PRAETORIAN

D1.2 Risk & Opportunities Register

Protection of Critical Infrastructures from advanced combined cyber and physical threats

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Abstract

PRAETORIAN has defined a "Risks & Opportunities management strategy that will allow to overcome the risks and properly handle opportunities or actions affecting the expected outcomes of the project positively. The consortium will support the Project Management in the task of monitoring the risks and the opportunities of the project so to easily identify them and take fast actions and wise decisions about them.

*Type. Report; Demonstrator; Ethics

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PRAETORIAN

PRAETORIAN strategic goal is to increase the security and resilience of European CIs, facilitating the coordinated protection of interrelated CI against combined physical and cyber threats. To that end, the project will provide a multidimensional (economical, technological, policy, societal) yet installation-specific toolset comprising: (i) a Physical Situation Awareness system, (ii) a Cyber Situation Awareness system; (iii) a Hybrid Situation Awareness system, which will include digital twins of the infrastructure under protection; and (iv) a Coordinated Response system. The PRAETORIAN toolset will support the security managers of Critical Infrastructures (CI) in their decision making to anticipate and withstand potential cyber, physical or combined security threats to their own infrastructures and other interrelated CIs that could have a severe impact on their performance and/or the security of the population in their vicinity.

The project will specifically tackle (i.e. prevent, detect, response and, in case of a declared attack, mitigate) human-made cyber and physical attacks or natural disasters affecting CIs. It will also address how an attack or incident in a specific CI can jeopardise the normal operation of other neighbouring/interrelated CIs, and how to make all of them more resilient, by predicting cascading effects and proposing a unified response among CIs and assisting First Responder teams.

PRAETORIAN is a CI-led, user-driven project, which will demonstrate its results in three international pilot clusters, some of them cross border -Spain, France and Croatia-, involving 9 outstanding critical infrastructures: 2 international airports, 2 ports, 3 hospitals and 2 power plants.

Document history:

Version	Date of issue	Content and changes	Partner
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Abbreviations and Acronyms

CP	Consortium Plenary
DoA	Description of Action
EC	European Commission
H2020	Horizon 2020. The EU Framework Programme for Research and Innovation
PD	Project Director
PDF	Portable Document Format
PMB	Project Management Board
PO	Project Officer
QA	Quality Assurance
R&O	Risks & Opportunities
TL	Task Leader
TM	Technical Manager
WP	Work Package
WPL	Work Package Leader

Executive Summary

Throughout the duration of the PRAETORIAN project, the management process will identify and monitor technical, managerial and financial risks that might affect the project's progress towards its objectives, in order to carry out mitigation actions as early as possible.

While the Work Package (WP) Leaders are responsible for the risk assessment and monitoring within their WPs, the Project Manager (PM) will be ultimately responsible for the oversight of the entire project against milestones and for the risk management effectiveness.

Risks can arise from unexpected technical difficulties or scientific findings, poor communication or co-operation between the partners, resource shortage by the partners, objectives not achievable in terms of budget or feasibility, partners leaving the consortium, human operational errors: planning errors, poor quality, etc. Risks need to be identified as early as possible and their probability and impact need to be evaluated in order to assign them a rating. According to the magnitude of the rating, risks will be handled and/or monitored until they are considered low.

Risks will be continuously updated and included in the **Risk Table** that is part of the project's Management Dashboard.

Furthermore, PRAETORIAN also monitor the opportunities that may arise during the implementation of the project. The consortium will propose solutions to properly handle opportunities or actions affecting the expected outcomes of the project positively, in order to take fast actions and wise decisions about them. Actions plans to catch an opportunity will be raised to the Project Management Board for internal decision.

The opportunities are monitored through the project's **Opportunities Register**.

1. Introduction

1.1   Purpose of the document

The objective of this report is to define a methodology for the continuous monitoring and management of risks and opportunities that may arise during the implementation of PRAETORIAN.

The risk management must provide continuous risk assessment and in case of problems, initiate the required corrective actions in co-operation with the concerned partners. To minimize the risks and potential delays or nonfulfillment of the promised goals, a general risk mitigation strategy will be prepared and will be observed during the whole project's lifespan.

Moreover, monitoring the opportunities or actions that may affect positively the expected outcomes of PRAETORIAN will contribute to maximize the project's impact.

1.2   Scope of the document

This document outlines policies and procedures for identifying and handling uncommon causes of project deviations that may compromise objectives (the risks) as well as those factors that can contribute to achieve the project expected outcomes (the opportunities). Risk/opportunities management is a continuous process throughout the lifetime of a project and addresses the planning of risk/opportunities management, identification, analysis, monitoring and control.

This document has to be read jointly with D1.5 Project Management Handbook and D1.1 Quality Assurance Plan.

1.3   Structure of the document

This document is structured as follows:

- Section 2 provides a description of the management structure in PRAETORIAN dealing with the risks and opportunities processes.
- Section 3 details the risk management methodology, and section 4 includes the PRAETORIAN Risk Table which has been produced until the submission of this deliverable.
- Section 5 deals with the Opportunities management methodology, and section 6 includes the PRAETORIAN Opportunities Register which has been produced until the submission of this deliverable.
- Section 7 summarizes the approach for PRAETORIAN R&O management.
- Section 8 offers the main conclusions of this document.

2. Governance and structure: roles in risk/opportunities management

The project's management structure is defined in D1.1 Quality Assurance Plan and is summarized in the following figure:
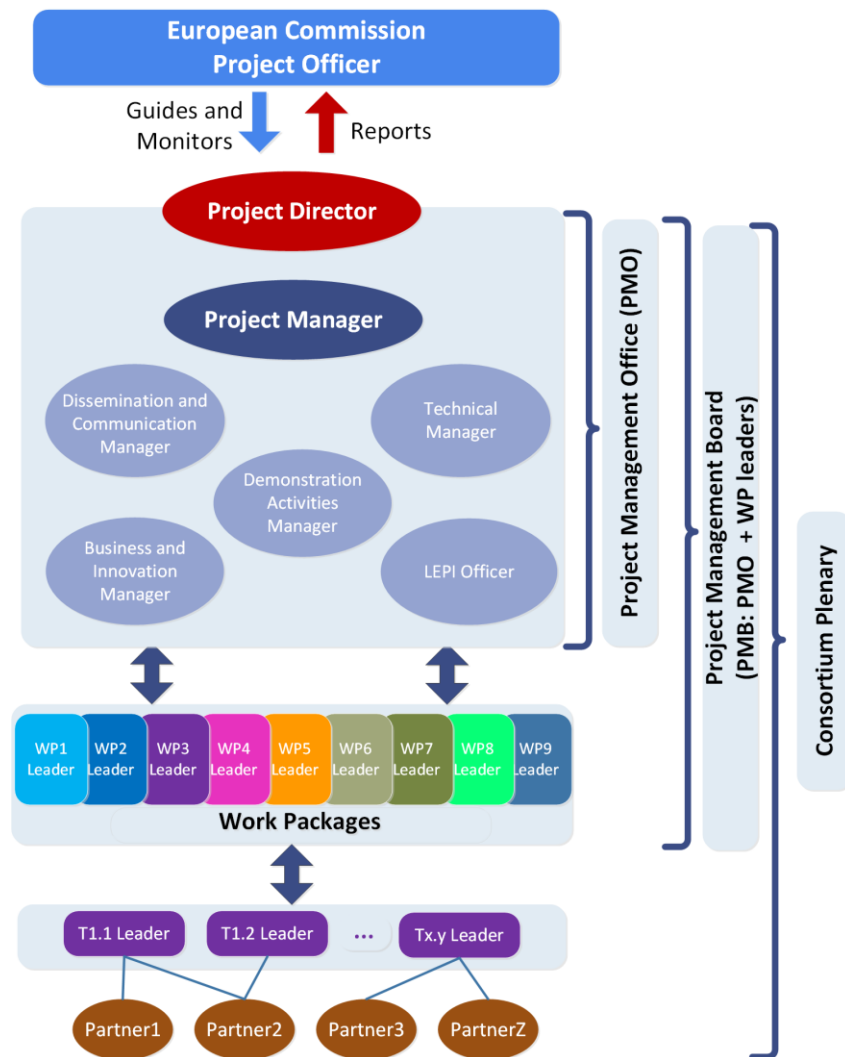
Figure 1 – PRAETORIAN Management structure

Focusing on **the risk assessment procedures**, it is the responsibility of the Project Manager to coordinate the inputs from WP leaders, to provide continuous risk assessment and in case of problems, initiate the required corrective actions in co-operation with the concerned partners. The general risk mitigation strategy must be part of this process and will be observed during the whole project's lifespan, to minimize the risks and potential delays or nonfulfillment of the promised goals.

Responsibilities in this task are defined as follows:

The Work Package Leaders are responsible for the risk assessment within their work packages, therefore they will be requested periodically (monthly) to check and update the Risk Table (see section 4) that is part of the project Management Dashboard. Biweekly meetings that take place for the Project Management Board (PMB) will be used to remind WPL about this. WPLs will do risk identification related to the activities of their WP, also with the corporation of Task Leaders, and will provide some insights about the Risk Analysis, Risk Handling and Risk Monitoring. Moreover, WPLs shall:

- Provide risk information to the PM and PD (in case of moderate or high risk).
- Prepare risk briefings, reports, or documents required for project progress monitoring during PMB meetings.
- Provide briefing to the respective Work Package members on the status of risks.

The Technical Manager (TM) is the overall risk manager and responsible for:

- Briefing the consortium on the status of PRAETORIAN risks during CP meetings.
- Tracking efforts to reduce high risk to acceptable levels.
- Facilitating consortium-level risk assessments during PMB meetings.
- Combining risk briefings, reports, and documents as delivered by the WP leaders and required for project reviews by the Commission.

On the other hand, the aim of the **opportunities management** is to identify and realize opportunities across the life of the PRAETORIAN project in order to optimize and secure objective achievements. The Project Manager, with the support of the Technical Manager, and the Project Management Board (in which are included the Work Package Leaders) are the main partners that will handle the Opportunities within PRAETORIAN. Moreover, the PM will:

- Monitor that the Opportunities Register is completed after detection of an opportunity by a partner.
- Ensure that the actions detailed in the Opportunities Register are feasible and can take place within a realistic action plan.
- Prepare risk briefings, reports, or documents required for project progress monitoring during PMB meetings.
- Provide briefing to the consortium on the status of PRAETORIAN opportunities during CP meetings.

3. Risk management methodology

The risk management in PRAETORIAN is based on the FERMA standard [1].

For the PRAETORIAN project, a risk is defined as an event that may or may not occur in the future, which could potentially have an adverse effect on a team's progress and success. A risk has a severity of impact and a probability of occurrence.

The consortium's experience in managing complex international projects in conjunction with its technological competence on communication and networking permits to identify the following main areas of possible risks:

- Technical: lack of competence or means to overcome unexpected difficulties.
- Financial: related to the economic situation of a partner or the allocation of resources for a certain task.
- Schedule: issues to meet the project deadlines.

Various combinations of these three main negative factors could also happen with the effect to increase their impact.

The corrective measures will be chosen after an evaluation of their impact and relevance on the project.

For the convenience of the reader, this report reproduces again in the following subsection some of the definitions that were already introduced in D1.1 Quality Assurance Plan. Then the Risk Management Process will be further depicted in subsection 3.2

3.1 Definitions

Risk

In the context of the project management, a risk is a measure of the inability to achieve overall project objectives within defined cost, schedule, and technical (performance and quality) constraints and has two components:

1. The probability of failing to achieve a particular outcome and
2. the consequences (impact) of failing to achieve that outcome.

For PRAETORIAN, the risk is a measure of the difference between actual performance of a process and the known best practice for performing that process.

Risk Event

Risk events are those events within PRAETORIAN that, if they go wrong, could result in problems in the development of the expected research results, production and assessment of the prototypes, and dissemination of the results. Risk events should be defined to a level such that the risk and causes are

understandable and can be accurately assessed in terms of likelihood/probability and consequence to establish the level of risk.

Type of Risk

- A **Technical Risk** is the risk associated with the evolution of the research results and the prototypes development of PRAETORIAN affecting the level of performance necessary to meet the requirements of the DoA.
- A **Financial Risk** is associated with the ability of the project to achieve its cost objectives as determined in the DoA. Two risk areas bearing on cost are:
  - The risk that the cost estimates and objectives are not accurate and reasonable and
  - the risk that project execution will not meet the cost objectives as a result of a failure to mitigate technical risks.
- **Schedule Risks** are those associated with the adequacy of the time estimated and allocated for the development, production, and fielding of the system. Two risk areas bearing on schedule risk are:
  - The risk that the schedule estimates and objectives are not realistic and reasonable and
  - the risk that program execution will fall short of the schedule objectives as a result of failure to mitigate technical risks.

Risk Ratings

This is the value that is given to a risk event (or the overall project) based on the analysis of the likelihood/probability and impact of the event. For PRAETORIAN, risk ratings of *Low*, *Moderate*, or *High* are assigned based on the following criteria:

- **Low Risk**: Has little or no potential for increase in cost, disruption of schedule, or degradation of performance. Actions within the scope of the planned project and normal management attention should result in controlling acceptable risk.
- **Moderate Risk**: May cause some increase in cost, disruption of schedule, or degradation of performance and/or quality. Special action and management attention may be required to control acceptable risk.
- **High Risk**: Likely to cause significant increase in cost, disruption of schedule, or degradation of performance and/or quality. Significant additional action and high priority management attention will be required to control acceptable risk. This type of risk may be subject to a report to the Commission.

Contingency Plan

Once identified and assessed, it is essential to trace risks both in their status (Risk Monitoring) and with respect to necessary activities. A contingency plan should cover the registration and reaction to the change of environmental conditions to avoid risk events.

3.2 Risk Management Process

A risk management process will be defined and will be implemented during the project duration. Different stages must be part of this iterative process, as shown in Figure 2.
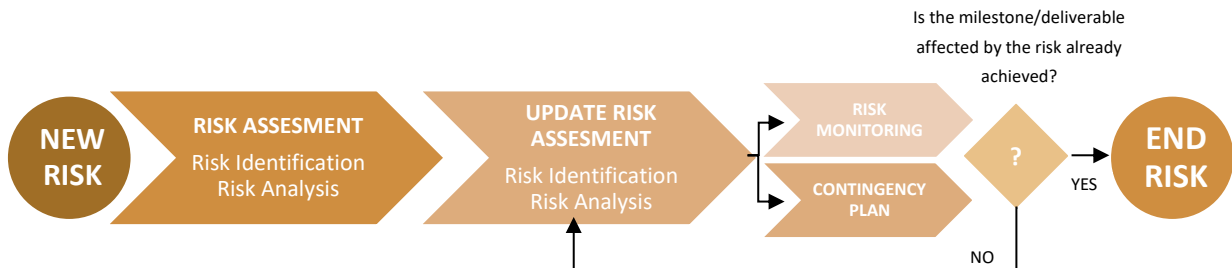
Figure 2 – Risk Management Process

3.2.1 Risk Assessment

Risk assessment includes the identification of critical risk events/processes, which could have an adverse impact on the project, and the analysis of these events/processes to determine the likelihood of occurrence/process variance and consequences.

Risk assessment is an iterative process. Each risk assessment is a combination of risks identified/analysed in the previous iteration and the identification/analysis of risks on current milestones/deliverables according to the DoA.

3.2.1.1 Risk Identification Process and Procedure

Risk identification is the first step in the assessment process. The basic process involves searching through the entire PRAETORIAN project plan to determine those critical events that would prevent the project from achieving its objectives.

The identified risks will be documented in the Risk Table – see section 4-, with a statement of the risk and a description of the conditions or situations causing concern and the context of the risk.

The risks will be primarily identified by the WPL, with the support of Task Leaders. All individuals in the PRAETORIAN project, can detect and report a risk to a WPL. The basic procedure of identifying risks consists of the following steps:

1. Understand the objectives (both "Technological" and "Impact and user oriented"). Examine the conditions under which the values must be achieved by referring or relating to the DoA.
2. Identify the processes and activities (tasks) that are needed to produce the results.
3. Evaluate each activity/task against sources/areas of risk.

3.2.1.2 Risk Indicators

The following indicators are helpful for identifying risks:

- Lack of stability, clarity, or understanding of requirements: Requirements drive the research and the design of the prototypes. Changing or poorly stated requirements guarantees the introduction of performance, cost, and schedule problems.
- Failure to use best practices virtually assures that the project will experience some risk. The further the deviation from best practices, the higher the risk.
- Insufficient or inadequate resources: People, funds, schedule, and tools are necessary ingredients for successfully implementing a process. If any are inadequate, to include the qualifications of the people, there is risk.
- Test Failure may indicate corrective action is necessary. Some corrective actions may not fit available resources, or the schedule, and (for other reasons as well) may contain risk.
- Negative trends or forecasts are cause for concern (risk) and may require specific actions to turn around.
- Communication is a critical success factor for PRAETORIAN. Failure to provide (push) available information actively as well as to demand (pull) required information actively will both introduce considerable risk.

3.2.1.3 Risk Analysis Process and Procedure

Risk analysis is an evaluation of the identified risk events to determine possible outcomes, critical process variance from known best practices, the likelihood of those events occurring, and the consequences (impact) of the outcomes. Once this information has been determined, the risk event may be rated against the project's criteria and an overall assessment of low, moderate, or high may be assigned.

The basic procedure for analysing risk comprises the following steps:

1. Gather all identified risks.
2. Assignment of likelihood/probability and consequence to each risk event to establish a risk rating.
3. Prioritisation of each risk event relative to other risk events.
4. Quantitative analysis.

For each risk identified during the risk identification process an assignment using Probability (likelihood) and Consequence/Impact assessments will be performed. A risk assessment matrix is used for PRAETORIAN, to provide a quantitative approach for this process. This matrix is implemented in the Risk Table so the person who identifies the risk can decide on the quantification of the different levels.
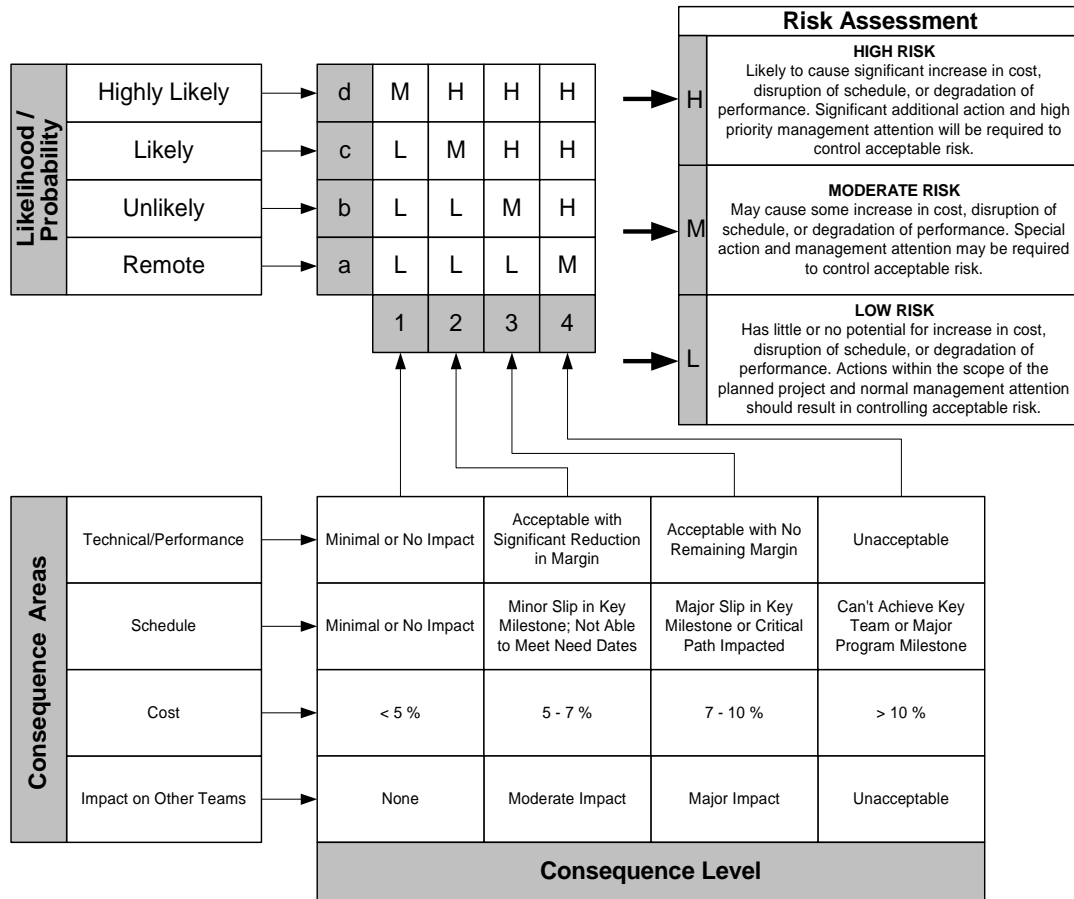
Figure 3 – Risk Assessment Matrix

The following items provide some more details on the most important issues of the risk assessment matrix:

- **Likelihood/Probability**: For each risk area identified, the likelihood/probability of the risk must be determined. There are four levels (a-d) in the PRAETORIAN risk assessment process, with the corresponding criteria of Remote, Unlikely, Likely and Highly Likely. If there is zero likelihood of an event, there is no risk per our definition.

- **Consequence/Impact:** For each risk area identified, the following question must be answered: Given the event occurs, what is the magnitude of the consequence? There are four levels of consequence (1-4) for this project. Further, there are four areas that we will evaluate when determining consequence: technical performance, schedule, cost, and impact on other teams (work packages). At least one of the four consequence areas need to apply for there to be a risk; if there is not adverse consequence in any of the areas, there is not risk at all.

    o **Technical Performance**: this category refers to content and includes all requirements that are not included in the other three metrics of the consequence table.

    o **Schedule**: this category refers to impacts in the overall time framework of the project. It is important to avoid excluding a consequence level from consideration just because it does not affect the work plan of a specific team/work package – i.e. try to have the whole PRAETORIAN consortium in mind.

- o **Cost**: since costs vary significantly within PRAETORIAN, the percentage criteria shown in the matrix may not strictly apply at the lower levels of the work breakdown structure. Therefore, the work package leaders may set the percentage criteria that best reflect their situation, but have to report any deviation from the matrix to the PC.
- o **Impact on Other Teams (work packages)**: both the consequence of a risk and the mitigation actions associated with reducing the risk may impact another team. This may involve additional coordination or management attention (resources) and may therefore increase the level of risk.

3.2.1.4 Evaluation of Risks

During Risk Analysis, it is possible that identified scenarios of occurring risk events cause impact to several impact areas. In this case, a consequence combination is present and the worst case of the risk assessment (high risk, moderate risk, low risk) is applicable and influences the required actions as described in the matrix. Of course, all identified consequence areas to a risk event must be recorded and the consequence area caused the final assessment has to be clearly identified.

3.2.1.5 Quantitative Analysis

After completion of the risk analysis, the quantitative analysis takes place and assigns a rating to each risk (low, medium, high). This finally yields an overview on the risk status over the entire course of the project and is part of the Risk Table in section 4.

3.2.2 Risk Monitoring

3.2.2.1 Risk Monitoring Process

Risk monitoring systematically tracks and evaluates the performance of risk-handling actions. It is part of the PM function and responsibility and will not become a separate discipline. Essentially, it compares predicted results of planned actions with the results actually achieved to determine the status and the need for any change in risk-handling actions.

To ensure that significant risks are effectively monitored, risk-handling actions will be reflected in the Risk Table and analysed at each CP meeting. Identifying these risk-handling actions and events in the context of the work breakdown structure establishes a linkage between them and specific work packages, making it easier to determine the impact of actions on cost, schedule, and performance.

3.2.2.2 Risk Monitoring Procedure

Each member of the consortium is responsible for monitoring and reporting the effectiveness of the handling actions for the risks assigned.

- Risks rated as **High** will be reported to the PM, who will handle and track them until the risk is considered Medium or Low and recommended for "Close Out".

- Risks rated as **Moderate** will be reported to WPLs, who will also track them until the risk is considered Low and recommended for "Close Out". However, the risk will be handled within the work package under the responsibility of the work package leader.
- Risks rated as **Low** are tracked within the Work Package and monitored continuously to ensure they stay low.

The risk management process is continuous. Information obtained from the monitoring process is fed back for reassessment and evaluations of handling actions to improve the process itself in co-operation with the PM and the TM.

3.2.3   Contingency Plan

3.2.3.1 Risk Handling Process

After the project's risks have been identified and assessed, the approach to handle each significant risk must be developed. There are essentially four techniques or options for handling risks:

- Avoidance (application of tasks in order to avoid the risk event).
- Control (watch the environmental conditions for influences on an already assessed risk).
- Transfer (application of tasks to set a risk to a lower level).
- Assumption (base a decision for handling plans on the assumption the risk event happens).

For all the identified risks, the various handling techniques should be evaluated in terms of feasibility, expected effectiveness, cost and schedule implications, the effect on the system's technical quality/performance and the most suitable technique selected. The results of the evaluation and selection will be included and documented in the Risk Table, with a description of the Contingency Plan or including a link to the relevant project's documents.

3.2.3.2 Risk Handling Procedure

The respective Work Package Leader or (in case of high risk) the PM is responsible for evaluating the risk handling options that are best fitted to the project's circumstances. These contingency plans shall be presented during PMB meetings or Plenary Meetings, and once approved, these are included in the work package's or project's strategy or management plans, as appropriate.

For each selected handling option, the responsible project team member will develop specific tasks that, when implemented, will handle the risk.

4. PRAETORIAN Risk Table

The main tool to keep track of the different identified risks is the Risk Table. It contains all the fields to correctly assess, monitor and mitigate a risk.

The table is structured considering the WPs in PRAETORIAN in order to create a direct connection between the risks and the responsible of its control. It could be the case that the risk manager – or WP leader – is not the same as the risk responsible – partner that should provide an action plan and mitigate the problem.

The Risk Table provides an easy way to quantify the severity of the problem. It implements the risk assessment matrix described previously and a Global Risk Indicator that considers the assessment of the four consequence areas as a whole.

In this way, the partner identifying a risk, only has to indicate the probability of the risk (HL=Highly Likely=4; L=Likely=3; U=Unlikely=2; R=Remote=1) and the impact in each of the consequence areas (1 Minimum, 4 Maximum). The table is capable of translating the assessment into the three categories (High risk, Moderate risk, Low risk) and calculate the Global Risk Indicator as an average of the different areas (0 Minimum, 4 Maximum).

A low global indicator may still imply a high risk, since the worst case should be always considered. A high risk in a single area will imply a low global indicator; however, it requires the maximum priority and attention. The global indicator serves to prioritize and order risks with the same qualification but affecting more than one area.

In this section, the reader can find the list of risks already foreseen by the own partners in PRAETORIAN. This table is part of the PRAETORIAN Management Dashboard and it is updated on a monthly basis.

	Nr of Risk	WP leader or Risk Manager	Date Identification	Last update	Risk description	Type of Risk (Technical/Financial/Schedule)	Risk responsible	Milestone or deliverable affected	Probability HL/L/U/R	Consequence/Impact 1=Minimum-4=Maximum Technical Performance	Schedule	Cost	Impact on other teams	Risk Assessment	Global Risk Indicator 0=Minimum 4=Maximum	Dates and trends Open	Trend (+ - =)	Close	Contingency Plan or link to document	Comments
WP1 - Project Management	WP1-1	ETRA	01/06/2021		Missing skills in the consortium when facing innovation and business challenges.	Technical / Schedule	ETRA		1	2	1	2	2	LOW	0,4375	01/06/2021			The consortium is composed by experienced partners with complementary competences and access to a wide pool of knowledge and resources.	
	WP1-2	ETRA	01/06/2021		Underestimation or resources not well balanced for the design and development of the project products.	Financial / Schedule	ETRA		2	1	2	1	1	LOW	0,625	01/06/2021			Regular monitoring of the work and reallocation of resources when needed will take place in every stage of the project.	
	WP1-3	ETRA	01/06/2021		A partner leaves the consortium, for example, because of deterioration of its economic situation.	Schedule	EDF		0	2	2	1	3	LOW	0	01/06/2021			The corrective measures would be distribution to the remaining partners of the activity not fulfilled or to subcontract to a 3rd party, or a combination of the two.	
	WP1-4	ETRA	01/06/2021		Disagreement or lack of communication among partners	Technical	EDF		1	1	2	1	2	LOW	0,375	01/06/2021			Continuous communication between all partners. The PM is the responsible for solving conflicts during the project.	
	WP1-5	ETRA	01/01/2020		COVID crisis could affect the organizations of project meetings and visit to the pilot sites.	Schedule	ETRA		1	1	2	1	1	LOW	0,3125	01/06/2021			These meetings will be organized virtually, and the visits to the pilot sites will take place when the COVID crisis will allow it.	

	Nr of Risk	WP leader or Risk Manager	Identification	Last update	Risk description	Type of Risk (Technical/Financial/Schedule)	Risk responsible	Milestone or deliverable affected	Probability HL/L/U/R	Technical Performance	Schedule	Cost	Impact on other teams	Risk Assessment	Global Risk Indicator 0=Minimum 4=Maximum	Open	Trend (+ - =)	Close	Contingency Plan or link to document	Comments
WP2 PRAETORIAN Toolset Architecture & Risk Scenarios	WP2-1	EDF	01/06/2021		Insufficient details in the requirements specifications that lead to incomplete information models or poor interoperability among systems.	Technical	EDF	MS4	1	3	2	3	3	LOW	0,6875	01/06/2021			All relevant partners will participate in the iterative process of the definition of information models and interoperability specification in line with overall project rationale.	
	WP2-2	EDF	01/06/2021		Insufficient details or wrong selection of use cases and requirements that lead to underestimate the performance to be achieved.	Technical	EDF	MS4	1	3	1	3	3	LOW	0,625	01/06/2021			All the project partners will be involved from the beginning in the iterative process of the definition and selection of the use cases and requirements. Common meetings and workshops will be organized to build a common view.	
	WP2-3	EDF	26/08/2021		Risk of delay in task T2.2 "Risk assessment approach development and benchmarking" due to high amount of information to be processed.	Schedule	EDF	MS1	1	2	2	0	3	LOW	0,4375	26/08/2021		04/10/2021	Extend the deadline by two weeks	Not needed
	WP2-4	EDF	18/10/2021		Delay to be expected for task 2.3	Schedule	EDF	D2.3, D2.5, D4.1	2	1	1	0	1	LOW	0,375	18/10/2021			Extend the deadline by one month	Request accepted by the PO on the 28th Oct
	WP2-5	EDF	18/10/2021		Delay to be expected for task 2.5	Schedule	EDF	MS2	2	1	3	0	3	MODERATE	0,875	18/10/2021			Extend the deadline by two months	Request accepted by the PO on the 28th Oct
	WP2-6	EDF	18/10/2021		Delay to be expected for task 2.6	Schedule	EDF	MS4	2	1	1	0	0	LOW	0,25	18/10/2021			Extend the deadline by two months	Request accepted by the PO on the 28th Oct
	WP2-7														0					
	WP2-8														0					

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Nr of Risk	WP leader or Risk Manager	Date Identification	Date Last update	Risk description	Type of Risk (Technical/Financial/Schedule)	Risk responsible	Milestone or deliverable affected	Probability HL/L/U/R	Consequence/Impact 1=Minimum-4=Maximum Technical Performance	Schedule	Cost	Impact on other teams	Risk Assessment	Global Risk Indicator 0=Minimum 4=Maximum	Open	Trend (+ - =)	Close	Contingency Plan or link to document	Comments
WP3 Cyber Situation Awareness (CYBER SA)																			
	WP3-1	THA	27/08/2021		Risk of a delay regarding the task T3.1 "Transioning risk management from design-time to runtime". Most of the interviews are missing due to the summer vacation period.	Schedule	THA	D3.1	2	2	0	0	2	LOW	0,5	27/08/2021	-		Extend the deadline by two more month	Request accepted
	WP3-2	THA	25/05/2021	08/09/2021	The deliverables of T3.4 is a demonstrator, and it has been classified EU Restricted by the EU during the Grant. Likewise for T3.6, even is this is only a report, because that report is about the APIs. How do we work collaboratively on EUCI code, including EUCI interfaces?	Technical	EDF	MS05	4	4	4	4	4	HIGH	4		-		Assess data that really needs to be EUCI between WP3 partners, then discuss solutions with EU on the way forward.	On 23/09/21, at PMB, ETRA informed that EU wrote that code is not EUCI on the project. To make that offocial it is proposed to change the deliverable from demonstrator to report.
	WP3-3	THA	01/10/2021		EDF organised the task KO of T3.3 on Octobre 1st (i.e., with 1 month delay), but the choice of the DT has not yet been made. If the delay extends to more than 2 months, this could have an impact on T3.4.	Schedule / Management	EDF	MS05	1	1	1	1	4	MODERATE	0,4375		+		EDF to decide on which DT to use.	
	WP3-4														0					
	WP3-5														0					
WP4 - Physical Situation Awareness (PSA)																			
	WP4-1	KONCAR	26/08/2021		Risk of a delay in task T4.1 "Physical risks and vunerabilities analysis" due to a lack of resources during the summer vacation period	Schedule	ETRA		2	1	0	0	2	LOW	0,375	26/08/2021			Extend the deadline to two more months	Request accepted
	WP4-2	ETRA	12/11/2021		Identification of legacy systems and sensors is not complete or accurate when doing the "Physical risks and vulnerabilities analysis" in T4.1	Technical	ETRA		2	3	1	2	3	MODERATE	1,125	12/11/2021			To monitor activities in T4.1 and T4.2 jointly, always with a link in pilto scenarios definition	
	WP4-3														0					
	WP4-4														0					
	WP4-5														0					
	WP4-6														0					
	WP4-7														0					

	Nr of Risk	WP leader or Risk Manager	Identification	Last update	Risk description	Type of Risk (Technical/Financial/Schedule)	Risk responsible	Milestone or deliverable affected	Probability HL/L/U/R	Technical Performance	Schedule	Cost	Impact on other teams	Risk Assessment	Global Risk Indicator 0=Minimum 4=Maximum	Open	Trend (+ - =)	Close	Contingency Plan or link to document	Comments
WP5 Hybrid Situation Awareness (HSA) & Cascading Effects	WP5-1	UPV	10/11/2021		Inaccurate specific CI requirements definition	Technical		MS2	2	2	2	1		LOW	0,625	10/11/2021				
	WP5-2	UPV	10/11/2021		Delay in Cyber Digital Twin development (T3.3)	Technical / Schedule		MS5	1	1	2	1		LOW	0,25	10/11/2021				
	WP5-3	UPV	10/11/2021		Delay in Physical Digital Twin development (T4.5)	Technical / Schedule		MS6	1	1	2	1		LOW	0,25	10/11/2021				
	WP5-4	UPV	10/11/2021		Lack of HSA feeding with physical data from PSA's output	Technical			1	2	1	2		LOW	0,3125	10/11/2021				
	WP5-5	UPV	10/11/2021		Lack of HSA feeding with cyber data from CSA's output	Technical			1	2	1	2		LOW	0,3125	10/11/2021				
	WP5-6														0					
	WP5-7														0					
	WP5-8														0					

	Nr of Risk	WP leader or Risk Manager	Identification	Last update	Risk description	Type of Risk (Technical/Financial/Schedule)	Risk responsible	Milestone or deliverable affected	Probability HL/L/U/R	Technical Performance	Schedule	Cost	Impact on other teams	Risk Assessment	Global Risk Indicator 0=Minimum 4=Maximum	Open	Trend (+ - =)	Close	Contingency Plan or link to document	Comments
WP6 Response Coordination	WP6-1	ICCS	01/09/2021	27/09/2021	Risk of not being able to use a pre-existing platform (mainly SAURON) as baseline for implementation; also affects other WP6 tasks. This might lead to a S/W architecture being developed from scratch.									LOW	0	01/09/2021			Attempting to evaluate the risk before the kick-off of WP6 (or in very early stages).	Still at risk asessmnent phase
	WP6-2	ETRA	09/11/2021		For EPWS there is no phone operator partner	Technical			3	2	1	1	1	MODERATE	0,9375	09/11/2021			Only part of the demonstrator will be implemented. The part in charge of sending the message to the phones will be simulated	
	WP6-3														0					
	WP6-4														0					
	WP6-5														0					

	Nr of Risk	WP leader or Risk Manager	Identification	Last update	Risk description	Type of Risk (Technical/Financial/Schedule)	Risk responsible	Milestone or deliverable affected	Probability HL/L/U/R	Technical Performance	Schedule	Cost	Impact on other teams	Risk Assessment	Global Risk Indicator 0=Minimum 4=Maximum	Open	Trend (+ - =)	Close	Contingency Plan or link to document	Comments
WP7 Integration and Verification	WP7-1	DLR	01/06/2021		COVID Crisis affect the development, deployment and integration of new systems and installations for proper demonstration, and the demonstration activities themselves, and evaluation of PRAETORIAN developments.	Technical			1	3	2	2	3	LOW	0,625	01/06/2021			The existing infrastructure and equipment will be deployed during the initial stage of the project. In case that some of the equipment is not ready in this initial stage, and extension on the demonstration and evaluation activities could take place. The persons involved will be wearing protection materials, such as masks, in totally controlled areas. The technical partners are skilled in remote work if it was necessary to avoid unnecessary contacts.	
	WP7-2														0					
	WP7-3														0					
	WP7-4														0					
	WP7-5														0					
WP8 Demonstration Activities & Impact Assessment	WP8-1	FVP	01/06/2021		Insufficient or corrupted raw measurement data collected from demonstrations to be used for the evaluation process.	Technical			2	3	2	3		MODERATE	1	01/06/2021			Use of several sources and conduct a pre evaluation procedure of the data to identify possible corruption and repeat part of the measurements if required.	Advance the request of data, propose the signing of NDAs if needed
	WP8-2	FVP	01/06/2021		Insufficient feedback collected from end-users during demonstration phase to be used for the evaluation process.	Technical			1	3	2	3		LOW	0,5	01/06/2021			End-users are part of the project consortium. Other end-users will be involved by organising meetings/workshops with them, repeating end-user feedback collection procedure if needed.	
	WP8-3	FVP	01/06/2021		Insufficient equipment and facilities to perform all test use cases.	Technical			1	2	1	2		LOW	0,3125	01/06/2021			Careful specification of the tests will be performed. The already installed equipment will be completed with the necessary HW and SW to run the demonstrators.	
	WP8-4	FVP	01/06/2021		Insecure storage of pilot data/ data breaches.	Technical			1	2	1	2		LOW	0,3125	01/06/2021			Develop security policy for handling pilot data since the beginning and agree on how to implement it with pilots.	
	WP8-5	FVP	01/06/2021		Insufficient or not proper KPIs selected or defined for both cross-site evaluation and impacts assessment.	Technical			2	2	2	2		LOW	0,75	01/06/2021			Use of well-known methodologies for KPIs selection and definition with the support of both PRAETORIAN AB and SG.	
	WP8-6	FVP	01/06/2021		Demonstration tasks are limited due to constraints of infrastructure availability, market and regulatory framework.	Technical		D9.2	1	1	1	2		LOW	0,25	01/06/2021			We have already a good understanding on the infrastructure, markets and regulatory framework	Link with WP9
	WP8-7														0					
	WP8-8														0					

| | Nr of Risk | WP leader or Risk Manager | Date | | Risk description | Type of Risk (Technical/Financial/Schedule) | Risk responsible | Milestone or deliverable affected | Probability HL/L/U/R | Consequence/Impact 1=Minimum-4=Maximum | | | | Risk Assessment | Global Risk Indicator 0=Minimum 4=Maximum | Dates and trends | | | Contingency Plan or link to document | Comments |
			Identification	Last update						Technical Performance	Schedule	Cost	Impact on other teams			Open	Trend (+ - =)	Close		
WP9 Ethical, Legal & Regulatory Issues	WP9-1	KUL	09/09/2021		Legal and policy developments during project lifetime	Technical	KUL		2	1	1	1	2	LOW	0,625	09/09/2021			Keeping up-to-date and implementing legal and policy developments	Since PRAETORIAN is a 2-year project, the likelihood is of this risk is not as high.
	WP9-2	KUL	09/09/2021		Non-compliance with legal and ethical frameworks	Technical			1	1	2	2	2	LOW	0,4375	09/09/2021			Providing information and guidance to partners. Identifying, implementing and validating legal and ethical requirements in research activities and developed technologies. Compliance with ethical requirements through WP11 deliverables and measures	Non-compliance could, among others, relate to requirements on the processing of personal data or involvement of human participants in research activities (e.g. legal basis, informed consent, transparency, etc.)
	WP9-3	KUL	11/11/2021		Dual-use or misuse of research findings (e.g. knowledge, methods, materials, technologies, etc.)	Technical			1	1	2	3	2	LOW	0,5	11/11/2021			Providing information and guidance to partners, understanding dual-use & misuse concepts and responsibilities, risk monitoring and management strategy, preventing & mitigating measures	

Nr of Risk	WP leader or Risk Manager	Date Identification	Date Last update	Risk description	Type of Risk (Technical/Financial/Schedule)	Risk responsible	Milestone or deliverable affected	Probability HL/L/U/R	Consequence/Impact 1=Minimum-4=Maximum Technical Performance	Schedule	Cost	Impact on other teams	Risk Assessment	Global Risk Indicator 0=Minimum 4=Maximum	Dates and trends Open	Trend (+ - =)	Close	Contingency Plan or link to document	Comments
WP10 Dissemination & Exploitation																			
WP10-1	ETRA	01/06/2021		Insufficient capacity of replication and evolution of concepts and services developed in the project.	Technical			1	2	1	2	1	LOW	0,375	01/06/2021			An extensive analysis will take place of the situation in other areas to define a roadmap for replication in different scenarios.	
WP10-2	ETRA	01/06/2021		Lack of standards and interoperability problems among the different systems.	Technical			1	2	1	2	2	LOW	0,4375	01/06/2021			A thorough analysis of existing standards and the selection of the most appropriate will be conducted. Interoperability is a main focus of the project and the tools developed.	
WP10-3	ETRA	01/06/2021		Unsuccessful exploitation strategy in terms of attracting the relevant stakeholders	Technical			1	1	1	2	1	LOW	0,3125	01/06/2021			A detailed analysis of the market and the products developed will be done during the project to detect gaps in the market to be covered by the project.	
WP10-4	ETRA	01/06/2021		The risk that technology investments will become obsolete.	Technical			2	1	1	2	1	LOW	0,625	01/06/2021			Specific plans for effectively mitigating obsolescence risk will be done for each product produced during the project.	
WP10-5	ETRA	01/06/2021		COVID crisis will cancel dissemination activities such as presentations in conferences or the organization of workshops	Technical / Schedule			2	2	2	2	1	LOW	0,875	01/06/2021			Some of these activities will be done virtually, and some others will be postponed.	
WP10-6	ICCS	14/09/2021	27/09/2021	Low engagement of partners in dissemination and communication due to COVID-19 and due to focus on technical tasks or other priorities	Technical / Schedule			2	3	2	2	1	MODERATE	1	14/09/2021			Remind partners to engage more in dissemination and in social media	
WP10-7														0					

5. Opportunities management methodology

5.1 Definitions

"True" opportunity: event that has not yet occurred but may and is positive for the PRAETORIAN project regarding the time, the cost and/or the performance.

Probability: it is based on the assessment of the partner detecting an opportunity, that it can be successfully realized during the project implementation.

Impact: positive effects that the opportunity will have in the project in case it is materialized.

5.2 Opportunities Management Process

The process to correctly manage the Opportunities follows the steps described in the subsections below: assessment, monitoring and handling.

5.2.1 Opportunities Assessment

The assessment starts with the identification of opportunities which could have a positive impact on the project, and the analysis of the actions that can contribute to its final achievement.

Allocation of responsibilities: identification of the partner in charge of monitoring and handling the opportunity. The WPs in which the opportunity may have an impact will be identified.

An initial **identification of "Probability" and "Impact"** has to be done by the responsible partner, who will rank them into three levels: Low, Medium and High. According to these values, the Interest of the Opportunity will be identified in the register as shown in the Opportunity Interest Matrix (Figure 4 below):

Opportunity Interest Matrix					
			Probability		
			L	M	H
Impact	L		L	L	M
	M		L	M	H
	H		M	H	H

Figure 4 – Opportunity Interest Matrix

Identification of actions: Actions to be carried out during the project implementation activities:

- Actions to get more information about the opportunity
- Actions to improve the opportunity probability or impact
- Actions to manage the opportunity once occurred

This information will be documented in the excel file **PRAETORIAN Opportunities Register**, which is available in the Alfresco Repository

5.2.2 Opportunities Monitoring

Once the opportunities have been described jointly with their set of actions and owners, the phase of monitoring starts. The opportunities will be monitored at least each month by the Opportunity Owners and by the Technical Manager. Moreover, each time a new information about an opportunity arises, the Opportunities Table will be updated accordingly and distributed inside the consortium.

The monitoring process consists of the following set of activities:

- Review the list of current opportunities status (on-going, paused, closed).
- Identify the action plans to be started.
- Compute the efficiency of the actions plan associated with each opportunity.
- Identify the occurrence of new opportunities that shall go through the same process.
- Update the opportunities register and inform the stakeholders.

Each change in the Opportunities Register will be communicated to the consortium for transparency reasons and to inform all the partners about the current potential actions that may have an impact for them.

5.2.3 Opportunities Handling

The process to correctly manage the Opportunity handling strategies has the following steps:

- Create: Create a major change in the strategy or direction to realise an opportunity.
- Share: Seeking to share benefits with a third party, another project or organisation.
- Increase: Carry out specific actions to increase the probability or the impact of the opportunity.
- Wait for: Acknowledge the opportunity but not take any specific action to realise the opportunity.

6. PRAETORIAN Opportunities register

In this section, the reader can find the list of opportunities already identified by the own partners in PRAETORIAN. This register will be updated when a new opportunity is detected and always after a Consortium Plenary meeting, in which a broad exchange of ideas is expected to occur, thus favouring the identification of opportunities.

PRAETORIAN

				WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	Resp. Partner / Role	Probability	Impact	Interest	Date of identification	Last update	Estimated trend Up / Stable / Down
	#		**Name**																	
M a n a g e m e t n	OM1		To be part of the ECSCI	x									x	PD / PM	High	Medium	High	09/09/2021		Stable
	OM2		Collaborate with sister project PRECINCT	x									x	PD / PM	High	Medium	High	26/08/2021		Stable
	OM3																			
	OM4																			
T e c h n i c a l	OT1																			
	OT2																			
	OT3																			
	OT4																			
B u s i n e s s	OB1																			
	OB2																			

OPPORTUNITIES REGISTER

OM1	

Name	To be part of the ECSCI
Description	The main objective of the European Cluster for Securing Critical Infrastructures, ECSCI (https://www.finsec-project.eu/ecsci) is to create synergies and foster emerging disruptive solutions to security issues via cross-projects collaboration and innovation. Research activities will focus on how to protect critical infrastructures and services, highlighting the different approaches between the clustered projects and establishing tight and productive connections with closely related and complementary H2020 projects. PRAETORIAN, as INFRA project, should join ECSCI.
Responsible	PD / PM

Actions	
Actions to get more information about the opportunity	DLR, alreday a member of the ECSCI, can provide more info as well as contact details
Action to improve the opportunity probability or impact	- To find the main contact of ECSCI and send a request to join the cluster - To identify possible working groups or task forces of interest in ECSCI taht may be positive for PRAETORIAN
Actions to manage the opportunity once occurred	- To identify partners in PREATORAIN willing to participate actively - To create a register of actions carried out in ECSCI to monitor and report to the EC

Action update date	9 September 2021

OM2	

Name	Collaborate with sister project PRECINCT
Description	Opportunity to collaborate with the sister project PRECINCT (https://cordis.europa.eu/project/id/101021668/), funded under the same call than PREATORIAN
Responsible	PD / PM

Actions	
Actions to get more information about the opportunity	To get in contact with the PRECINCT project coordinator INLECOM
Action to improve the opportunity probability or impact	- To create a roadmap for collaboration, in which joint activities can take place during the two year of duraction fo both projects
Actions to manage the opportunity once occurred	- To involve the PREATORIAN DCM for monitoring and reporting of activities

Action update date	26 August 2021

7. The R&O management approach

The project management approach used in PRAETORIAN provides mechanisms to identify and resolve various potential project risks, which can be considered as particular internal or external factors, ensuring efficient implementation of the required contingency plans. Moreover, the identification of opportunities during the project implementation, with the support of all the actors in the research, development and innovation areas of PRAETORIAN, will ensure that the project management will be able to take fast actions and wise decisions about them.

The general PRAETORIAN philosophy is based on the following pillars:

- **Effective project management**: The management structures and procedures ensure that project management can closely supervise the delivery of the expected results.
- **Contingency planning**: The work plan has been designed to allow for effective contingency planning in case of major risks. For every risk, a strategy will be developed considering the possibility to avoid or mitigate the risk, the plan for reducing its probability of occurrence and, in the case of materialisation of the risk, the plan for minimizing the impact on the project overall objectives and compromises.
- **Multiple loosely coupled objectives**: Finally, even when the goal of the project is to present a fully operative PRAETORIAN security solution, some of its extensions and components can be decoupled and exploited independently.

This strategy is aligned with the following ten golden rules of the risk and opportunities management.

1. Make the R&O management part of the project.
2. Identify R&O early in the project.
3. Communicate about R&O.
4. Consider both risks and opportunities.
5. Clarify ownership issues.
6. Prioritize R&O.
7. Analyse R&O.
8. Plan and implement risk responses and opportunities realisation.
9. Register project R&O.
10. Track R&O and associated tasks.

8. Conclusion

This deliverable has introduced PRAETORIAN R&O management governance and methodology, along with the main risks and opportunities foreseen at the time of writing this deliverable.

The Project Manager, with the support of the Technical Manager, and the Project Management Board (in which are included the Work Package Leaders) are the main partners that will handle the R&O management.

The basic procedure that these members will implement for analysing risk comprises the following steps:

1. Gather all identified risks.
2. Assignment of likelihood/probability and consequence to each risk event to establish a risk rating.
3. Prioritisation of each risk event relative to other risk events.
4. Quantitative analysis.

Moreover, concerning the identification and monitoring of opportunities, the basic procedure includes:

1. Review the list of current opportunities status (on-going, paused, closed).
2. Identify the action plans to be started.
3. Compute the efficiency of the actions plan associated with each opportunity.
4. Identify the occurrence of new opportunities that shall go through the same process.
5. Update the opportunities register and inform the stakeholders.

The PRAETORIAN Consortium has produced a first version of the overall Risk Table and Opportunities Register for the project, after the initial analysis of WP leaders and demo partners. These tables will be used as the starting point, will be revised periodically, and included in periodic reports.

9. References

[1] FEDERATION OF EUROPEAN RISK MANAGEMENT ASSOCIATIONS, FERMA, "A Risk Management Standard," [Online]. Available: https://www.ferma.eu/app/uploads/2011/11/a-risk-management-standard-english-version.pdf. [Accessed November 2021].