DIP

Data, Information and Process Integration with Semantic Web Services

FP6 - 507483

Deliverable

WP 15: Project Management
D15.11
<Risk Management Report >

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EXECUTIVE SUMMARY

Target audience of this deliverable:

- The members of the Project Management Office and the Executive Project Management Board
- The responsible risk owners, as assigned in the risk management plan

Risk management can have an important impact to projects. Especially research projects suffer from an inherent uncertainty regarding a changing environment, unproven technological assumptions and different expectations by the stakeholders.

This deliverable describes how risk management is done in DIP. It is based on a best-practice model, successfully applied in former projects. It tries to meet the above mentioned special requirements, without adding too much overhead. It was also tested against real risks that already occurred ("partner leaves consortium"). The overall planning, the particular instruments and all necessary actions will be explained in detail and the DIP risk management plan will be developed step-by-step.

In DIP, the Project Management Office (PMO) is assigned to monitor and maintain the project risk management plan. Before, the PMO assigns a Task Force for risk identification to develop a plan that enables them to identify, assess, and quantify project risks and prepare a response to monitor them. All critical decisions are made by the Executive Project Management Board (EPMB).

The risk management process is broken down into the following steps:

- *Risk identification*. A task force identifies the main risks and creates a project risk list.
- *Qualitative risk analysis*. A task force assesses the importance of the identified risks and their probability of occurrence.
- *Risk Response Planning*. As soon as the risk analysis procedures are finished, the PMO determines the available options to respond to a risk. Our risk response planning assigns parties to take responsibility for each risk response. These "response owners" periodically report to the PMO on the effectiveness of the plan, any unanticipated effects, and any mid-course correction that the EPMB must take to mitigate the risk.
- *Risk monitoring and control*. The PMO determines contingency strategies and monitors the risks as the project matures, new risks occur, or anticipated risks disappear Risk monitoring and control is an ongoing process for the whole lifetime of the project.

The final outcome of this process is the DIP Risk Management Plan, realised as a spreadsheet and attached to this deliverable. It contains all information about the DIP Risk Management at a glance and serves as a guideline to all actions concerning risk management.

This report primarily describes the process in detail. As a matter of this process, the risks identified in this report and their rating might change. The attached risk management plan as a summary of the risk management report will be reviewed bi-

monthly by the Work package Leaders and included in the EC Report by the Project Management Office.

Much of the methodology described in the plan has already been informally applied during the first year of the project. With this deliverable it becomes a formalised process.

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LIST OF KEY WORDS/ABBREVIATIONS

AB	Advisory Board
EB	Exploitation Board
EPMB	Executive Project Management Board
PCR	Project Change Request
PID	Project Initiation Document (identical with DIP Annex-I)
PMO	Project Management Office
PxI	Probability and Impact
RAD	Rapid Application Development
TPMB	Technical Project Management Board
VA	Value Analysis
WBS	Work Breakdown Structure

Advisory Board
Board of external experts. Commissioned by the Executive Project Management Board to observe the State-of-the-Art environment, monitor risks and give profound advice.

Contingency Reserve
The amount of money or time needed above the estimate to reduce the risk of overruns of project objectives to a level acceptable to the organization.

Decision Tree
A diagram used to select the best course of action in uncertain situations.

Exploitation Board (EB)
Reports to the EPMB, and is concerned with all matters relating to exploitation of the results of the project, the management of the knowledge acquired in the course of the project, innovation aspects and intellectual property rights. It will in turn ensure that the project is kept aware of current market trends and developments which might have an impact on the project. The members of the EB will primarily be selected from the commercial partners, but with a representation from the research partners.

Executive Project Management Board (EPMB)
Responsible in DIP for the overall success of the project, and for ensuring that the project has an effective and achievable exploitation strategy. The EPMB will consist of the Core Partners, with the Project Manager present as a non-voting observer.

Impact
Effect or consequence.

Milestone
A significant event in the project, usually completion of a major deliverable.

Mitigation
The act of alleviating a harmful circumstance. Risk mitigation seeks to reduce the probability and/or impact of a risk to below an acceptable threshold.

Probability
Likelihood of the occurrence of any event.

Project Change Request
Any significant changes to the scope, cost, or schedule of the document of work.

Project Initiation Document
Concept approval document for candidate projects that contains:

- A defined project scope
- A reliable capital and support cost estimate for each alternative solution
- A project schedule (workplan) for the alternative recommended for programming the project

Project Management Office
Provides the necessary support for day-by-day project management and administration of the project. It reports to the Co-ordinator, and takes charge of supporting and providing assistance to the Co-ordinator and the EPMB in their day-to-day tasks. It is led by the Project Manager and will additionally comprise a Project Administrator and other support staff as necessary to fulfil its responsibilities, which will include production of non-technical reports (management, progress and financial reporting); maintaining consolidated records of costs, resources, and time-scales, ensuring the necessary infrastructure for intra-project communication, and operational liaison with the Commission.

Scope
Encompasses the work that must be done to deliver a product with the specified features and functions.

Technical Project Management Board
The technical supervisory body of the Project. It meets quarterly and reports to the EPMB, and has the responsibility for overall technical co-ordination of the project, inter-communication between the different workpackages, and ensuring the timely progress of the project and the high quality of the results. It will meet quarterly and will consist of the Project Manager and the designated Leaders of the workpackages.

Value Analysis
The Project Management Office systematically applies recognized techniques to:

- Identify the function of a product or service
- Establish a worth for that function
- Generate alternatives through the use of creative thinking
- Reliably provide the needed functions at the lowest overall cost

The term is often interchanged with Value Engineering.

Workplan
A resourced schedule – the workplan identifies the project-specific WBS elements and defines the cost, timeline, and requirements for each. The current workplan guides the day-to-day operations of project execution and project control and is derived from DIP Annex-I.

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1 INTRODUCTION

Risk management can have an important impact to projects. Especially research projects suffer from an inherent uncertainty regarding a changing environment, un-proven technological assumptions and different expectations by the stakeholders.

A project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on a project objective. A risk has a cause and, if it occurs, a consequence.

A risk is not a problem - a problem has already occurred; a risk is the possibility that a problem might occur. By recognizing potential problems, the project manager can attempt to avoid a problem through proper actions.

Risk management is the systematic process of planning for, identifying, analysing, responding to, and monitoring project risk. It involves processes, tools, and techniques that help the project manager maximize the probability and consequences of positive events and minimize the probability and consequences of adverse events. Project risk management is most effective when first performed early in the life of the project and is a continuing responsibility throughout the project.

Before risk planning is started, the project risk management infrastructure must be in place. Implementing this infrastructure takes time and is done before the project starts. If it happens at a later stage, the infrastructure will either be incomplete or the most critical time set aside for identifying risks to a project will be spent on infrastructure implementation.

Furthermore, it is critical for project risk management to be integrated into the project plan from the beginning, as it cannot be successful if it is treated or perceived as separate to the project.

Larger projects require more detailed risk planning due to the number and complexity of risks. This often includes the development of contingency strategies. The ranking and development of mitigation strategies may also require a larger scale of assignments for probability and/or impact (such as low, medium, high and very high).

The project risk management process helps the DIP Executive Project Management Board (EPMB) to make informed decisions regarding project alternatives. Risk management encourages the Project Management Office and the EPMB to take appropriate measures to minimize:

- Adverse impacts to project scope, cost, and schedule
- The necessity to change workplan or redefine project goals
- Management by crisis

In general this will cause a cultural shift from "fire-fighting" and "crisis management" to proactive decision making that avoids problems before they arise. Anticipating what might go wrong will become a part of everyday business, and the management of risks will be as integral in project management as other management tasks.

There are some situations where nothing can realistically be done to prevent or deal with a risk. The risk has to be “accepted”. In this case, the project must be managed in such a way that the probability of the event occurring is minimized. If the event does

occur, the project manager must re-plan the project and include the effect of the problem.

Many different risk management methodologies have been developed. The most common steps are identifying the risks, grading them and deciding what corrective actions have to be taken, should the worst happen. Most attention is given to the risks with a high probability and high to medium severity rating. No attempt should be made to identify all possible risks that might affect the project, but anything likely to occur should be included in the analysis.

In DIP, an adapted best practice approach was chosen. This approach meets the special requirements of the DIP project, like dealing with unproved cutting-edge technology and unpredictable market development, without adding too much overhead. The following chapters will explain the overall planning, the particular instruments and all necessary actions in detail and develop the DIP risk management plan step-by-step.

2 PROCESS OVERVIEW

In DIP, the Project Management Office (PMO) is assigned to monitor and maintain the project risk management plan. The PMO assigns a task force to develop a plan that enables them to identify, assess, quantify and prepare a response to monitor project risks.

The next step is risk identification. The task force identifies risks by using brainstorming methods, common risk taxonomies, and interviews and creates a *project risk list*. Then the task force assesses the importance of the identified risks and their probability of occurrence. This is done in a *Qualitative Risk Analysis*.

If the outcome of the Qualitative Risk Analysis is insufficient and/or it makes sense to gather more accurate data in an efficient way, the PMO can hire an external expert to gather additional numerical estimates of frequency, probability, and consequences of the risks (*Quantitative Risk Analysis*). However, the DIP project in its nature as a highly innovative R&D project in the semantic web area makes it impossible to gain the needed data to calculate quantitative risks, so this step is skipped.

As soon as the risk analysis procedures are finished, the PMO determines the available options to respond to a risk (avoiding, mitigating, accepting, and transferring). This step is called *Risk Response Planning*.

Finally, the PMO determines contingency strategies for every defined risk and monitors the risks as the project matures, new risks occur, or anticipated risks disappear (*Risk monitoring and control*). This step is an ongoing process for the whole lifetime of the project: Every two months the risk management plan is reviewed by the Work Package Leaders and included in the regular EC report by the Project Management Office.

Figure 1: Risk Management Process below shows the process flow of the DIP Risk Management:

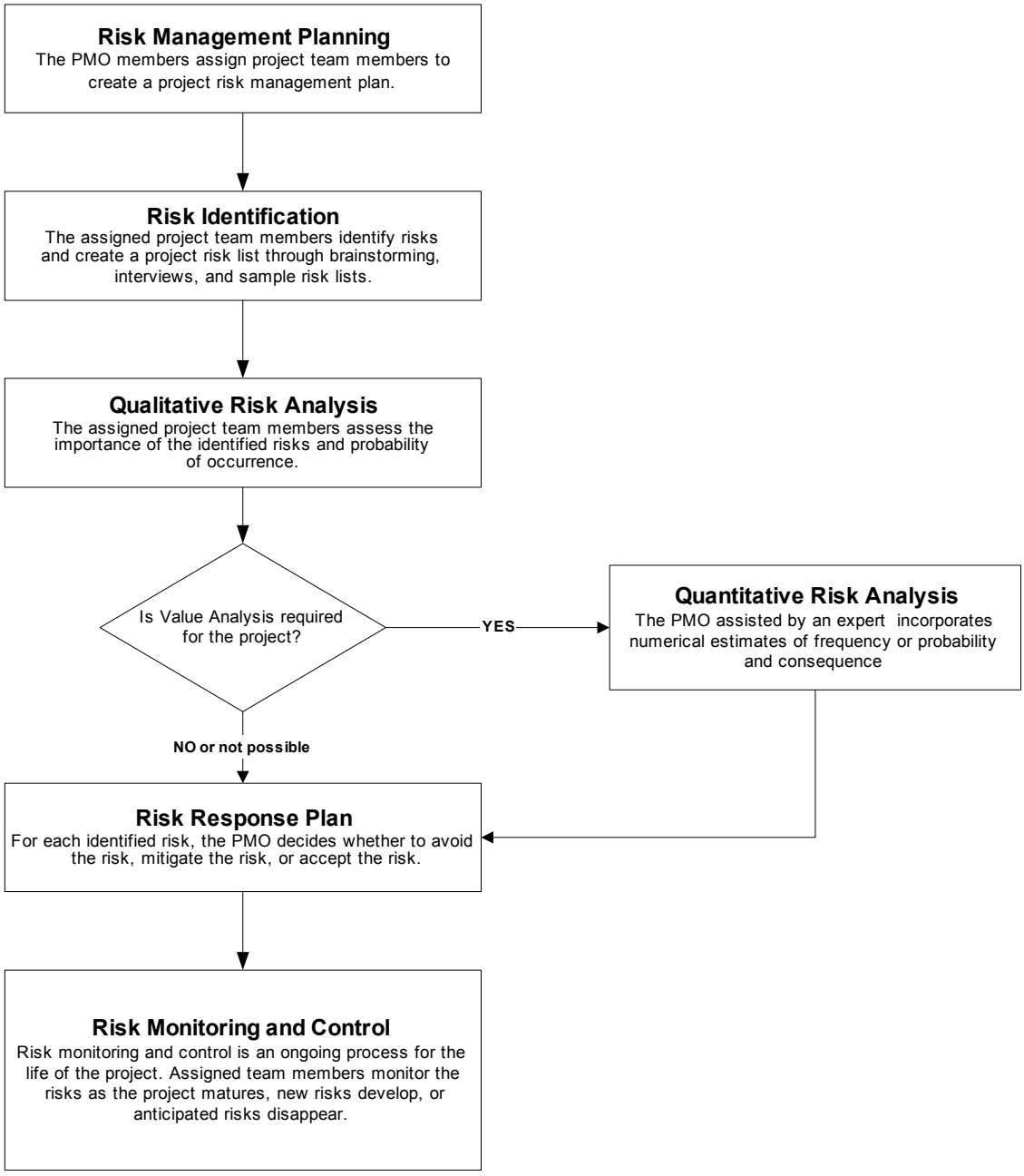

Figure 1: Risk Management Process

Please note that the Quantitative Risk Analysis is an optional part of our selected best-practice model. As it is impossible in DIP to gain the needed data to calculate quantitative risks, we decided to skip this step (see also Chapter 6).

3 RISK MANAGEMENT PLANNING

The Project Management Office (PMO) assigns a task force for risk identification to create a project risk management plan. The task force creates the risk management plan that identifies and establishes the activities of risk management for the project.

To prepare the risk management plan, the assigned task force members use a spreadsheet that shows the risks and responses in an abbreviated form.

4 RISK IDENTIFICATION

The very first step is to brainstorm the risks involved in the project by using common risk taxonomies and interviews, and create an initial risk list. The risk list is reviewed by key members of the EPMB.

To identify the risks it is helpful to distinguish between "risk", "normal practice" and "limitation" to avoid producing a risk list that is too long:

- **Risk**, by its definition, is "the potential exposure associated with unplanned events and/or scenarios affecting a project's success to the extent that it could lead to a loss to the organisations involved, and/or inhibit or distract from the expected level of success of a project".
- **Normal practice constitutes** "a risk that has been inherently accepted based on its inclusion in a formal process", for example using rapid application development (RAD) to quickly develop an application. During RAD, a design might not work and a new design has to be developed. An incorrect design using RAD is therefore not considered as a risk but as part of the RAD process.
- A **limitation** is "a potential exposure that cannot be managed and has to be accepted", for example, not having access to a sufficient number of software developers. If, for some reason, it is not possible to get more developers, the project manager must plan the project within this limitation. It is neither a risk, as it is a known fact, nor a potential event, as it is accepted.

Another point to be considered is to ensure that all risks are stated correctly. The format in which all risks are defined is "risk", "cause", and "effect". It happens quite often that a risk is fragmented into several risks just because it has many causes, for example the risk of unclear user requirements could be caused either by the user not knowing what he or she wants or the project team not understanding what the user means or the use of an unproven method to capture user requirements. The effect in these scenarios will, however, be the same.

Finally, it is helpful to classify the risk according to a common classification system. This way we can ensure we don't oversee a particular type of risk. The following types of risks were identified:

- **External risks** like political, social, legal, or technical changes can not be influenced and often hardly be predicted.
- **Operational risks** cover things like Software Development, Software Security, Human Resources, contractual and quality issues.

- **Financial risks** cover funding, budget, credit, and tax risks.
- **Strategic risks** cover risks regarding the overall organisation of the project, crisis management and the allocation of resources.

In DIP, the risk identification process was done according to the described guidelines. As a result we got the DIP risk list:

Table 1: DIP risk list

Risk	Risk Type	Cause	Effect
State-of-the-art environment lost relevance	External	Rise of new, superior technologies make the semantic web obsolete	Failure of the project, expected goals cannot be met, lack of sustainability
Project objectives lost relevance	External	Breakthrough in Semantic Technology by another project or an industrial player	Failure of the project, expected goals cannot be met, lack of sustainability
Management / organisational overhead higher than anticipated due to unforeseen events	Operational, Financial	Higher communication efforts	Budget can't be met deadlines cannot be met
Partner leaves consortium	Operational	change in partner's strategic goals, partner disagrees with project development	Recalculation of the budget necessary, search for a substitute
Staffing and recruitment problems	Operational	Lack of qualified staff available, salary expectations can't be met	Quality of project results is lower than expected
Key staff illness during critical project phase	Operational	External	deadlines cannot be met
Time for development is underestimated	Operational	Lack of project management, unexpected problems with new technologies	Time delays, deadlines cannot be met
Budget or Person Month for additional key skills needed	Operational, Financial	unexpected problems with new technologies	Budget can't be met
Revision of workplan puts stability of project to a risk	Strategic	Diverse expectations within the consortium, project environment has changed	Time delays, deadlines cannot be met
Use cases not representative	Operational	Wrong assumptions	Quality of project results are lower than expected, deadlines cannot be met
Potential users / customers fail to understand the usability	Operational	Unclear user expectations; misunderstandings by project team, unproven method to capture user requirements	Quality of project results are lower than expected; Time delays, deadlines cannot be met

Conceptual failure of architecture	Strategic	project environment has changed, planning phase was too short, important aspects were neglected	Total failure of the project, expected goals cannot be met, lack of sustainability
Software components fail or limited functionality	Operational	Lack of experience with certain software components, unexpected problems with new technologies	Quality of project results is lower than expected
Development based on new and unproved technology fails	Operational	unexpected problems with new technologies, project environment has changed	Total failure of the project, expected goals cannot be met, lack of sustainability
Decision in favour of standards with no promising future	External	project environment has changed, lack of/wrong industry partners	Total failure of the project, expected goals cannot be met; lack of sustainability
Technology changes require significant redesign	External	project environment has changed	Budget can't be met, deadlines cannot be met
Tools cannot be used or integrated	Operational	unexpected problems with new technologies, lack of planning	Quality of project results is lower than expected, deadlines cannot be met

5 QUALITATIVE RISK ANALYSIS

Qualitative risk analysis assesses the importance of the identified risks. The probability of the occurrence of a risk as well as the severity of its impact is determined. Prioritised lists of these risks for further analysis or direct mitigation are developed.

5.1 Risk probability

Every risk is ranked to a specific risk rate which is expressed through a ranking number. The ranking numbers represent a specific risk rate given in table 1 below:

Table 2: Typical risk ranking

Risk Probability Ranking	
Ranking	**Probability of Risk Event**
5	80–99%
4	60–79%
3	40–59%
2	20–39%
1	1–19%

Here is the resulting DIP risk ranking:

Table 3: DIP risk ranking

Risk	Probability of Risk Event
State-of-the-art environment lost relevance	1
Project objectives lost relevance	1
Management / organisational overhead higher than anticipated due to unforeseen events	1
Partner leaves consortium	2
Staffing and recruitment problems	3
Key staff illness during critical project phase	3
Time for development is underestimated	3
Budget or Person Month for additional key skills needed	1
Revision of workplan puts stability of project to a risk	1
Use cases not representative	2
Potential users / customers fail to understand the usability	1
Conceptual failure of architecture	1
Software components fail or limited functionality	2
Development based on new and unproved technology fails	3
Decision in favour of standards with no promising future	3
Technology changes require significant redesign	3
Tools cannot be used or integrated	2

5.2 Impact Evaluation

The impact of a risk can be defined using the following table:

Table 4: Impact definition

Evaluating Impact of a Risk on Major Project Objectives						
	Impact	**1**	**2**	**4**	**8**	**16**
Objective	Time	Insignificant schedule slippage	Delivery plan milestone delay within quarter	Delivery plan milestone delay of one quarter	Delivery plan milestone delay of more than one quarter	Delivery plan milestone delay outside reporting period
	Cost	Insignificant cost increase	<5% cost increase	5–10% cost increase	10–20% cost increase	>20% cost increase
	Scope	Scope decrease is barely noticeable	Changes in project limits or features with <5% cost increase	Changes in project limits or features with 5–10% cost increase	Changes in project limits or features with 10–20% cost increase	EU Commission does not agree that scope meets the purpose and need

Applied to the DIP risk list, we get the impact of every risk:

Table 5: DIP risk impact

Risk	Impact time	Impact cost	Impact scope
State-of-the-art environment lost relevance	1	1	8
Project objectives lost relevance	1	1	8
Management / organisational overhead higher than anticipated due to unforeseen events	8	8	2
Partner leaves consortium	4	2	1
Staffing and recruitment problems	4	1	4
Key staff illness during critical project phase	4	2	1
Time for development is underestimated	2	2	1
Budget or Person Month for additional key skills needed	4	8	4
Revision of workplan puts stability of project to a risk	4	2	8
Use cases not representative	4	2	8
Potential users / customers fail to understand the usability	8	4	4
Conceptual failure of architecture	4	4	16
Software components fail or limited functionality	2	1	4
Development based on new and unproved technology fails	2	4	8
Decision in favour of standards with no promising future	2	4	8
Technology changes require significant redesign	4	4	4
Tools cannot be used or integrated	4	2	4

5.3 Probability and impact (PxI) matrix

The PxI combines each risk's probability and impact. These matrices show whether each risk is high, moderate, or low. The risks are displayed by high, moderate, and low groupings for each of the three objectives (time, cost, and scope). Risks that are moderate to high will be given special attention:

Table 6: Translate score to risk rank

Score	Risk
1 – 6	Low
7 – 14	Moderate
15 – ++	High

According to the risk ranking table and the risk impact table shown above, the risks regarding cost, time, and scope are entered into the particular risk strategy tables for every particular risk.

Table 7: Sample of a PxI matrix with given scores

Time, Cost, and Scope Objectives High Impact is critical					
Probability					
5	5	10	20	40	80
4	4	8	16	32	64
3	3	6	12	24	48
2	2	4	8	16	32
1	1	2	4	8	16
	1	2	4	8	16
	Impact				

Table 8: DIP risk strategy

Risk	PxI matrix
State-of-the-art environment lost relevance	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Time Cost Scope 1 2 4 8 16 **Impact**
Project objectives lost relevance	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Time Cost Scope 1 2 4 8 16 **Impact**

Risk	PxI matrix
Management / organisational overhead higher than anticipated due to unforeseen events	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Scope Time Cost 1 2 4 8 16 **Impact**
Partner leaves consortium	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Scope Cost Time 1 2 4 8 16 **Impact**
Staffing and recruitment problems	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 Cost Time Scope 2 1 1 2 4 8 16 **Impact**

Risk	PxI matrix
Key staff illness during critical project phase	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 Scope Cost Time 2 1 1 2 4 8 16 **Impact**
Time for development is underestimated	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 Scope Time Cost 1 1 2 4 8 16 **Impact**
Budget or Person Month for additional key skills needed	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Time Scope Cost 1 2 4 8 16 **Impact**

Risk	PxI matrix
Revision of workplan puts stability of project to a risk	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Cost Time Scope 1 2 4 8 16 **Impact**
Use cases not representative	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 Cost Time Scope 1 1 2 4 8 16 **Impact**
Potential users / customers fail to understand the usability	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Cost Scope Time 1 2 4 8 16 **Impact**

Risk	PxI matrix
Conceptual failure of architecture	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 1 Time Cost Scope 1 2 4 8 16 **Impact**
Software components fail or limited functionality	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 Cost Time Scope 1 1 2 4 8 16 **Impact**
Development based on new and unproved technology fails	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 Time Cost Scope 2 1 1 2 4 8 16 **Impact**

Risk	PxI matrix
Decision of standards with no promising future	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 Cost Time Scope 2 1 1 2 4 8 16 **Impact**
Technology changes require significant redesign	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 Time Cost Scope 2 1 1 2 4 8 16 **Impact**
Tools cannot be used or integrated	**Time, Cost, and Scope Objectives** High Impact is critical **Probability** 5 4 3 2 Cost Time, Scope 1 1 2 4 8 16 **Impact**

As a result we see that

- Several risks are moderate in terms of time, cost, or scope.
- The risks "Use cases not representative", "Conceptual failure of architecture", and "Development based on new and unproved technology fails" are high in terms of scope.

These risks will be given special attention in the project and should be avoided.

6 Quantitative Risk Analysis

In general, Quantitative Risk Analysis incorporates numerical estimates of frequency or probability and consequence. In practice a sophisticated analysis of risk requires extensive data which are expensive to acquire or often unavailable. Fortunately few decisions require sophisticated quantification of both frequency and consequences.

The DIP project in its nature as a highly innovative R&D project in the semantic web area makes it impossible to gain the needed data to calculate quantitative risks. For this reason the comprehensive Qualitative Risk Analysis will be the only basis of the DIP Risk Management Report (see also Figure 1: Risk Management Process).

7 Risk Response Planning

Before deciding how to respond to a risk, the risk strategy must be determined.

Typical strategies include avoidance, transfer, mitigation and acceptance of risk. If it is decided that a risk is going to be accepted, no further planning is required, thus saving time.

Our risk response planning assigns parties to take responsibility for each risk response. This process ensures that each risk requiring a response has an "owner".

We identify which strategy is best for each risk - these strategies and actions include:

- **Avoidance**. The response owner changes the project plan to eliminate the risk or to protect the project objectives from its impact. The team might achieve this by changing scope, adding time, or adding resources (thus relaxing the so-called "triple constraint"). These changes may require a Project Change Request (PCR).
- **Transference**. The response owner transfers the financial impact of a risk by contracting out some aspect of the work. Transference reduces the risk only if the contractor is more capable of taking steps to reduce the risk and does so.
- **Mitigation**. The response owner seeks to reduce the probability or consequences of a risk event to an acceptable threshold. They accomplish this via many different means that are specific to the project and the risk. Mitigation steps, although costly and time consuming, may still be preferable to going forward with the unmitigated risk.

- **Acceptance**. The response owner decides to accept certain risks. They do not change the project plan to deal with a risk, or identify any response strategy other than agreeing to address the risk if and when it occurs.

Table 9: DIP risk strategy

Risk	Strategy	Actions to implement the strategy	Response Owner
State-of-the-art environment lost relevance	Avoidance	close co-operation with Industrial partners, monitoring of co-existing research projects	AB
Project objectives lost relevance	Avoidance	Proper monitoring of technological progress	AB
Management / organisational overhead higher than anticipated due to unforeseen events	Avoidance	Reserved contingency budget and resources	PMO
Partner leaves consortium	Acceptance	N/A	EPMB
Staffing and recruitment problems	Acceptance	N/A	Partners
Key staff illness during critical project phase	Avoidance	Reserved contingency resources	PMO
Time for development is underestimated	Avoidance	Reserved contingency budget	PMO
Budget or Person Month for additional key skills needed	Avoidance	Reserved contingency resources	PMO
Revision of workplan puts stability of project to a risk	Mitigation	Proper monitoring, problem detection, corrective actions	EPMB
Use cases not representative	Avoidance	close co-operation with Industrial partners	EB
Potential users / customers fail to understand the usability	Transference	Commissioning of Market research/studies and outsourcing of usability testing	EB
Conceptual failure of architecture	Avoidance	Review with Software Engineering Methods	EPMB
Software components fail or limited functionality	Mitigation	Adaptation of Prioritisation of Functionalities and Components to maximise output	TPMB
Development based on new and unproved technology fails	Avoidance	Review with Software Engineering Methods	TPMB
Decision in favour of standards with no promising future	Avoidance	close co-operation with Industrial partners	EPMB
Technology changes require significant redesign	Acceptance	N/A	N/A
Tools cannot be used or integrated	Avoidance	Review with Software Engineering Methods	TPMB

8 Risk Monitoring and Control

While risk response planning determines the options available to risk response, risk monitoring and control determines contingency strategies and keeps track of the identified risks, residual risks, and new risks. It also ensures the execution of risk response plans, and evaluates their effectiveness.

The contingency plan contains a set of well-defined actions to be taken if a risk occurs. For every risk we define a contingency strategy that can be executed when necessary:

Table 10: DIP contingency strategies

Risk	Contingency Strategy
State-of-the-art environment lost relevance	Advisory Board continuously observates technical progress of competing technologies addressing the same problems. Guidance by neutral outside experts. AB changes the workplan, if necessary.
Project objectives lost relevance	Advisory Board periodically reviews the progress in the field of Semantic Web and changes the workplan, if necessary.
Management / organisational overhead higher than anticipated due to unforeseen events	Project board organization and checkpoints will monitor, detect problems early and take corrective action.
Partner leaves consortium	Consortium is of sufficient strength and diversity for other partners to replace if required.
Staffing and recruitment problems	DIP has a split partner concept which can be seen as a risk balancing to avoid dependencies. Every partner is responsible for their staffing and recruiting.
Key staff illness during critical project phase	Critical parts of project will be done by more than one partner
Time for development is underestimated	Project checkpoints will monitor, detect problems early and take corrective action. Case studies can be re-timed and re-scoped to mitigate against delayed delivery of software.
Budget or Person Month for additional key skills needed	DIP will place in reserve a contingency budget on the order of 10 PM
Revision of workplan puts stability of project to a risk	Project board organization and checkpoints will monitor, detect problems early and take corrective action
Use cases not representative	Close co-operation with Industrial partners, case studies can be re-timed and re-scoped to mitigate against delayed delivery of software.
Potential users / customers fail to understand the usability	Key efforts are being set up to define a market driven exploitation and deployment strategy. These activities will be informed by ongoing market and technology watch initiatives.
Conceptual failure of architecture	The software engineering process is an integral part of the development, architecture will be chosen in a way that it can react on change; several fallback variants of the architecture are taken in account

Software components fail or limited functionality	The architecture provides a balanced design between existing tools and components to be developed, functionalities are ranked by priority
Development based on new and unproved technology fails	Architecture is flexible to react on change, particularly with respect to the following key components: Ontology, Web Services. Technology watch is a key project activity.
Decision of standards with no promising future	Acceptance by the Industry will be closely watched, close co-operation with Industrial partners, a person responsible for managing and watching standards is nominated
Technology changes require significant redesign	Architecture is flexible to react on change, particularly with respect to the following key components: Ontology, Web Services. Technology watch is a key project activity.
Tools cannot be used or integrated	Interoperability and architecture workpackage set up with specific responsibility in this area.

Having a plan to prevent a risk is not a guarantee that it will work. Preventing a risk is the proactive response, while contingency planning is the reactive response to a risk.

Risk is dynamic and needs to be monitored and controlled constantly. The list of project risks changes as the project matures, new risks occur, or anticipated risks disappear.

Periodic project risk reviews repeat the tasks of identification, analysis, and response planning. The Project Management Office regularly schedules project risk reviews, and ensures that project risk is an agenda item at all EPMB meetings. Risk ratings and prioritization commonly change during the project lifecycle.

If an unanticipated risk emerges, or a risk's impact is greater than expected, the planned response may not be adequate. The project manager and the EPMB must perform additional response planning to control the risk.

Risk control involves:

- Choosing alternative response strategies
- Executing or re-defining contingency strategies
- Taking corrective actions
- Re-planning the project

The response owner assigned to each risk reports periodically to the Project Management Office on the effectiveness of the plan, any unanticipated effects, and any mid-course correction that the EPMB must take to mitigate the risk.

9 RISK MANAGEMENT PLAN

The DIP Risk Management Plan contains all information about the DIP Risk Management explained before at a glance and serves as a guideline to all actions concerning risk management. The Risk Management Plan is attached as an Excel Sheet and integrates all tables of this deliverable. (DIP_RiskManagementPlan.xls). It will be reviewed and, if necessary, updated every two months, before it is included in the regular EC Report.

10 CONCLUSION

The subject of this deliverable was to identify possible project risk, analyse them with regard of probability and impact, define responsible risk owners and contingency strategies in case any of the risks occurs. The basic processes of risk management were defined and assigned to the responsible stakeholders. The most important ones are the Project Management Office, the task force for risk identification, and the Executive Project Management Board.

The most important outcome of the analysis is that the risks “Use cases not representative”, “Conceptual failure of architecture”, and “Development based on new and unproved technology fails” are high in terms of scope. In addition, several risk are moderate in terms of time, cost, or scope. These risks will be given special attention in the project reviews and should be avoided.

The risk management plan contains all information about the DIP Risk Management at a glance and serves as a guideline to all actions concerning risk management. The risks identified in this report might change during time. This deliverable primarily describes the process of risk management in detail, and serves as a starting point regarding identification an classification of risks. The attached risk management plan will be reviewed bi-monthly and might be adapted.

The described risk management process has been applied from the beginning of the project in an informal way. With this deliverable it becomes a formalised process.