnel updates.

2.1 Technical Manager (TM)

The main objective of the TM is to coordinate the communication, co-ordination, and cooperation between the work packages of the project. The main duties of the Technical Manager are to support the Project Coordinator and the General Assembly in monitoring technical coordination aspects of project progress and quality of results; to request additional reports and remedial actions from Work Package Leaders, should there be any doubt concerning project progress; to assist the partners in building consensus in the case of disagreements in technological decisions. The technical coordination of the project was carried out in the first year by UBO. Unfortunately, the lead personnel involved in the technical coordination (Prof. Reinhard Klein, Raoul Wessel) is only available for DURAARK with limited resources, due to unexpected obligations which emerged recently. Due to these constraints, UBO and TUE have suggested to shift the role of Technical Coordinator from UBO to Dr. Jakob Beetz (TUE), who is leading one of the central WPs in DURAARK (WP3). The consortium has well-received this proposal and fully supports this transition.

2.2 Work Package Leader (WPL)

The DURAARK work plan is organized in eight work packages (WP), each led by a consortium member who nominates a Work Package Leader (WPL) and his/her substitute. WPLs are senior professionals with proven successful experience in leading focused technical work. The WPL has the overall responsibility for the progress and results of the work package, while specific responsibilities include: to propose and implement a detailed plan for the work package, clearly indicating its role with respect to the project vision and its contributions to the overall project objectives; to coordinate the technical and scientific work carried out by the WP members in line with the overall project work plan; to coordinate the development and delivery of the WP deliverables, their content

and interrelationships, and to monitor the respective quality control procedures; to organize work package meetings and provide other communication mechanisms as needed to ensure the quality of the WP results; to establish and coordinate joint work and planning with related work packages, and to manage the exchange of information between them where necessary. During the life of the project we had turnovers on the leaderships of two WPs, i.e. WP2 and WP8. Details are highlighted in Table 2. Currently, the WPL are:

- WP 1 Project Management (LUH):
  Marco Fisichella (fisichella@L3S.de)
- WP 2 System Specification and Integration (FhA):
  Martin Hecher (martin.hecher@vc.fraunhofer.at)
- WP 3 Semantic Metadata Management and Enrichment (TUE):
  Jakob Beetz (j.beetz@tue.nl)
- WP 4 Documenting the changing State of built Architecture (UBO):
  Sebastian Ochmann (ochmann@informatik.uni-bonn.de)
- WP 5 Recognition of Architecturally Meaningful structures and Shapes (UBO):
  Richard Vock (vock@cs.uni-bonn.de)
- WP 6 Long-term Preservation (LUH):
  Michelle Lindlar (michelle.lindlar@tib.uni-hannover.de)
- WP 7 Data acquisition, Evaluation and Test (CITA):
  Martin Tamke (martin.tamke@kadk.dk)
- WP 8 Dissemination and Exploitation (LTU):
  Frode Randers (frode.randers@ltu.se)

3 Communication mechanisms

This chapter outlines the electronic and physical communication mechanisms used by DURAARK project partners. Both the flashmeetings and the general assembly gatherings, with respect to the second year, are reported. Both lists are complementary, with respect to the entire project duration, to the ones presented in the previous version of this deliverable, i.e. D1.1.4.

3.1 Flashmeetings during the second year

The WP leaders agreed to meet electronically every month to exchange information about the overall project's activities. This very frequent communication is important in avoiding risks and managing unexpected delays in the time plan and it is in addition to the other internal communications organized by each individual WP leader.
The electronic meetings are in the form of video-conferencing and are organized via Flashmeeting technology. The meetings are and will be recorded for future reference and any decisions taken during the discussion is later circulated for easy access by all partners. With respect to the second year of the project, the online meeting organized, sorted by chronological descending order, are:

- 2015-January 13 DURAARK Telco
- 2014-December 11 DURAARK Telco
- 2014-November 4 DURAARK Telco
- 2014-October 7 DURAARK Telco
- 2014-September 9 DURAARK Telco
- 2014-August 20 DURAARK Telco
- 2014-July 3 DURAARK Telco
- 2014-June 3 DURAARK Telco
- 2014-May 6 DURAARK Telco
- 2014-April 1 DURAARK Telco
- 2014-February 4 DURAARK Telco

3.2 Project Meetings during the second year

The DURAARK project general strategy for general assemblies and consortium board gatherings is described and agreed upon in the Consortium Agreement. LUH, the project coordinator is responsible for the preparation of minutes for all project meetings. The meeting minutes are sent to all partners for approval.
With respect to the second year of the project, the general assemblies and consortium board gatherings organized, sorted by chronological descending order, are:

- 2015-March 12-13 DURAARK GA meeting (hosted by Catenda in Oslo, Norway)
- 2014-November 10-11 DURAARK GA meeting (hosted by CITA in Copenhagen, Denmark)
- 2014-June 11-12 DURAARK GA meeting (hosted by LTU in Lulea, Sweden)
- 2014-March 12, rehearsal before the 1st DURAARK EU Review (Luxembourg)
- 2014-February 25-26 DURAARK GA meeting (hosted by FhA in Graz, Austria)

4 Submitted Deliverables

A deliverable in a project generally provides information concerning the work outcomes, the general progress and procedures and intermediate or final results. Each and every deliverable should thus be carefully drafted with rich content, a clear structure and a professional presentation. All project deliverables together should comprise a set of informative material with continuity and clear interfacing, and be free of information overlaps or gaps. Deliverables inform the follow-up activities within the project, enable cross-WP collaboration and represent important tangible outcomes for dissemination activities.
In this section, we report all the deliverables submitted until month 24. Specifically, all deliverables due by the 24th month were successfully submitted according to the deadline reported in the Description of Work. Furthermore, in order to maintain the highest level of quality, each deliverable followed the criteria and procedures presented in the previous versions of this report (i.e. D1.1.2 and D1.1.4). Hereafter, we list them.

Id	**Title**	**WP**	**Lead partner**	**Delivery date** (month)
D1.1.1	Project collaboration & communication infrastructure	1	LUH	2
D1.1.2	Quality Assurance & Risk Management Plan v1	1	LUH	2
D1.1.3	IPR management plan v1	1	LUH	2
D1.1.4	Quality Assurance & Risk Management Plan v2	1	LUH	12
D1.1.5	IPR management plan v3	1	LUH	12
D1.6	Quality Assurance & Risk Management Plan v3	1	LUH	24
D1.7	IPR management plan v3	1	LUH	24
D2.2.1	Requirement document	2	LUH	6
D2.2.2	System architecture & specification v1	2	FhA	6
D2.2.3	System architecture & specification v2	2	FhA	12
D2.4	Software prototype v1	2	FhA	18

Id	Title	WP	Lead partner	Delivery date (month)
D3.3.1	Meta data schema extension for archival systems	3	TUE	12
D3.3.2	Ontological framework for semantic digital archive for building components	3	TUE	12
D3.3	Semantic Digital Archive Prototype	3	Catenda	18
D3.4	Semantic Digital Interlinking and Clustering Prototype v1	3	TUE	21
D4.4.1	Software prototype v1	4	UBO	12
D5.5.1	Recognition of meaningful shapes – point cloud compression – IFC storage prototype v1	5	UBO	12
D5.2	Shape grammars for almost invisible objects software prototype v1	5	FhA	20
D6.6.1	Current state of 3D object digital preservation and gap-analysis report	6	LUH	12
D6.2	Ingest and Storage of 3D Objects in a digital preservation system	6	LUH	24
D7.7.1	Current state of 3D object processing in research and practice	7	CITA	12
D7.3	Use case long term Archiving	7	LUH	24
D8.8.1	DURAARK public web site	8	LTU	1
D8.8.2	Dissemination Master Plan and Publicity Material v1	8	LTU	6
D8.8.3	Dissemination report Year 1	8	LTU	12
D8.4	Dissemination Master Plan and Publicity Material v2	8	LTU	18
D8.5	Market Study and Exploitation Plan V1	8	LTU	24

Id	Title	WP	Lead partner	Delivery date (month)
D8.6	Dissemination report Year 2	8	LTU	24

Table 1: **Deliverables submitted until month 24**

5 Improving the work plan

After the end of the first year, we took the opportunity to improve the work plan based on the lessons learned and experiences from the first year. This is an important quality assurance and risk management activity, as it enables a continuous reaction on (a) the actual progress in the project and (b) the observed state of the art in the rest of the world. Given the continuous evolution of the project as well as the research and development landscape, a continuous monitoring and revision is crucial.

5.1 Update of the DoW

As part of the coordination activities in WP1, particularly the risk management and quality assurance in the project, we have requested an amendment of the *Description of Work* (DoW) to reflect the experiences and activities of the first year. This in particular takes into account the review recommendations received during the first review, and the lessons learned and the re-prioritization of activities after the first reporting period. This amendment includes a number of minor corrections (phrasing, deliverable numbering) as well as updates of deliverable timings, task and deliverable descriptions, role assignments, and person month (PM) distributions. The full DoW update is documented in the official annual report for this period.

As priorities within the project emerged more clearly after the first period, an update of the budget calculation and forecast provided before the start of the project has been carried out. This reflects the staffing and personnel situation within each partners' organization and helps to address unexpected events, where roles and assignments had been updated, leading to minor shifts of PM across WPs and organizations.

Furthermore, PM rates and costs could be better estimated and the actual work split and contributions among partners is now better reflected. In order to make better use of the budget and resources, each partner has prepared an improved spending forecast which in some cases includes some budget reallocation, for instance, the shifting of PM across work packages or the suggested shift of (surplus) personnel budget to fund dissemination activities (e.g. through travel budget in the "other costs" category).

All suggested changes respect the following conditions:

- the overall budget / EC contribution does not change

- all foreseen PM are carried out and funded (i.e. shift of personnel budget only suggested in cases where it does not affect the overall amount of PM)
- there are sound justifications for the budget shift (e.g. higher travel frequency, un-anticipated costs etc.)

5.2 Implementation of Review Recommendations

The update of the DoW also took into account the review recommendations received during the first year review. While the general steering of the project was guided by the review feedback, we have summarised the most important actions below.

- **Recommendation c1:** Evidence about the evaluation of lossless compression techniques should be included in D5.5.3.
  Actions: In addition to the compression technique described in deliverable D5.5.1, deliverable D5.3 (renamed after DoW amendment) introduced a method that is more tailored to architectural data in the sense that it can handle incrementally acquired point clouds. Additionally, in D5.3 we are evaluating the compression quality in a (pseudo-)lossless scenario, i.e. keeping the points spatial deviation due to compression below the noise level of the actual point cloud capturing device.
- **Recommendation c2:** Software development guidelines and Q/A methodology for software should be documented in D2.2.4.
  Actions: For the development of the software prototype a coding framework (the DURAARK Framework [1]) was provided to partners to give our developer team clear entry points to add their components functionality. The framework was designed with modularity and extensibility as major goal to ensure a sustainable system also after the project's lifetime. Having defined clear interfaces between the work bench and the components further ensures that those design principles are not invalidated when adding code from new and potentiually unexperienced developers.
  To ease the development work for partners and to ensure code quality as well as design principles, WP2 provides a Wiki-based "Software Development Guide" [2], aggregating necessary documentation for adding functionality to the Workbench

[1] https://github.com/DURAARK/workbench/tree/master/server/core
[2] https://github.com/DURAARK/workbench/wiki

prototype. The page contains an extensive setup description to setup a development environment on Microsoft Windows- and Linux-based operating systems. A video tutorial is provided to introduce the framework and to have a reference for new internal or community developers. An additional written tutorial explains the communication between server and frontend system. Coding Guidelines for the programming languages used in DURAARK are provided. Also, the Workbench's functionality exposed via a RESTful application programming interface (API) is documented for developers in D2.4 (renamed after DoW amendment), Appendix 1.

- **Recommendation c3:** The risk register needs to be periodically updated, to be documented in D1.1.6. Management strategies for technical risks need also to be reported in work package deliverables.
  Actions: In order to systematically gather all technical risks, a section on *Risk assessment* containing foreseen technical risks with respect to each specific deliverable was introduced in each deliverable. This practice was implemented as a general procedure for all deliverables in year two. Contingency actions were described for each identified risk. While WP leaders are monitoring risks of relevance in their WP, the WP1 leader and coordinators monitor risks from an overall project perspective and constantly implement contingency actions when needed (as documented in D1.6). Finally, in deliverable D1.6 (renamed after DoW amendment), the risk register was constantly updated, particularly with technical risks.

- **Recommendation c4:** Future deliverables should discuss implications of conclusions to planning at WP-level, but also to the project as a whole.
  Actions: Mandatory sections on *technical decisions* were introduced and added to the general deliverable template and procedure. These sections contain justifications for technical decisions and a discussion of alternative plans. Furthermore, a final section on *Conclusion and Impact* was introduced in each deliverable and its population was supervised by the coordination team. This section discusses the impact of each deliverable on the project as well as the general impact.

- **Recommendation c5:** A clear plan for contributions to standardization should be documented in D8.8.4.
  Actions: In deliverable D8.4 as well as more recent documents such as D8.5 and D8.6, special attention has been paid to DURAARK's potential for contribution

to standardization. In detail, specifically contributions to best practices and standard procedures, curation and sharing of open vocabularies and schemas have been implemented. Amongst the aforementioned efforts, contribution to standardization included the envisaged extension of an IFC file format towards the IFC/A standard, which provides vast possibilities of semantic enrichment as well as support for efficient 3D point cloud storage. In addition, community efforts towards defacto standards, e.g. for building data schemas, have been established through the [3], which is co-chaired by and srongly linked with DURAARK partners.

- **Recommendation c6:** D8.8.4 should be advanced to M18.
  Actions: Deliverable D8.4 (renamed after DoW amendment), was submitted on the requested deadline, i.e. M18.

- **Recommendation c7:** Consistency of licensing (generated, used) should be verified. Implications of possible incompatibility issues need to be assessed (also cf. Recommendation c3).
  Actions: To gather license information for software in a more systematic way, a mandatory section *Licenses* was introduced in each deliverable of type P (i.e. Prototype) listing licenses. These were constantly discussed and aligned within the entire consortium, in particular by the technical board and coordination team. Deliverable D1.7 summarises all licensing observations and decisions (generated and used) emerged during the two years of the project together with an overall strategy for IPR management and IP exploitation (complemented by D8.5 and D8.6).

[3] http://www.w3.org/community/lbd/

6 Risk Management and Contingency Actions in the second Year

In this section, we outline the actions for the general risk management strategy; furthermore, we elaborate on the actions executed during the second year of DURAARK in response to specific deviations occurred.

6.1 General Risk Management Strategy

In the first two years of the project, we identified and assessed significant risks and we developed contingency plans for the case in which the risk occurs. This continuous process consists of the following steps:

- Identify the risks of any nature that might occur in the project,
- Assess the likely severity of each risk and its potential impact on the project,
- Assess the potential probability of the risk,
- Identify the measures that may be necessary, if relevant, to offset or prevent the occurrence of that risk,
- Identify the measures that may be necessary, if relevant, to minimize the impact of the risk should it nevertheless occur.

To this end, in D1.1.4 we have already established a general risk management strategy which we will follow.

6.2 Actions during the second year

Hereafter in Table 2, we report the actions performed during the second year of the project in order to prevent and deal with risks and deviations occurred. In addition, we present the responses that we elaborated together with all WP leaders in order to implement review recommendations received during the first year. The last column of the table represents the corresponding risk ID previously forecasted and reported in Section 7 (ID #1 - #10) and in D1.1.4 (ID #11 – Risk #23)

#	Risk Emerged	Action	Relevant to Risk ID
1	Change in the Technical Coordination. **Description**: The technical coordination of the project was carried out in the first year by UBO. Unfortunately, the lead personnel involved in the technical coordination (Prof. Reinhard Klein, Raoul Wessel) will only be available for DURAARK with limited resources, due to unexpected obligations which emerged recently.	UBO, LUH, and TUE have suggested to shift the role of Technical Coordinator from UBO to Dr. Jakob Beetz (TUE), who is leading one of the central WPs in DURAARK (WP3). The consortium has well-received this proposal and fully supports this transition.	11
2	Change in the WP leadership for WP2. **Description**: During month 15, the WP2 leader, René Berndt, left the project due to other obligations internally at FhA institute.	FhA staff proposed a change between René Berndt and Martin Hecher who is an expert in 3D Web-Technologies and System-Architecture. The replacement was smoothly since René Berndt helped Martin Hecher from month 15 until month 17. The consortium has well-received and fully supports this succession.	11

#	Risk Emerged	Action	Relevant to Risk ID
3	Change in the WP leadership for WP8. **Description**: During month 21, the WP8 leader, Östen Jonsson, left the project due to serious unexpected personal reasons.	LTU immediately started the process to acquire personnel from internal staff pools. In month 22, LTU identified and proposed to the entire consortium the candidacy of Mr. Frode Randers. He has been working in LDP (long-term digital preservation) Centre for several years. He has been engaged in the EU projects Protage and Ensure in the area of dissemination. Before his employment at LTU, Frode Randers has been working in the ITC industry and as self-employed for several years. The consortium has well-received and fully supports this succession. Furthermore, the entire consortium is assisting Frode Randers especially during this initial transition.	11

#	Risk Emerged	Action	Relevant to Risk ID
4	Improved spending forecast and budget. **Description**: After the experiences and activities of the first period, priorities and actual needs within the project emerged more clearly, allowing for an update of the budget calculation and forecast provided before the start of the project. PM rates and costs can be better estimated and the actual work split and contributions among partners can now be better reflected.	In order to make better use of the budget and resources, each partner prepared an improved spending forecast which in some cases included some budget reallocation, for instance, the shifting of PM across work packages or the suggested shift of (surplus) personnel budget to fund dissemination activities (e.g. through travel budget in the "other costs" category). We respected the following conditions: • the overall budget / EC contribution does not change; • all foreseen PM are carried out and funded (i.e. shift of personnel budget only suggested in cases where it does not affect the overall amount of PM); • there are sound justifications for the budget shift (e.g. higher travel frequency, unanticipated costs etc.) All suggested changes were submitted and approved by the EU commission and a new DoW document containing all changes was produced.	None

Table 2: **Responses during the second year.**

7 Other Identified Risks

In this section, we report important risks that have already been collected and assessed, together with actions to be taken for preventing and dealing with them. This list is complementary to the ones presented in the two previous versions of this deliverable (i.e. D1.1.2 and D1.1.4).

This updated risk assessment table has been revised to better reflect actual project needs and technical risks, as remarked during the first year project review. This work was joint work between the project management and all WP leaders and reflects actual technical risks and quality criteria identified in each WP.

Finally, each risk is contextualized within each WP, as reported in the following listing.

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
12	2	The DURAARK Workbench, described in D2.4, acts as service-oriented platform for the functionality developed in DURAARK and provides a coherent web-based user interface to access the functionality from a stakeholder point of view. One risk could be that the development of web technology based applications loses momentum, resulting in an unsupported development stack.	**Impact**: High **Probability**: Low **Description**: Currently the web browser and the corresponding web technology stack is gaining much attention in application development, mostly because of the advantage of platform independency in the context of mobile development. The probability is rather low that the web technology stack is abandoned in the future.	Low Not observed
	Contingency Solution: WP2 is closely following the developments of web technologies. If the momentum gets lost, the endorsed technology will be evaluated and a plan for porting the existing software will be made. Because of the modular design of the DURAARK framework, a change to existing and well-established technology stacks (e.g. Qt/C++, XAML/C#, Swing/Java) would be possible too.			

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
13	2	The DURAARK framework, described in D2.4, is using an existing Javascript library that is tailored for presenting data in a web browser and for manipulating this data. One risk could be that Javascript, as the main programming language for backend and frontend, is not accepted by the community.	**Impact**: High **Probability**: Low **Description**: In a community it is possible that multiple programming languages are used by respective programmers.	Low Not observed
	Contingency Solution: The DURAARK project endorses developing modular backend functionalities and is exposing them via a well-defined API. If the community is not adopting the Javascript-based approach of the DURAARK framework, it is still possible to use the existing functionality via a RESTful API. Adding a new web service is possible as providing a RESTful API to a functional component is agnostic to the programming language of the underlying component. The mere disadvantage is that the respective developer can not use the already existing DURAARK framework. The integration of new UI modules, which are not based on a web technology stack, is supported; DURAARK is already integrating stand-alone desktop applications which are not web based.		

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
14	2	The DURAARK framework, described in D2.4, is using an existing Javascript library that is tailored for presenting data in a web browser and for manipulating this data. One risk could be that Javascript is too slow as it is an interpreted CPU bound language.	**Impact**: Medium **Probability**: Medium **Description**: Javascript is a scripting language executed by an interpreter. Compared to compiled languages like C++ or Java an interpreted language is slower.	Low Not observed
	Contingency Solution: All computational intensive tasks are executed in different modules (C++/Java/Python) that are chained and wrapped together by thin modular Model-View-Controller (MVC) - style framework with a user-interface on a web frontend.			
15	2	The stakeholder has no or slow access to the internet, the web application can not be executed or file uploads take too long.	**Impact**: High **Probability**: Low **Description**: As web application, the DURAARK Workbench heavily depends on a internet connection with reasonable bandwith for a) accessing the application and b) for uploading files to the web services. A non-existing connection prevents the usage of the software and a slow connection reduces the user experience dramatically.	Low Not observed

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
	Contingency Solution: The M18 version of the prototype is a pure web application and will not work without an internet connection. However, software exists that allow to convert existing web applications into a stand-alone desktop application[45], where the majority of existing source code can be reused without additional programming work. WP2 will look into these projects to assess their capabilities for producing a desktop application as alternative to the current web application. This would remove the necessity for an internet connection and long upload times for large files, as the services working on the files will run locally on the users computer with access to the local files. However, some services in DURAARK are depending on an internet connection (e.g. the semantic enrichment; the SIP upload to a digital preservation service, etc.) and will not be usable without it. Still, the session-based design of the Workbench allows to perform the steps where no internet connection is required and pass on the session to an internet-enabled computer to resume the session there.			
16	3	Scalability issues emerging from a growing number of data-sets in the Semantic Digital Archive (SDA) long term storage of evolving datasets.	**Impact**: Medium **Probability**: Medium **Description**: Linked Data used for the enrichment of newly ingested assets cannot be mirrored in the Semantic Digital Archive Storage (SDAS) anymore. Deltas of present datasets cannot be stored and the *evolution path* of datasets present is lost.	Low Not observed
	Contingency Solution: Additional database hardware and storage space can be added. The SDAS can be distributed over several machines and should scale almost linearly.			

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
17	3	Scalability issues emerging from a growing number of users querying datasets the SDAS with free form queries.	**Impact**: High **Probability**: Low **Description**: Querying the triple store of the SDAS for profiles and records in the SDAS results in sluggish query responses, time-outs or memory issues.	Low Not observed
	Contingency Solution: Next to additional hardware resources, the querying possibilities are restricted to default query templates similar to the ones documented in the appendix. Permissions for arbitrary queries are granted to e.g. scholars only upon request.			
18	3	Formulation of SPARQL queries is too much demanding for end users (e.g. archivists) who are interacting with the data stores (as opposed to the Workbench).	**Impact**: Low **Probability**: Low **Description**: Retrieving meaningful information and records are impossible for end-users. Faulty queries threaten all system performances.	Low Not observed
	Contingency Solution: Provide dedicated (REST) query API encapsulating SPARQL queries in *error proof* calls including time outs, LIMITs etc. Create dedicated UI for SPARQL query compilation e.g. using forms.			

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
19	3	The use of SPARQL end-points is replaced by other standards and future versions of Linked Data are presented differently.	**Impact**: High **Probability**: Low **Description**: Even though they differ in implementation details, SPARQL end-points will likely remain to play a role in the future of Linked Data. Additional layers such as security etc. might be added on top, which would require adaptions of the prototypical tools described here.	Low Not observed
	Contingency Solution: The organisations of the DURAARK consortium are closely following the developments of the Semantic Web and Linked Data communities. If severe modifications of elemental building blocks such as SPARQL end-points are being introduced into the overall Linked Data approaches, conceptual and technical migration paths will very likely be developed along side in many other research initiatives and products.			
20	5	The software prototype supports the detection of sockets and light-switches, but the stakeholder needs the detection of a personalized feature.	**Impact**: Medium **Probability**: Medium **Description**: The software prototype's current implementation is built for detecting sockets and light-switches. Depending on the architecture in question other features may be relevant for detecting the nearly invisible structures in the building.	Low Not observed

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
	Contingency Solution: The design of the software deliverable provides the possibility to execute a picture-based training step before the actual detection of features in the building is taking place. The training step allows the stakeholder to provide pictures of the needed feature (e.g. self-taken or from an online image library) which are used to train the system. After the training phase the algorithms support the detection of those features. Depending on the characteristics of the feature the provided algorithms may not be suited for the detection of the feature, or better suited algorithms exist. In this case, the pipeline-based architecture described in D5.2 allows the integration of those algorithms to fit the needs of the stakeholder.			
21	5	No laser scanner is available to acquire the necessary input data.	**Impact**: Low **Probability**: Low **Description**: A stakeholder does not have the (financial) possibility to buy or rent a laserscanner for generating the input data necessary for the usage of the software prototype.	Low Not observed
	Contingency Solution: The software prototype has a clear data input interface that defines which data has to be provided in which format. The acquisition method can be chosen according to the possibilities of the stakeholder, as long as the data format is pre-processed into the demanded input data format. Alternative data acquisition methods for point clouds include low-cost Structure From Motions (SFM) approaches purely based on 2D images from conventional affordable hardware (cameras).			

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
22	8	The consortium might have missed important partners and initiatives (collaborations) in order to generate the best impact on standardization.	**Impact**: High **Probability**: Low **Description**: Dissemination activities are planned according to the best opportunities hich are identified at this stage.	Low Not observed
	Contingency Solution: A plan for how the work is and will be carried out exists, but all available communication channels need to be monitored carefully to ensure that no crucial existing or new initiative - for standardization or other collaborations - are missed. The state of the art and ongoing research developments will be monitored through ongoing clustering activities, via network activities, and through regular attendance of scientific and industrial conferences. Furthermore, WP8 and the DURAARK coordination will keep a close contact with the DURAARK Advisory Board in order to ensure that input is taken into account from all communities of relevance for DURAARK. Should new initiatives emerge, which are so far unrecognized, the WP8 team will assess any collaboration opportunities and, if applicable, will plan new dissemination activities involving the new entities. The status of our efforts will be examined and further plans adjusted during regular WP8 meetings.			
23	8	Attention to different stakeholder groups gets out of balance (i.e. biased towards certain communities).	**Impact**: Medium **Probability**: Low **Description**: The project has stakeholders in many areas which have to be reached through different activities at different times. While this involves a risk to under-recognise certain communities in favor of others, a certain focus might also emerge throughout the course of the project.	Low Not observed

#	WP	Risk Description	Risk Assessment	2nd Year Relevance
	Contingency Solution: While the DURAARK consortium involves partners from all key areas relevant to the project (e.g., digital preservation, building information modeling/architecture, semantic web), individual activities of partners are assumed to contribute to a balanced dissemination approach and will be complemented through additional dissemination actions. WP8 will permanently monitor dissemination activities and orchestrate joint dissemination activities which specifically target the identified dissemination needs.			

Table 3: **Important risks identified and assessed.**

8 Conclusions and impact

In this document we have outlined the Quality Assurance & Risk Management Plan (QA&RM), detailing the updated management structure, reporting adopted communication mechanisms and QA procedures and reflecting on the risks and quality management processes during the first two years of the project. The most important contribution is the updated risk assessment and the reflection on identified risks and taken contingency actions in the second year of the project.

As outlined, we have successfully dealt with a number of risks and issues during the first two years of the project. While the actions performed mitigated the risks, any negative effects could be averted. Even in the contrary, several contingency actions are perceived as having had a positive impact on the project overall. Continuously monitoring technical- and non-technical risks and issues and taking required contingency actions is an important part of the overall coordination and management of the project, guaranteeing the successful conduction of work across all WPs and partners.

Finally, it should be stressed that this deliverable has to be considered complementary to the previous two versions D1.1.2 and D1.1.4. Within these three documents, we have established and revised the quality specification and risk management plan for DURAARK. The plan serves as a reference for the consortium during the execution of the project.