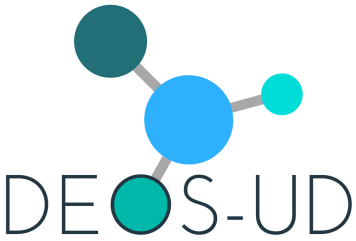

Project DEOS-UD

Disruptive Earth Observation Sensing for Urban Developement

Deliverable 3
Procurement, Quality, Risks and Communication Management

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1 Plan procurement management

On the following sections, procurement decisions will be exposed, determining whether to acquire external support, and if so, what to acquire, how to acquire it, how much is needed, and when to acquire it.

1.1 Make or Buy decisions

In this section, the WBS work packages that will be outsourced are identified. The reasons to buy these work packages, the estimated cost, risk and other important parameters to take into account are shown in Table 1.1.1.

WBS ID	Work Package Name	Reasons for BUY	Cost estimate	Type of contract	Possible risks	List of suppliers	Special considerations or constraints
5.1.1.	Manufacturing of payload sensors	Create sensors with the designed parameters, using high performance industry standards.	125.900 €	FFP (Firm Fixed Price contract)	Delay in delivering the products. Faulty products.	Neptec Technologies Satellite Imaging Corporation	Products must satisfy design parameters. Maximum due date 16/04/21
5.1.2.	Manufacturing of modular system	Use sensor interface specific outsource facilities for manufacturing the modular system	123.086 €	FFP (Firm Fixed Price contract)	Delay in delivery. Specifications not met.	Curtis-Wright Solutions	Product must satisfy design parameters. Maximum due date 16/04/21
5.6.	Quality of the product	An entity external to the project must do the quality tests.	93.248 €	FFP (Firm Fixed Price contract)	Quality standards of the products not met.	ESA	Due date of quality study is fixed on 21/01/22
7.2.1.	Web site development	Quick launch of the project professional website.	17.957 €	FFP (Firm Fixed Price contract)	Late delivery. Not meeting communication plan specifications	Intechnic Llungelizard	Due date before 21/01/22
	Auditing	External company for auditing and supervising	20.000€	FFP (Firm Fixed Price Contract)	Wrongly audit the work done.	Bureau Veritas	Deliveries during the whole project.

Table 1.1.1: List of procurement items

1.2 Statement Of Work

The Statement Of Work (SOW) is developed for each contract taking into account the scope baseline of the project. The SOW describes the procurement item and its needs in detail to allow sellers to determine if they are capable of providing the products or services. In the following tables, a description of the procurement items, requirements, type of contract and others are shown for each of the buying decisions.

SOW - 5.1.1. Manufacturing of payload sensors	
Description	The fabrication of the sensors that will constitute the payload will be outsourced. From the final design of each of the sensors, the suppliers have to be able to manufacture them accordingly.
Requirements	Build sensors described by the 4.2.1.0. Payloads final design, related to the Earth Observation project. The seller can manufacture one part of the required items, but the budget will be adjusted accordingly.
Type of contract	A Firm Fixed Price contract is stipulated because, for these tasks, there are clear requirements and determined deadlines. Also, a budget has been assigned and a final product version is clearly decided.
Scheduled date	To be delivered no later than 16/04/2021. Starts after the 4.2.1.0. Payloads final design delivery and is part of the 5.0. Prototype manufacturing milestone.
Constraints	Manufactured sensors should meet all 4.2.1.0. Payloads final design constraints without exception.
Risk control actions	As one of the principal risks of this item consists of the delay of the delivery, an action regarding periodic monitoring of the fabrication progress. That way a potential delay can be detected and corrected before affecting the delivery date. In order to control that the products manufactured are not faulty, a report specifying the fabrication methods and that everything has been done according to the applying regulations will be requested from the suppliers and analysed by the technical team to assure that the risk of the fabricated product being faulty is reduced to a minimum.
Form and format	Each sensor will be delivered properly packed, with all the appropriate documentation.
Pre qualified sellers	description
Procurement metrics	description

Table 1.2.1: SOW 5.1.1: Manufacturing of payload sensors

SOW - 5.1.2. Manufacturing of modular system	
Description	The fabrication of the modular system that will house the payloads will be outsourced. The supplier has to follow the final design specified and assure that fulfils all the requirements.
Requirements	Build the modular system described by the 4.2.2.0. Modular system final design, related to the Earth Observation project.
Type of contract	A Firm Fixed Price contract is stipulated because, for these tasks, there are clear requirements and determined deadlines. Also, a budget has been assigned and a final product version is clearly decided.
Scheduled date	To be delivered no later than 16/04/2021. Starts after the 4.2.2.0. Modular system final design delivery and is part of the 5.0. Prototype manufacturing milestone.
Constraints	The manufactured modular system should meet all 4.2.2.0. Modular system final design constraints without exception.
Risk control actions	As one of the principal risks of this item consists of the delay of the delivery, an action regarding periodic monitoring of the fabrication progress. That way a potential delay can be detected and corrected before affecting the delivery date. In order to assure that the specifications defined in the design are met, a technical report specifying the manufacturing process will be required from the supplier and will be reviewed to check that all the fabrication processes are being correctly done.
Form and format	The modular system needs to be delivered in a safe package that guarantees its integrity throughout the transportation from the manufacturing site to its destination, accompanied with the due documentation.
Pre qualified sellers	description
Procurement metrics	description

Table 1.2.2: SOW 5.1.2: Manufacturing of modular system

SOW - 5.6. Quality of the product	
Description	The review of the quality of the product will be outsourced. This review will not focus on the correct operation of the systems but it will rather review the efficiency and order of their operation.
Requirements	The product must comply with the quality standards determined by the team.
Type of contract	A Firm Fixed Price contract is stipulated because, for these tasks, there are clear requirements and determined deadlines. Also, a budget has been assigned and a final product version is clearly decided.
Scheduled date	To be delivered no later than 21/01/2022. Starts after the 5.02. Full system testing.
Constraints	The product must comply with all the quality constraints defined for each of the subsystems and elements.
Risk control actions	In order to prevent the failure of meeting the quality standards of the product, they have to be perfectly defined before starting the quality review of it.
Form and format	description
Pre qualified sellers	description
Procurement metrics	description

Table 1.2.3: SOW 5.6: Quality of the product

SOW - 7.2.1. Website development	
Description	The creation of a functioning professional website will be outsourced. The presence on the internet is key to get to all kind of public and make the work done available to anyone interested in knowing more about it.
Requirements	The website must help the visibility of the project and give understandable information to anyone willing to obtain more information about what HIRO is and does. It needs to have also all the on-line dissemination material specified in the communication plan.
Type of contract	A Firm Fixed Price contract is stipulated because, for this tasks, there are clear requirements and determined deadlines. Also, a budget has been assigned and a final product version is clearly decided.
Scheduled date	To be delivered no later than 21/01/2022. Starts after the 7.0. Communication plan.
Constraints	The information that the site will make available has to be that that can be disclosed to the public without breaking any kind of confidentiality agreements.
Risk control actions	The contents of the website need to be the ones specified in the communication plan. To prevent any unwanted content to be included on the website, a previous analysis of the content before making it available to the public could help prevent this risk.
Form and format	The website's URL has to be delivered.
Pre qualified sellers	description
Procurement metrics	description

Table 1.2.4: SOW 7.2.1: Web site development

2 Quality management plan

The Quality management Plan defines the quality levels that must be achieved in order to accept the final product developed and the methods to ensure these levels. In this section the quality management plan is defined together with methods and tools to assure, control and improve it.

2.1 Quality Assurance Approach

One of the most important parts of the project is to ensure high quality levels in all its sections in order to provide a final product that meets the expectations of possible future customers. In this section, the procedures and methods to ensure this high quality are detailed.

At this point, it is important to recall high-level technical requirements defined previously in the Project Charter:

Item	Description
T1	Ensure the endurance of the overall system.
T2	Readiness for operational services.
T3	Ability to detect greenhouse gases.
T4	Ability to detect weather patterns for proper weather forecasting applications.
T5	Ability to perform a high precision terrain mapping for urban applications.
T6	The system must have a program for automatic updates and self-revision of possible issues.
T7	Availability of real-time information with a maximum delay of 1 second.
T8	15% increase in the reliability and precision of the results compared to current technologies.

Table 2.1.1: Technical requirements

The quality assurance will be applied in the different steps of the project in order to obtain the desired results. These steps are:

- Before manufacturing the prototype. Quality procedures must be applied over the final design to ensure it meets the requirements of the project.
- During the manufacture. The procedures executed in the manufacture of the prototype must be validated to guarantee that they are suitable for the manufacture of the product.
- Final product validation. The final product must be revised to ensure it fulfils the expected specifications. These validations will contain methods to check the quality of the software and the hardware of the project.

Now that the quality needed has been specified, in the following sections the methods to control the quality and to improve the quality plan will be described.

2.2 Quality Control Approach

The quality control approach of the project is divided in three main areas:

- Documentation quality plan
- Technical quality plan
- Software quality plan

2.2.1 Documentation quality plan

All the documentation of the project has to follow a strict quality plan in order to ensure that no information is lost. To do so, there is a series of steps that have to be followed:

1. Definition of the document
   - Define the type of document and its content as well as the standards that it has to follow.
   - Define the responsible of the document, the team that is going to work on it and the team that is going to verify it.
   - Define the deadline for the document as well as any milestone that may be related to it.
2. Redaction of the document: There may be some periodic quality controls while the document is in progress to ensure that the quality plan is met.
3. Review and approval: Once the document is finished, the responsible of that deliverable should perform the following tasks regarding the document:
   - Spell check.
   - Consistency.
   - References up to date.
   - Check that the deliverable follows the acceptance criteria.

   Then, the document can be delivered to the quality department. It will verify that the documentation follows the quality standards defined by the company. With the aim of guaranteeing a complete and trustful review, there should be at least two independent reviewers and they should not have been involved in the making of that document. If there is any review comment, it should be communicated to the deliverable responsible, since they have the final responsibility that the document meets the acceptance criteria.

This documentation quality plan refers to the deliverables but also to the internal documents of the company.

2.2.2 Technical quality plan

Since part of the project consists of the design and construction of a prototype, it is necessary to ensure that it meets all the quality requirements to guarantee its proper operation. In order to do that, the following steps are defined:

1. Definition of the quality plan: Before beginning with the design, a quality plan has to be done in order to define the acceptance criteria.
2. Design: Once the plan is finished and the design phase starts, some quality controls have to be done periodically to guarantee that the design complies the requirements and follows the quality plan previously defined.
3. Prototype and validation: During the construction of the prototype all the components and the production stages have to meet the acceptance criteria defined in the quality plan. Then, when the prototype is ready, a validation must be done in order to check that it fulfills all the requirements of the project as well as to verify that it complies the quality plan. This validation process has to follow the standards given by the industry.

2.2.3 Software quality plan

The project not only consists of a prototype that should be constructed, but it also has a software that has to be verified. The following steps are defined to guarantee a satisfactory design of the implementation platform:

1. Definition of the quality plan: Before starting with the coding, a software quality plan has to be defined. This document will set some standards that will have to be followed in the making of the interaction platform, such as coding and comment standards, to ensure a correct flow of information between the people who work on it as well as to avoid possible errors. It will also define the acceptance criteria that have to be met by the interaction platform.
2. Coding phase: During the design phase, every modification of the code will have to be registered indicating the date and a description of the changes. Then, a review of the latest modifications should be done before making them definitive. If an error is detected, it has to be immediately reported to the responsible of the software development. Then, an engineer will be assigned to solve it, and he/she will report it once the problem is solved.
3. Implementation and validation: Once the interaction platform is operative, a validation has to be performed in order to ensure that it fulfils all the requirements of the project

as well as to verify that it complies the software quality plan. This validation process has to follow the standards given by the industry.

2.3 Quality Improvement Approach

Quality improvement (QI) is a formal analysis of practice performance and efforts done in order to improve the performance of the project with the main objective of increasing its efficiency. The information shown here about QI models and tools has been extracted from [1] and [2]. A proper QI process requires some basics to succeed. These basics are the following ones:

- Establish a culture of quality in the project: Creation of QI teams, QI meetings, and QI goals.
- Determine and prioritize potential areas of improvement: Define, according to the acceptance criteria of the project, the main areas of improvement.
- Collect and analyse data: Determine the type of data to be collected and analyse it properly according to the project objectives.
- Communication of results: Quality improvements should be transparent to the stakeholders in order to keep them satisfied.

In this project, the six-sigma working philosophy will be implemented in order to improve quality. The objective of this philosophy is to adjust the existing processes in order to improve the quality and minimize the variability by reducing defects and irregularities. The model related to six-sigma philosophy that will be used is DMAIC. This model includes the following steps:

- Define: Set the objective of the problem or the existent defect. In this project, this definition will be done according to the acceptance criteria. The improvement of the quality plan is one of the objectives that will need to be taken into account.
- Measurement: Measures are needed in order to have values for the problem or defect. In this project the measurements according to the effectiveness of the quality plan are:
  - Number of iterations of a document/design to be approved.
  - Stakeholders satisfaction
  - Time needed to approve a document/design.
  - Number of defects detected by the quality department
- Analyse: Figure out the causes of the problem or defect and propose solutions.

- Improve: Implement the approved solution.
- Control: Control the implementation of the improvement, assure continuity and success.

2.4 Quality Roles and Responsibilities

In the following table, the quality roles for this project will be stated and its responsibilities defined. These roles are important so they will be the ones to control the implementation of the quality assurance, control, and improvement.

Role	Responsibilities
Project Manager	Final responsible for the quality of the project. Schedules meetings with the Quality Department in order to discuss the quality aspects of the project. Approves the quality plans of the project.
Project Manager Secretary	Helps the Project Manager in the tasks that he/she delegates.
Quality Manager	Main quality responsible of the project. Fixes the quality standards that all documents are required to fulfil. Reviews all the deliverables to make sure they fulfil the required quality. The same documents are also reviewed by the Quality Manager Assessor.
Quality Manager Assessor	Helps the Quality Manager in the tasks that he/she delegates. Reviews all the deliverables to make sure they fulfil the required quality. The same documents are also reviewed by the Quality Manager.

Role	Responsibilities
Technical Manager	Coordinates the work done by the engineers and technicians. Defines the technical quality plan and the software quality plan. Performs periodic quality controls on the design of the product. Reviews the technical aspects of the deliverables before approving them. Monitors the quality control procedures of both the prototype and the final product. Monitors the quality control procedures of the interaction platform.
Engineers and technicians	Make sure that the design of the product follows the technical quality plan. Perform quality control procedures over the prototype and over the final product. Make sure that the design of the interaction platform follows the software quality plan. Validate that the interaction platform fulfils the quality standards.

Table 2.4.1: List of quality roles and responsibilities

3 Risk management plan

3.1 Definitions of Probability

There are two parameters that are commonly used in order to model risk: the probability that something might happen and the impact it would have if it did happen. Therefore, to evaluate the probability of the potential risk to occur it is crucial to define and quantify it properly.

A scale of 1% to 100% will be used for Probability, which is linearly divided into the five sections represented in Table 3.1.1. In fact, the 1% is associated with the minimum probability of a risk to happen, meaning that it will very rarely occur; while the maximum 100% means the risk will be unavoidable.

Probability	Description	Probability Score
Very High	Means it is a fact because it is very likely to occur	(81-100)%
High	Likely to occur	(61-80)%
Medium	May occur about half of the time	(41-60)%
Low	Unlikely to occur	(21-40)%
Very Low	Very unlikely to occur	(1-20)%

Table 3.1.1: Definitions of probability

3.2 Definitions of impacts by objective

To evaluate the impact on the overall project if a certain risk happens, a numerical estimate is provided to quantify the effects of the risks in terms of Scope and Quality, Schedule and Cost.

These three categories are scaled from 1 to 5 in a linear way in order to quantify the impact, where 1 is the minimum and 5 is the maximum. Moreover, each effect is defined qualitatively depending on its category and its impact.

Scope/Quality Impact	Description	Scope Impact Score
Very High	Be unable to achieve the desired objectives. The project end item is effectively useless.	5
High	Scope and quality reduction hardly acceptable. The impact causes the project item quality to be below the desired objectives and under the acceptance criteria.	4
Medium	The risk produces moderate impact in the project and the results. Major areas of the scope are affected and quality is reduced but still above the acceptance criteria.	3
Low	It produces a low impact. Minor areas of the scope are affected and quality is slightly reduced affecting very demanding applications.	2
Very Low	It produces an insignificant impact in the project. Scope and quality decrease barely noticeable.	1

Table 3.2.1: Scope/Quality impacts

Schedule Impact	Description	Schedule Impact Score
Very High	Very significant delay in the schedule, increasing the milestone duration more than a 20%.	5
High	Significant delay in the schedule, increasing the milestone duration between a 10% and 20%.	4
Medium	Moderate delay in the schedule, increasing the milestone duration between a 5% and 10%.	3
Low	Slightly significant delay in the schedule, increasing the milestone duration less than 5%.	2
Very Low	Insignificant delay and time increase.	1

Table 3.2.2: Schedule imapcts

Cost Impact	Description	Cost Impact Score
Very High	Several impact on the project cost, increasing the cost more than 30%.	5
High	Important impact on the project cost, increasing the cost from 15% to 30%.	4
Medium	Moderate impact on the project cost, increasing the cost from 10% to 15%.	3
Low	Reduced impact on the project cost, increasing the cost less than 10%.	2
Very Low	Insignificant impact on the project cost.	1

Table 3.2.3: Cost impacts

3.3 Probability and impact matrix

Beyond the definitions of probability and impact, a further quantitative analysis of risk is required. Every risk is assigned a rate based on the probability and impact scores. This evaluation of risks is the way in which they are classified by their importance: the higher the risk rating, the higher their priority for attention. To manage ratings in a more organized manner, the probability and impact matrix is defined. This matrix specifies combinations of probability and impact that lead to rating the risks as very low, low, moderate, high or extreme. The following tables show the risk rating legend used for the elaboration of this project risk matrix:

Risk Rating	Score	Colour
Extreme Risk	[4 - 5]	
High Risk	[3 - 4)	
Moderate Risk	[2 - 3)	
Low Risk	[1 - 2)	
Very Low Risk	[0 - 1)	

Table 3.3.1: Risk Rating Legend

		Probability				
		Very Low/.2	**Low/.4**	**Medium/.6**	**High/.8**	**Very High/1**
Impact	**Very High/5**	1	2	3	4	5
	High/4	0.8	1.6	2.4	3.2	4
	Medium/3	0.6	1.2	1.8	2.4	3
	Low/2	0.4	0.8	1.2	1.6	2
	Very Low/1	0.2	0.4	0.6	0.8	1

Table 3.3.2: Probability and Impact Matrix

Depending on the risk score, the response and priority assigned to a risk will change. For example, risks that are in the red area of the matrix (high probability and high impact) may require priority action and aggressive response strategies while risks in the light green area may not require proactive management action beyond being considered as a warning. Throughout the project risks may vary so, using this matrix, risks will be reconsidered, changing their rating if necessary.

3.4 Risk rating

As already mentioned, risk rate is determined by probability and impact scores. In fact, it is the result of multiplying both scores. Hence, to identify a risk's position in the matrix, first, it is necessary to assess probability and impact score as explained in sections 3.1 and 3.2. The previously defined matrix represents impact as an overall score but in our case, different impact scores have been defined depending on the project objective that is threatened (scope, schedule, or cost). Hence, to determine the general impact grade the following equation is defined:

$$I_{general} = \sum_{i}(W_i \cdot I_i) \tag{3.4.1}$$

Where:

- i represents the different types of impact (scope, schedule, cost)
- W_i represents the importance or weight (from 0 to 1) of each of the impact types and it is satisfied that $Wscope + Wschedule + Wcost = 1$
- I_i represents the impact score of each of the types (from 0 to 5)

Consequently, the overall impact will have a value of (0-5] calculated doing a balance between each type of impact importance. Regarding the weights defined for this project, it has been decided that cost is the most important, followed by the scope and finally, the schedule. Hence, the values assigned are the ones shown below:

$$W_{scope} = 0.3$$

$$W_{schedule} = 0.2$$

$$W_{cost} = 0.5$$

Once the general impact is calculated, the risk rating is defined as: Risk Rating = Probability Score $\times$ Impact Score

3.5 Risk identification and assessment

In this section risk identification and assessment is provided by taking into account the defined data of the previous sections. Here it is also provided the information about the revised-risks.

The factors that have been used in the identification process are: enterprise environmental factors, organizational process assets, the project scope statement and the project management plan.

It is worth to mention that after analyzing these points, risks have been classified in two main groups: External risks, which are risks the project team cannot control and therefore no response nor action can be defined, and Internal risks, which can be detected in advance and be addressed properly.

In the table below is presented the following information for each risk:

- Probability to happen
- Impact regarding quality, time and cost
- Score using the weights of section 3.4
- Response. What is going to be done in order to avoid the risk before it happens.

Note that there are different types of responses that have been classified in these groups:

- Mitigation. Actions for reducing the severity, seriousness, or painfulness of the risk.
- Transfer. Delegation the actions to an outsourced company.
- Avoidance. Actions to keep away the risk and avoid it to happen.
- Acceptance. A difficult or unpleasant situation is accepted and a response is done in order to solve the issue.

Risk ID	Risk Statement	Probability	Impact			Score	Response
			Scope/Quality	Schedule	Cost		
R.1	Deliverable delays	Medium	1	4	3	1.6	Mitigation: Dedicate more resources than expected.
R.2	Inaccurate cost forecast	High	3	2	4	2.6	Transfer: Consider new funding sources and revise the financial management plan.
R.3	Lack of communication	High	3	4	3	2.6	Avoidance: Periodical meetings and use of collaborative software.
R.4	Lack of technology improvement	Low	3	2	1	0.7	Avoidance: Guarantee the development with thorough search of the actual technology.
R.5	Lack of access to project needed information	Very Low	2	2	2	0.4	Avoidance: A previous accurate research is needed before the development of the project.
R.6	Low team motivation	Medium	3	5	1	1.4	Acceptance: Personal control and team building projects.

Risk ID	Risk Statement	Probability	Impact			Score	Response
			Scope/Quality	Schedule	Cost		
R.7	Unsuccessfully quality control	Low	4	2	2	1.0	Mitigation: Improve or increase the quality controls.
R.8	Conflicts between members	High	2	4	2	1.9	Acceptance: Personal conflicts resolution meetings.
R.9	Infeasible design	Low	2	4	4	1.4	Transfer: Periodical reviews with experts and managers.
R.10	Technologies components with security vulnerabilities	High	4	2	2	2.1	Transfer: Check for possible security problems during development through specialized companies.
R.11	Organization issues	Very High	3	4	3	3.2	Transfer: Ask for help from an external company specialized in project management.
R.12	Stakeholder desertion	Low	2	4	3	1.2	Acceptance: Try to transfer the responsibilities to another stakeholder or contract a new one.

Risk ID	Risk Statement	Probability	Impact			Score	Response
			Scope/Quality	Schedule	Cost		
R.13	Competitors appearance	Very Low	4	1	4	0.7	Acceptance: Improvement of the quality/price ratio of the service.
R.14	Delay in external deliverables	Medium	2	4	2	1.4	Acceptance: Control the delivery schedules and change provider if necessary.
R.15	Economical market issues	Low	2	1	4	1.1	Acceptance: Control cost evolution due to external changes throughout the project.
R.16	Components or row material quality	Low	4	2	3	1.2	Mitigation: Have exhaustive and regular quality controls to avoid problems in components in the final test.

Table 3.5.1: Risk identification and assessment

At this point, with the information of the previous table, the risk assessment has been done.

Each risk has been positioned in the impact-probability matrix. In the vertical axis there is the impact of the risk (calculated with the formula of section 3.4) and in the horizontal axis the probability of the risk to happen is shown.

It can be observed that regarding probability, there is an equilibrium between all the risks, but if the impacts are considered, the majority of them are medium.

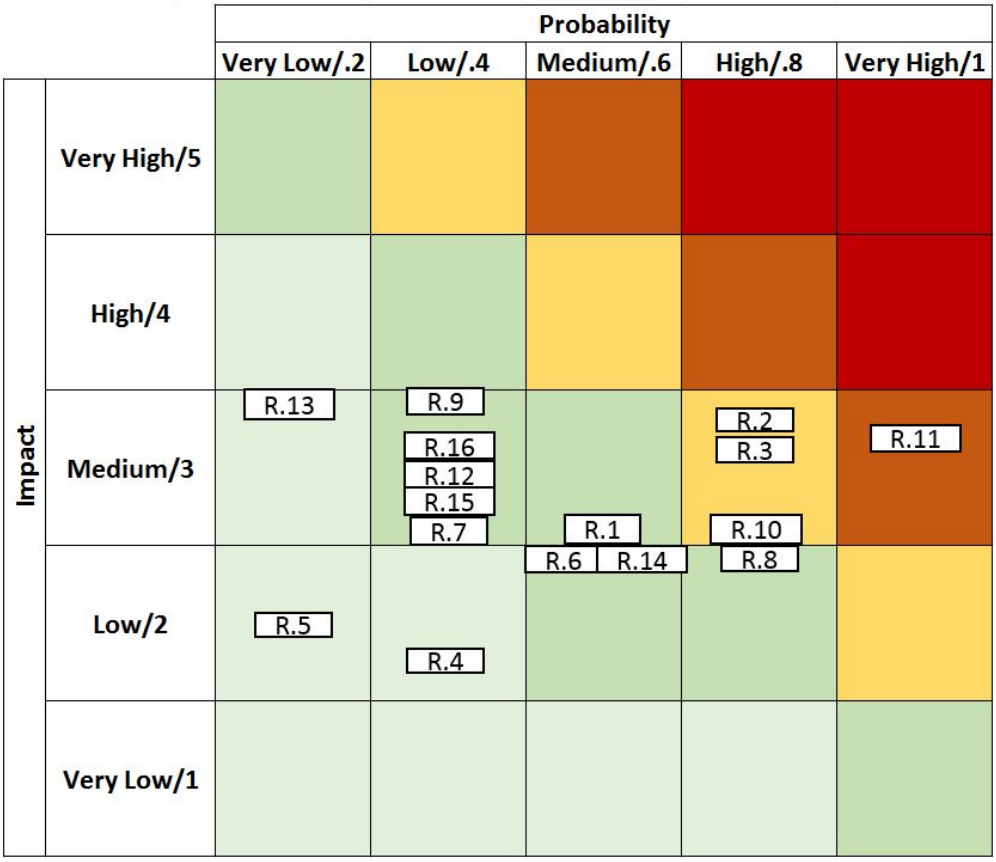

Table 3.5.2: Risk assessment

Having done this analysis, the revised situation has to be considered too. It means how the probability and the impact will change once the corresponding response has been executed.

There are also presented specific actions to take in order to avoid the revised risk and the responsible to carry out them.

Risk ID	Revised Probability	Revised Impact			Revised Score	Owner	Action
		Scope/Quality	Schedule	Cost			
R.1	Low	1	2	2	0.7	Project Manager	Increase the number of control meetings. Allocate more human resources in delayed tasks.
R.2	Medium	2	2	2	1.2	Project Manager and Financial Manager	Highly periodical cost and expense controls.
R.3	Low	1	2	1	0.5	Project Manager secretary	Impart communicative skills courses to team members. Enhance use of collaborative software.
R.4	Very Low	2	1	1	0.3	Project Manager	Use all resources that are needed to guarantee the innovation expected. Propose redesigns and alternatives if needed.
R.5	Very Low	1	1	2	0.3	The manager of the corresponding department	Maintain contact with scientific and technological centers to be up to date of last technological improvements.

Risk ID	Revised Probability	Revised Impact			Revised Score	Owner	Action
		Scope/Quality	Schedule	Cost			
R.6	Low	2	3	1	0.7	Human Resources Manager	Interview team members to know their level of satisfaction with their work and request for their suggestions to improve their motivation.
R.7	Low	2	1	2	0.7	Quality Manager	Use higher qualified personnel, and buy better quality control resources.
R.8	Medium	1	2	2	1.0	Project Manager	Encourage communication among team members. Look for possible causes of conflicts. Establish teambuilding activities.
R.9	Very Low	1	2	4	0.5	Engineering Department Manager	Follow the specified design standards. Stick to the available technology.

Risk ID	Revised Probability	Revised Impact			Revised Score	Owner	Action
		Scope/Quality	Schedule	Cost			
R.10	Low	2	2	2	0.8	Engineering Department Manager	Establish regular contact with outsourced companies responsible for technological safety.
R.11	Medium	2	2	2	1.2	Project Manager	Establish weekly meetings between the department responsibles. Enhance the use of organization software.
R.12	Very Low	1	2	2	0.3	Project Manager	An in-depth research of alternatives to the current members would allow fast solutions.
R.13	Very Low	3	1	3	0.5	Quality Manager	Improve the image that HIRO gives to the European Union. Use of resources more efficiently.
R.14	Low	2	1	2	0.7	Sales Department Manager	Buy the resources in advance and keep them in stock.
R.15	Low	2	1	3	0.9	Sales Department Manager	Reconsider budget estimations with market variations.

Risk ID	Revised Probability	Revised Impact			Revised Score	Owner	Action
		Scope/Quality	Schedule	Cost			
R.16	Low	2	1	2	0.7	Software Engineering Manager	Establish quality inspections of the acquired materials.

Table 3.5.3: Revised risk identification and assessment

Finally, the risk assessment with revised risks has been carried out. Note that this time the risks have less probability to happen and less impact if they occur. This is because the taken responses have mitigated the severity of the risks.

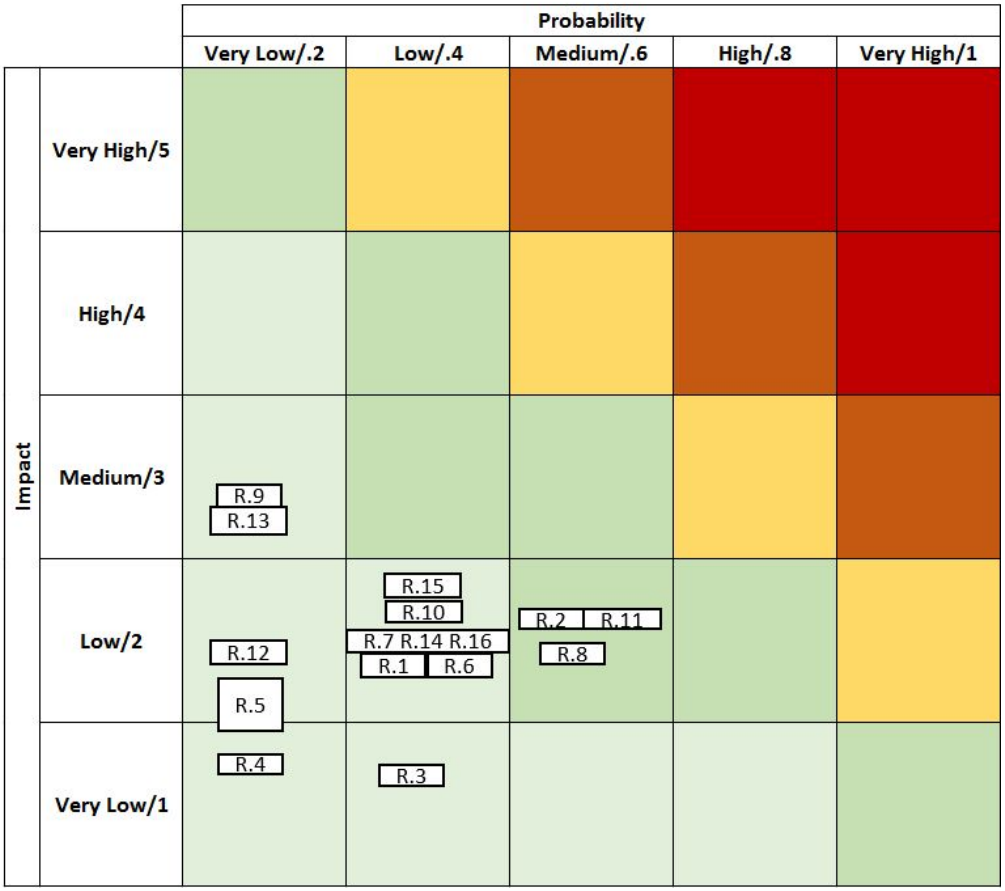

Table 3.5.4: Revised Risk assessment

3.6 Risk data sheet

In this section, a summary of the previous tables will be done in datasheet form for each risk. The presented information is its description, status, cause, normal and revised probability, impact and score, the owner, responses and actions, secondary and residual associated risks and the contingency plan, funds and time.

<table>
<tr><td>Risk-ID:
R.1</td><td colspan="6">Risk Description:
Deliverables delays: The deliverables could not be completed at the time of their corresponding deadlines, leading to an increase of costs and a delay of all the schedule of the project.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
Several facts can delay the deliverables, such as an unexpected event or the employees' low performance.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Medium</td><td>1</td><td>4</td><td>3</td><td>1.6</td><td colspan="2">Mitigation: Dedicate more resources than expected.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>1</td><td>2</td><td>2</td><td>0.7</td><td>Project Manager</td><td>Increase planning hours and scope controls.</td></tr>
<tr><td colspan="7">Secondary Risks:
If the quality control is very strict some of the information may be lost by not being accepted by it.</td></tr>
<tr><td colspan="7">Residual Risks:
It may not be possible to mitigate all the delay.</td></tr>
<tr><td colspan="5">Contingency Plan:
With stricter controls, the potential delay is expected to stop growing, and it is possible that new external services must be contracted to correct the delay.</td><td colspan="2">Contingency Funds:
5.000€
Contingency Time:
During the whole project.</td></tr>
</table>

Table 3.6.1: Risk 1 data sheet

<table>
<tr><td>Risk-ID:
R.2</td><td colspan="6">Risk Description:
Inaccurate cost forecast: The financial predictions could be wrong or different issues may occur increasing the total cost of the project.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
The costs of the hardware are estimated; they may change a little until the day of purchase. When any task goes wrong, there might be some extra costs involved.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>High</td><td>3</td><td>2</td><td>4</td><td>2.6</td><td colspan="2">Transfer: Consider new funding sources and revise the financial management plan.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Medium</td><td>2</td><td>2</td><td>2</td><td>1.2</td><td>Project Manager and Financial Manager</td><td>Increase control of the costs and reduce unnecessary expenses.</td></tr>
<tr><td colspan="7">Secondary Risks:
Budget problems can modify the initial planning or scope of the project.</td></tr>
<tr><td colspan="7">Residual Risks:
The residual risk is to not find new financial sources it may be necessary to cut back on the project, affecting quality.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
If this problem appears, the corresponding Managers have to create a team of people of the financial department that will be in charge of solving the financial issue and controlling the costs of the project during the contingency time. Both Managers will have to supervise the financial team until new financial sources are found.</td><td colspan="2">Contingency Funds:
50.000€</td></tr>
<tr><td colspan="2">Contingency Time:
8 weeks</td></tr>
</table>

Table 3.6.2: Risk 2 data sheet

<table>
<tr><td>Risk-ID:
R.3</td><td colspan="6">Risk Description:
Lack of communication: The absence of a proper communication method or channel might affect the quality of the product, the fulfilment of the deadlines or a good coordination between members and departments.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
The project members may not be used neither to work with their new co-workers nor to work in such a big project were communication is essential.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>High</td><td>3</td><td>4</td><td>3</td><td>2.6</td><td colspan="2">Avoidance: Periodical meetings and use of collaborative software.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>1</td><td>2</td><td>1</td><td>0.5</td><td>Project manager and secretary</td><td>Compulsory courses will be carried out to teach everybody to use collaborative software.</td></tr>
<tr><td colspan="7">Secondary Risks:
The implementation of new techniques in order to get a more efficient result in communication can cause an increase in time.</td></tr>
<tr><td colspan="7">Residual Risks:
The risk of a bad communication and an increase in time due to this situation is minimum considering the corrections to be done so there will produce minimum problems requiring no contingency in the project.</td></tr>
<tr><td colspan="4" rowspan="2">Contingency Plan:
Not needed.</td><td colspan="3">Contingency Funds:
Not needed.</td></tr>
<tr><td colspan="3">Contingency Time:
Not needed.</td></tr>
</table>

Table 3.6.3: Risk 3 data sheet

<table>
<tr><td>Risk-ID:
R.4</td><td colspan="6">Risk Description:
Lack of technology improvement: The main goal of the project is to innovate but there is a possibility that the company does not find the way to improve enough the different technologies.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
Innovation can be difficult to progress, if the technologies are already really improved.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>3</td><td>2</td><td>1</td><td>0.7</td><td colspan="2">Avoidance: Guarantee the development with thorough search of the actual technology.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Very low</td><td>2</td><td>1</td><td>1</td><td>0.3</td><td>Project Manager</td><td>Take the necessary measures to achieve to desired level of innovation including redesign and propose alternatives.</td></tr>
<tr><td colspan="7">Secondary Risks:
Due to the extensive time it takes to carry out the project, it is possible that the technology that was proposed to improve in the beginning at the end becomes obsolete.</td></tr>
<tr><td colspan="7">Residual Risks:
Not needed.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
Not needed.</td><td colspan="2">Contingency Funds:
Not needed.</td></tr>
<tr><td colspan="2">Contingency Time:
Not needed.</td></tr>
</table>

Table 3.6.4: Risk 4 data sheet

Risk-ID: R.5	**Risk Description:** Lack of access to the required project information: Discovering new technologies implies working with cutting-edge technology. This could unable teams to access the last improvements or patents.					
Status: Closed	**Risk Cause:** The patents and information may cannot be easily accessible.					
Probability	**Impact**			**Score**	**Responses**	
	Scope/Quality	**Schedule**	**Cost**			
Very low	2	2	2	0.4	Avoidance: A previous accurate research is needed before the development of the project.	
Revised Probability	**Revised Impact**			**Revised Score**	**Owner**	**Actions**
	Scope/Quality	**Schedule**	**Cost**			
Very low	1	1	2	0.3	The manager of the pertinent department	Maintain contact with scientific and technological centres to be up to date of last technological improvements.
Secondary Risks: Not all the information is accessible because the centres or authors do not authorise it.						
Residual Risks: Partial lack of communication between the scientist and centres that got the information.						
Contingency Plan: Improve the communication with the centres.					**Contingency Funds:** 130.000€	
					Contingency Time: 3 weeks	

Table 3.6.5: Risk 5 data sheet

<table>
<tr><td>Risk-ID:
R.6</td><td colspan="6">Risk Description:
Low team motivation: The team could lose motivation, which would lead to requiring more time and costs to be completed.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
Stagnation, poor management and global feeling of uselessness.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Medium</td><td>3</td><td>5</td><td>1</td><td>1.4</td><td colspan="2">Acceptance: Personal control and team building projects.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>2</td><td>3</td><td>1</td><td>0.7</td><td>Human Resources Manager</td><td>Interview team members to know their level of satisfaction with their work and request for their suggestions to improve their motivation.</td></tr>
<tr><td colspan="7">Secondary Risks:
People may still feel unmotivated and may decide to leave.</td></tr>
<tr><td colspan="7">Residual Risks:
It might be difficult finding someone new and people require time until they adapt to a new job.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
During the selection period, to have interviewed many people and keep the contact of the ones that are not hired. Moreover, trainees are always a good option, they don't have experience but they are cheap and they learn fast.</td><td colspan="2">Contingency Funds:
50.000€</td></tr>
<tr><td colspan="2">Contingency Time:
14 weeks</td></tr>
<tr><td colspan="7">Comments:
To improve the team building, the enterprise can take charge of some after-work leisure activities.</td></tr>
</table>

Table 3.6.6: Risk 6 data sheet

<table>
<tr><td>Risk-ID:
R.7</td><td colspan="6">Risk Description:
Unsuccessfully control of quality: The quality of some component, product or deliverable may not be as it is expected and established in the acceptance criteria.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
The employees may not be sufficiently qualified and the controls may not be sufficiently accurate.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>4</td><td>2</td><td>2</td><td>1</td><td colspan="2">Mitigation: Improve or increase the quality controls.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>2</td><td>1</td><td>2</td><td>0.7</td><td>Quality Manager</td><td>Use higher qualified personnel, and buy better control resources.</td></tr>
<tr><td colspan="7">Secondary Risks:
Specialists are expensive, but they might not be able to do all the tasks they are asked to do.</td></tr>
<tr><td colspan="7">Residual Risks:
The quality control established may still not be accurate enough.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
Design specific quality control methods to ensure that the new technologies accomplish the expected acceptance criteria.</td><td colspan="2">Contingency Funds:
250.000€</td></tr>
<tr><td colspan="2">Contingency Time:
8 weeks</td></tr>
</table>

Table 3.6.7: Risk 7 data sheet

<table>
<tr><td>Risk-ID:
R.8</td><td colspan="6">Risk Description:
Conflicts between members: There could be a disagreement over the project issues between executive members.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
Either lack of communication between the team members or bad relation between them.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>High</td><td>2</td><td>4</td><td>2</td><td>1.9</td><td colspan="2">Acceptance: Personal conflicts resolution meetings.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Medium</td><td>1</td><td>2</td><td>2</td><td>1</td><td>Project Manager</td><td>Encourage communication among team members. Look for possible causes of conflicts. Establish team-building activities.</td></tr>
<tr><td colspan="7">Secondary Risks:
Bad communication between the members can still persist, even if the environment is good.</td></tr>
<tr><td colspan="7">Residual Risks:
People may still need someone as their interlocutor, as it can be difficult for some people to improve their communication skills.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
The manager of each department has to be aware of the all the decisions that are made and he is the interlocutor between the team members when there is a misunderstanding with communication.</td><td colspan="2">Contingency Funds:
100.000€</td></tr>
<tr><td colspan="2">Contingency Time:
6 weeks</td></tr>
<tr><td colspan="7">Comments:
The manager does not have to see what all its team members are doing at all times, but as he is responsible for its team he has to watch over.</td></tr>
</table>

Table 3.6.8: Risk 8 data sheet

Risk-ID: R.9	**Risk Description:** Infeasible design: The design could turn out to be excessively costly or not possible to be built.					
Status: Closed	**Risk Cause:** Technology or physical limits, technical issues and costly solutions.					
Probability	**Impact**			**Score**	**Responses**	
	Scope/Quality	**Schedule**	**Cost**			
Low	2	4	4	1.4	Transfer: Periodical reviews with experts and managers.	
Revised Probability	**Revised Impact**			**Revised Score**	**Owner**	**Actions**
	Scope/Quality	**Schedule**	**Cost**			
Very low	1	1	4	0.5	Engineering Department Manager	Follow the specified design standards. Stick to the available technology.
Secondary Risks: If periodical reviews with experts and managers are carried out, the schedule of the project could be increased and the cost afected.						
Residual Risks: It is still possible to find a new technical issue that could make the design infeasible, but the risk will be unlikely if the experts detect them in advance.						
Contingency Plan: Rethink the entire design and make an evaluation of the technical problems in order to have a feasible design.					**Contingency Funds:** 300.000€	
					Contingency Time: 8 weeks	
Comments: It is very important that technical experts contribute in the meetings and the managers understand the issues.						

Table 3.6.9: Risk 9 data sheet

<table>
<tr><td>Risk-ID:
R.10</td><td colspan="6">Risk Description:
Technologies components with safety vulnerabilities: Safety vulnerabilities are unwanted in high-tech projects if some government is interested in using the technology.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
Computing vulnerabilities, source code bugs and exposure, encryption issues.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>High</td><td>4</td><td>3</td><td>2</td><td>2.1</td><td colspan="2">Transfer: Check for possible security problems during development through specialized companies.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>2</td><td>1</td><td>1</td><td>0.8</td><td>Engineering Department Manager</td><td>Establish regular contact with outsourced companies responsible for technological safety.</td></tr>
<tr><td colspan="7">Secondary Risks:
If the product does not fulfill the safety requirements, the data policy could be affected and the value of the product could be decreased.</td></tr>
<tr><td colspan="7">Residual Risks:
The collected data could be taken by secondary companies unless an encryption is carried out.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
Hire an external security company to solve the vulnerability issues.</td><td colspan="2">Contingency Funds:
100.000€</td></tr>
<tr><td colspan="2">Contingency Time:
6 weeks</td></tr>
<tr><td colspan="7">Comments:
A product or service without exposures will have more value for the European Union.</td></tr>
</table>

Table 3.6.10: Risk 10 data sheet

<table>
<tr><td>Risk-ID:
R.11</td><td colspan="6">Risk Description:
Organization Issues: The project could be disorganized in terms of timing, activities, etc. and the schedule may change.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
Not using the communication tools, not carring out the meetings planed, a bad organization due to irresponsible project manager, etc.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Very High</td><td>3</td><td>4</td><td>3</td><td>3.2</td><td colspan="2">Transfer: Ask for help from an external company specialized in project management.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Medium</td><td>2</td><td>2</td><td>2</td><td>1.2</td><td>Project Manager</td><td>Establish weekly meetings between the department responsible. Enhance the use of organization software.</td></tr>
<tr><td colspan="7">Secondary Risks:
Being helped from an external company suposes learning a new way of working and also a time and cost overrun.</td></tr>
<tr><td colspan="7">Residual Risks:
Some people could have difficulties in the process of adapting themselves to the new organization tools.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
If the problem persists, a staff restructuring will have to be done.</td><td colspan="2">Contingency Funds:
100.000€</td></tr>
<tr><td colspan="2">Contingency Time:
10 weeks</td></tr>
<tr><td colspan="7">Comments:
Organization issues are really important because they affect to quality, schedule and cost. They have to be seriously taken into account.</td></tr>
</table>

Table 3.6.11: Risk 11 data sheet

Risk-ID: R.12	**Risk Description:** Stakeholder desertion: The abandonment of a stakeholder could occur for several reasons, leaving the project without its contribution.					
Status: Closed	**Risk Cause:** Stakeholder bankruptcy, economical issues or problems between companies.					
Probability	**Impact**			**Score**	**Responses**	
	Scope/Quality	**Schedule**	**Cost**			
Low	2	4	2	1.2	Acceptance: Try to transfer the responsibilities to another stakeholder or contract a new one.	
Revised Probability	**Revised Impact**			**Revised Score**	**Owner**	**Actions**
	Scope/Quality	**Schedule**	**Cost**			
Very low	1	2	2	0.3	Project Manager	An in-depth research of alternatives to the current members would allow fast solutions.
Secondary Risks: If the response is carried out means that the project incorporates a new company, which could have different methodologies or opinions.						
Residual Risks: A Stakeholder desertion could still happen, but with the research of alternatives done, solving the problem would be easier.						
Contingency Plan: Hire a new company to replace the stakeholder.					**Contingency Funds:** 250.000€	
					Contingency Time: 2 weeks	

Table 3.6.12: Risk 12 data sheet

Risk-ID: R.13	**Risk Description:** Competitors appearance: The emergence of other companies that could offer the same product. This could modify the benefits of our company.					
Status: Closed	**Risk Cause:** Interest of other companies in the technology or the product that HIRO is developing.					
Probability	**Impact**			**Score**	**Responses**	
	Scope/Quality	**Schedule**	**Cost**			
Very low	4	1	4	0.7	Acceptance: Improvement of the quality/price ratio of the service.	
Revised Probability	**Revised Impact**			**Revised Score**	**Owner**	**Actions**
	Scope/Quality	**Schedule**	**Cost**			
Very Low	3	1	3	0.5	Quality Manager	Improve the image that HIRO gives to the European Union. Use our resources more efficiently.
Secondary Risks: There could be issues between the cost and the engineering departments.						
Residual Risks: The quality department could need resources to keep the image of HIRO.						
Contingency Plan: Dedicate as much resources as possible to improve the price of the product and the design in order to be more attractive.					**Contingency Funds:** 100.000€ **Contingency Time:** 10 weeks	
Comments: Note that competitors apperance is an external risk.						

Table 3.6.13: Risk 13 data sheet

<table>
<tr><td>Risk-ID:
R.14</td><td colspan="6">Risk Description:
Delay in external deliverables: If the products that the company orders do not arrive at the predicted time, all the processes can experience a delay, increasing costs.</td></tr>
<tr><td>Status:
Closed</td><td colspan="6">Risk Cause:
A bad performance of an outsourced company.</td></tr>
<tr><td rowspan="2">Probability</td><td colspan="3">Impact</td><td rowspan="2">Score</td><td colspan="2" rowspan="2">Responses</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Medium</td><td>2</td><td>4</td><td>2</td><td>1.4</td><td colspan="2">Acceptance: Control the delivery schedules and change provider if necessary.</td></tr>
<tr><td rowspan="2">Revised Probability</td><td colspan="3">Revised Impact</td><td rowspan="2">Revised Score</td><td rowspan="2">Owner</td><td rowspan="2">Actions</td></tr>
<tr><td>Scope/Quality</td><td>Schedule</td><td>Cost</td></tr>
<tr><td>Low</td><td>2</td><td>1</td><td>2</td><td>0.7</td><td>Sales Department Manager</td><td>Ask for materials to arrive before the delivery final deadline and have them in stock.</td></tr>
<tr><td colspan="7">Secondary Risks:
If the materials arrive before the delivery final deadline could have an extra cost.</td></tr>
<tr><td colspan="7">Residual Risks:
There is always the possibility that the product never arrives for any reason.</td></tr>
<tr><td colspan="5" rowspan="2">Contingency Plan:
If the outsourced company does not provide an acceptable performance it has to be changed.</td><td colspan="2">Contingency Funds:
100.000€</td></tr>
<tr><td colspan="2">Contingency Time:
2 weeks</td></tr>
</table>

Table 3.6.14: Risk 14 data sheet

Risk-ID: R.15	**Risk Description:** Economical market issues.					
Status: Closed	**Risk Cause:** During the period of time that the project is executed, there could be large-scale economic crisis.					
Probability	**Impact**			**Score**	**Responses**	
	Scope/Quality	**Schedule**	**Cost**			
Low	2	1	4	1.1	Acceptance: Control cost evolution due to external changes throughout the project.	
Revised Probability	**Revised Impact**			**Revised Score**	**Owner**	**Actions**
	Scope/Quality	**Schedule**	**Cost**			
Medium	2	2	2	0.9	Sales Department Manager	Reconsider budget estimations with market variations.
Secondary Risks: The possible economical market changes may have a major impact on the estimated budget.						
Residual Risks: The budget might be slightly overrun due to major changes.						
Contingency Plan: Try not to overrun the budget during the development of the project. Then, in case of an economical crisis try to be as efficient as possible and do little changes to try to accomplish with the planned budget.					**Contingency Funds:** 150.000€ **Contingency Time:** 6 weeks	

Table 3.6.15: Risk 15 data sheet

Risk-ID: R.16	**Risk Description:** Components or raw material quality: The ordered equipment or materials could be in an unacceptable condition, delaying processes and increasing costs.					
Status: Closed	**Risk Cause:** The hardware needed to implement the payload is purchase to an external company and it may arrive in unacceptable conditions.					
Probability	**Impact**			**Score**	**Responses**	
	Scope/Quality	**Schedule**	**Cost**			
Low	4	2	3	1.2	Mitigation: Have exhaustive and regular quality controls to avoid problems in components in the final test.	
Revised Probability	**Revised Impact**			**Revised Score**	**Owner**	**Actions**
	Scope/Quality	**Schedule**	**Cost**			
Medium	3	1	2	0.7	Software Engineering Manager	Establish quality inspections of the acquired materials.
Secondary Risks: The components and material can be degraded during the assembling.						
Residual Risks: Superficial imperfections that do not affect the quality of the product.						
Contingency Plan: Be carefull with the storage of the components and raw materials. In case of bad condition before usage, ask the company for a refund and change the supplier.					**Contingency Funds:** 70.000€	
					Contingency Time: 4 weeks	

Table 3.6.16: Risk 16 data sheet

4 Plan communication management

This section stands for an accurate description of the communication management inside the DEOS-UD Project, as communication is one of the keys to a successful development of any project. In the first insight, the different roles and responsibilities will be described as well as the different relations between people, teams, and committees inside DEOS-UD. Along with the detailed roles and responsibilities of teams and committees, every member's specific task inside them will be mentioned. Secondly, the different communication procedures will be carefully detailed to provide the maximum information possible in order to allow a correct development of meetings and communications between people and departments, thus increasing the overall project efficiency. The section will end with a communication management plan matrix, which will summarize all the previously described procedures by mapping all the communication requirements of the project.

4.1 Participants roles and responsabilities

As previously stated, this section will provide the reader with the roles and responsibilities of the different DEOS-UD staff in terms of the Communication Plan. In this section, different committees and teams will also be described.

Steering Committee

The steering committee will provide DEOS-UD with solutions to problems along with strategic command in order to ensure a correct and efficient development of the project. As this team's role is of extreme importance when it comes to the project's success, a careful selection of its representatives must be performed. The steering committee will be composed of the members with key roles in the DEOS-UD project; these members are listed in the following table, extracted from the first project charter.

Role	Resource Name	Organization	Responsibilities
Project Sponsor	Luís Manuel Pérez Llera	European Commission	Supervise the project.
Project Manager	Pol Fontanes Molina	HIRO	Manage the project.
Project Secretary	Sílvia González García	HIRO	Administrate the internal documents and information of the group.
Financial Manager	Santiago Lopezbarrena Arenas	HIRO	Estimate and control the costs of the project.
Stakeholders & Procurement Manager	Eva María Urbano González	HIRO	Identify the stakeholders of the project and manage and control their engagement. Plan, conduct and control the procurements of the project.
Scope & Time Manager	Marina Pons Daza	HIRO	Define and control the scope and deadlines of the project.
Risk Manager	Borja Calderón Rosario	HIRO	Identify and manage the possible risks of the project.
Quality Manager	Guillermo Escartín Vivancos	HIRO	Control that the quality requirements of the project are met.
Technical Managers	David Pérez Sánchez, Hamza Nachett, Laura Pla Olea	HIRO	Analyse and control the technical aspects of the project.
Marketing & Communications Managers	Albert Herrando Moraira, María De Benedicto Barba	HIRO	Promote the project and its final product. Search for possible customers. Ensure communication between the different members of the group.

Table 4.1.1: Roles and responsibilities

As described, the team will not only work as a steering committee but also as an advisory committee, for this reason, it will be composed by multiple consortium members that will act as advisors in diverse fields. The key roles developed by the steering committee are detailed below.

- Take and implement management decisions that affect a significant part of the

stakeholders.

- Take action in important schedule delays as well as cost overruns by modifying resources assigned to departments, staff planning, or anything necessary to redirect situations that endanger a correct development of the project.
- Offer leadership, guidance, and support to problems that smaller groups have not been able to solve by themselves.
- Enhance communication skills along with communications procedures in order to avoid communication-related problems.

Project Manager

DEOS-UD Project manager, Pol Fontanes Molina, is the person in charge of assuring that every aspect of the project is functioning as planned. He is ought to detect, communicate and correct any deviations (schedule variances, cost overruns, and scope changes) from the original plans. The decisions taken by the PM will be communicated directly to the steering committee, members of which will communicate to the rest of the staff.

Advisory committee

Participants in the advisory committee are detailed here.

- Research and Development assessors:
  - Matthew Perren (Airbus Defence and Space GmbH)
  - Ismael López (Deimos Space)
- Legal and Business Assessor
  - Oliver Heinrich (BHO Legal)
- Application collaborators
  - Jean François Rapp (ICUBE-SERTIT)
  - Vessela Samoungi (ReSAC)
- Development and Application collaborator
  - Steven Krekels (VITO nv)

The function of this committee will be that of providing tailored assistance in anything related to the project in order to solve issues and avoid risks during DEOS-UD development. Given

the importance of this group itself, its participants will meet with the steering group regularly to ensure a correct use and implementation of their know-how inside DEOS-UD.

Business Project Team

This team will be directed by Santiago Lopezbarrena Arenas, the financial manager, and is in charge of assuring an economical resources correct management by providing careful tracing in the use of the budget along with a proper staff training in means of economical performance. This team is also ought to communicate the project manager with the latest information on earned value management parameters in order for the latter to know at what point exactly the development of the project is found.

Technical Project Team

The Technical Project Team, conducted by its three leaders David Pérez Sánchez, Hamza Nachett and Laura Pla Olea, will be in charge of analysing and controlling every single technical aspect of the project. The team itself must assure that everything done during DEOS-UD project development meets the requirements of the contract by successfully following all de documentation and activities received from the overall project staff, including contractors and subcontractors as well. As part of its essential activities, the Technical Project Team is expected to resolve and to give advice in any inconveniences or issues that may appear during the course of the project. The Technical Project Team's leaders will be part of the Steering group and will report regularly to the project manager on topics that concern the technical progress of the DEOS-UD project, by having gathered all the information related to this subject from the different departments developing such activities.

Oversight

For the sake of a reliable accomplishment of the project's goals along with a recognized meeting of the contract's specifications, an oversight agency will actively work with DEOS-UD mostly when different milestones are achieved and a certification in the results is needed. The company auditing DEOS-UD results will be Bureau Veritas and its specific responsibilities are detailed here.

- Auditing a correct implementation of the different requirements of the contract regarding privacy policies with data management.
- Auditing and guaranteeing that the results obtained through the milestones of the project meet the requirements of the contract.
- Supervising and advising on issues that may lead to undesired situations by providing the managers with the tools to perform an auditable work.

Given that an auditory is an external agency, it has not been included the advisory team; yet its collaboration inside the project is key to a successful accomplishment of the project's goals.

4.2 Communication process

This section approaches the way in which the information is transmitted. In order to communicate efficiently it is important to bear in mind who are we addressing to. The communication process can be divided into three main categories: informal communications, formal communications, and external communications.

4.2.1 Informal

Informal communications consist of e-mail, conversations, or phone calls and serve to supplement and enhance formal communications. Due to the varied types and ad-hoc nature of informal communications, they are not discussed in this plan.

4.2.2 Formal

The DEOS-UD Project will engage in various types of formal communication. The general types and their purpose are described below as "Status Meetings" and "Status Reports".

4.2.2.1 Status Meetings

There are five basic types of status meetings for the DEOS-UD Project:

- Status meetings internal to the DEOS-UD business team to discuss assignments, activities, and to share information
- Status meetings and reports between the DEOS-UD business team, and the technical project team
- Advisory Committee meetings with the project stakeholders, and project manager to review progress, risks, and issues
- Status meetings and reports between the DEOS-UD project manager and the steering committee
- Status meetings and reports to stakeholders, such as oversight agencies

4.2.2.2 Status Reports

A variety of status reports will be produced during the project. The status reports will be produced at regular intervals to provide stakeholders project information on the status and progress of the DEOS-UD project. At a minimum the reports will contain:

- Project status on major activities
- Project schedule
- Budget and cost tracking
- Status of issues and risks
- Health status
- Status of action items, if applicable.
- Future or planned activities

The intent of the status reports is to inform stakeholders of the project's progress and keep them actively involved in the project. The information provided will contain enough detail to allow stakeholders to make informed decisions and maintain oversight of the project.

4.2.3 External Communication

Although internal communication is very important for the proper development of the project, we must not forget that external communication is also crucial in a project of this magnitude. Having a good dissemination plan involves explaining how the outcomes of the project will be shared with stakeholders, relevant institutions, organisations, and individuals.
In order to achieve the proposed objectives in terms of external communication, the process of dissemination will be focused in two different ways depending on whether we want to reach the general public or aerospace sector.

4.2.3.1 General public

It is important to find an adequate channel to reach the less specialized public in the aerospace field. In order to achieve the maximum diffusion of the project in this sector, the following resources will be used.

- Social Networking. Social networks are the best way to reach the widest possible audience. Posting regularly is also crucial to keep people interested in the project. Some of the platforms that will be used during the project development are: Twitter, Linkedin, Facebook, and Instagram. There will be at least one update a week in order to keep people informed of the progress of the project.
- Website. A project website is one of the most versatile dissemination tools and will help to reach people unfamiliar with social networks. It can contain information intended to different profiles. As in the previous case, it has to be kept updated.

4.2.3.2 Aerospace sector

- Trade shows. Trade shows, fairs, and exhibitions are a great way to get in close contact with people from other regions and countries that we would ordinarily never be face to face with. They are also helpful in terms of finding new prospects, nurture current client relationships and stay up to date on the latest industry developments.
- Conferences. National and international conferences will help to share the achievements of the project with specialists in the field.
- Journal Articles. To promote project ideas and results in scientific research.

4.3 Communication management plan matrix

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Internal Business Status Meetings	Discuss assignments, activities and sharing information	Face to Face	Weekly	Business Team	Financial Manager	Agenda, Meeting Minutes	Soft copy archived on SharePoint site and project website
Technical and Business Status Meetings and Reports	Discuss assignments, activities, sharing information and reporting the project status	Face to Face	Weekly	Project Manager, Business Team, Technical Team, Project Secretary	Project Manager	Agenda, Meeting Minutes, Status Reports	Soft copy archived on SharePoint site and project website
Advisory Committee Meetings	Review progress, risks and issues	Face to Face	Monthly	Advisory Committee, Project Stakeholders, Project Manager, Project Secretary	Project Manager	Agenda, Meeting Minutes	Soft copy archived on SharePoint site and project website

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Steering Committee Status Meetings	Enhance communication and coordination of the project	Face to Face	Monthly	Steering Committee, Project Manager, Project Secretary	Project Manager	Agenda, Meeting Minutes	Soft copy archived on SharePoint site and project website
Status Meetings and Reports to Stakeholders	Report the status of the project including activities, progress, costs and issues	Face to Face or Video Conference	Monthly	Stakeholders, Project Manager, Project Secretary	Project Manager	Agenda, Meeting Minutes, Status Reports	Soft copy archived on SharePoint site and project website
Project Status Reports	Provide Stakeholders information on the status and progress of the project	Email	Monthly	Project Stakeholders, Stakeholder and Procurement Manager, Project Manager	Stakeholder and Procurement Manager	Project status, schedule, budget and cost tracking, status of issues and risks, health status, status of action items, future or planned activities	Soft copy archived on SharePoint site and project website

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Social Networking	Share any updates on the project	Facebook, Twitter, Instagram	Weekly	General Public	Marketing and Communication Manager	Online Posts	Online
Website	Contain varied information about the project	Website	Updated with any change	General Public	Marketing and Communication Manager	Online Posts	Online
Trade Shows	Face to face contact with potential customers as well as finding new prospects, nurture client relationships and stay up to date with latest developments	Onsite stands	Scheduled	Potential Customers, Genera Public and Industry Professionals	Marketing and Communication Manager	None	Face to Face
Conferences	Sharing achievements with industry specialists	Conferences	Scheduled	Industry Professionals	Project Manager	Presentation	Face to Face

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Journal Articles	Promoting project ideas, concepts and results in scientific and applied research communities and getting feedback from relevant stakeholders	Digital and Written platforms	When Available	Potential Customers, General Public and Industry Professionals	Project Manager	Journal Article	Hard Copy

Table 4.3.1: Communication management plan matrix

5 | Bibliography

[1] AAFP. Basics of Quality Improvement – Practice Management.

[2] Lean Solutions. ¿Que es Six Sigma?