driver+

Driving Innovation in Crisis Management for European Resilience

D922.21- TRIAL GUIDANCE METHODOLOGY AND GUIDANCE TOOL SPECIFICATIONS (VERSION 1)

SP92 - TEST-BED

MARCH 2018 (M47)

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The DRIVER+ project

Current and future challenges due to increasingly severe consequences of natural disasters and terrorist threats require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

1. Develop a pan-European Test-bed for Crisis Management capability development:
    - Develop a common guidance methodology and tool (supporting Trials and the gathering of lessons learnt.
    - Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
    - Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
    - Ensure the sustainability of the pan-European Test-bed.
2. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
    - Facilitate the usage of the Portfolio of Solutions.
    - Ensure the sustainability of the Portfolio of Solutions.
3. Facilitate a shared understanding of Crisis Management across Europe:
    - Establish a common background.
    - Cooperate with external partners in joint Trials.
    - Disseminate project results.

In order to achieve these objectives, five sub-projects (SPs) have been established. **SP91** ***Project Management*** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on Crisis Management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment (from the former SP8 and SP9) are part of SP91 as well. **SP92** ***Test-bed*** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93** ***Solutions*** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in SP93. **SP94** ***Trials*** will organise four series of Trials as well as the final demo. **SP95** ***Impact, Engagement and Sustainability***, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardization.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities, whose most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange on lessons learnt and best practices between Crisis Management practitioners as well as technological solution providers.

Executive summary

This deliverable presents the foundations of the Trial Guidance Methodology (TGM), the steps of the TGM and the functional requirements of a tool (the Guidance Tool, GT) that support the end-users in applying the TGM.

The TGM is conceived for high-level crisis managers as it supports in investigating innovations in terms of new capabilities leading to improved crisis management operations. It focuses on a step-by-step approach to carry out Trials in a pragmatic yet sound and ethical way.

The foundations of the TGM draw on three main sources, which serve as the supporting Knowledge Base underlying the DRIVER + methodological approach:

- Concept Development and Experimentation (CD&E).
- A systematic literature review (SRL) of more than 200 peer-reviewed papers published in the last decade (2007-2017).
- Lessons learned from the first phase of the project.

These three pillars lay the groundwork for a new approach to Trials, which comprises three main phases:

1. The preparation phase, which consists of the iterative and co-creative DRIVER+ six-step approach (i.e., identify the Trial objective, formulate research questions, formulate data collection plan, formulate evaluation techniques and metrics, formulate the scenario and select solutions).
2. The execution phase, which consists of two Dry Runs and the actual execution of the Trial. The Dry Runs are the rehearsal to be carried out before the Trials to check both technical and methodological issues.
3. The evaluation phase, which covers the analysis of the Trial and also includes communication strategies.

D922.21 outlines the tasks and activities to be implemented in each phase, focusing on four main aspects: objectives, input, output and required activities. Several examples are also provided to illustrate these concepts.

Moreover, the functional requirements of the Guidance Tool (GT) with regards to the preparation phase to Trials are described in this document.

This document describes the first (initial) version of the TGM. The usage of each phase of the TGM in the upcoming Trials will be assessed, and lessons learned on its application will be covered in an updating version of the TGM (version-2), and finally the TGM will be described in the form of a handbook regarding systematic designing of Trials.

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List of Acronyms

Acronym	Definition
C4I	Connectivity for Industry
CD&E	Concept development and experimentation
CfA	Call for Application
CM	Crisis Management
COP	Common Operational Picture
CoW	Collaboration Workspace of DRIVER+
CP	Civil Protection
CRUD	Create, Read/Retrieve, Update, Delete/Destroy
DR&CM	Disaster Resilience and Crisis Management
DRM	Disaster Risk Management
EC	European Commission
ELSI	Ethical, Legal, Societal Issues
EU	European Union
GDPR	General Data Protection Regulation
GT	Guidance Tool
ICT	Information and Communication Technology
KPI	Key Performance Indicator
LL	Lessons learned
LLF	Lessons Learned Framework
NDA	Non-Disclosure Agreement
NGO	Non-Governmental Organisation
PoS	Portfolio of Solutions
RCRC	Red Cross Red Crescent
RQ	Research Question
SIA	Societal Impact Assessment
SLR	Systematic Literature Review
SMART	Specific, Measurable, Assignable, Realistic, Time-related
SOP	Standard Operating Procedure
SotA	State of the Art
TAP	Trial Action Plan
TGM	Trial Guidance Methodology
TRL	Technology Readiness Level

Acronym	Definition
UN	United Nations
UNISDR	United Nations International Strategy for Disaster Reduction
WP	Work Package

1. Introduction

The number and severity of natural disasters as well as humanitarian and civilian emergencies are increasing worldwide, causing fatalities as well as considerable economic losses. As a result, crisis management is a constantly evolving challenge. European crisis management capabilities need to continuously improve in order to face the rising challenges and needs.

This improvement is driven both from the bottom up by the response organisations carrying out the operations, as well as from the top down through the European Union's (EU) Civil Protection Mechanism and the European member states. The top down approach also supports and promotes prevention measures, as well as various (scientific) projects that prepare operations, set up disaster control structures and develop strategies, such as trainings, large-scale exercises, the Exchange of Experts Program and capacity building projects with the candidate countries.

Today more than ever, the EU's main objective in Crisis Management (CM) and Civil Protection (CP) is to provide assistance to those who need it as quickly as possible. The foundations for this are the Lisbon Treaty[1] and the Stockholm Programme[2]. Their objectives include improving the EU's disaster resilience and its capacity to prepare for and respond to acute threats. To meet these objectives, innovative socio-technical solutions promise to have a significant impact on the effectiveness of the whole CM system in the EU.

However, CM organisations often face difficulties to assess the potential impact of a change in their socio-technical setup for several reasons, ranging from the lack of resources to the lack of adequate methodological know-how to assess innovative solutions. Investments in new, but inappropriate sociotechnical solutions, not only produces significant costs, but also has negative impacts for the operational performance of response organisations. Changes may be brought about, for instance, by different types of solutions, such as new software or new training or workflow processes, each adopted with the aim to improve certain functions or activities. Assessing the potential impact of any kind of change is not a trivial task as it points to both capability development and to the identification of innovation. In the field of crisis management, innovation is often framed in terms of “innovation management” or innovative technical tools.

In the DRIVER+ project, the term innovation is closely linked to solutions that address the needs of the practitioners. The Trial-oriented environment developed in Sub-project 92 (SP92, Test-bed), is conceived and designed *to allow systematic assessing of solutions in realistic but non-operational contexts (namely, in Trials) to help practitioners in assessing solutions that can drive innovation (changes) before adopting them*. In a nut-shell, the pan-European Test-bed provides an appropriate environment in which the assessment of solutions is carried out using a structured, all-encompassing and mutual-learning approach.

In the context of SP92, WP922 is tasked with providing adequate guidance to practitioners through an iterative and co-creative approach. The detailed methodological approach consists of a pragmatic and sound, step-by-step framework (Trial Guidance Methodology, TGM) to prepare, execute and evaluate a Trial[3]. Starting from gaps that have been identified by end-users (D922.11), Trials are *designed* together with relevant stakeholders (T922.2, SP94) in such a way that the impact of changes/innovations can be properly assessed. The experiences in the Trials will lead to an updated and final version of the Trial Guidance Methodology and a corresponding Guidance Tool (T922.3 and SP93). To ensure the correct understanding and implementation of the methodology as well as the effective use of the Guidance Tool, WP924 will organise *ad-hoc* training modules.

[1] Consolidated versions of the Treaty on European Union and the Treaty on the functioning of the European Union. June 2010, DOI: 10.2860/58644. https://publications.europa.eu/en/publication-detail/-/publication/3c32722f-0136-4d8f-a03e-bfaf70d16349

[2] The Stockholm Programme – an open and secure Europe serving and protecting citizens. OJ C 115, 4.5.2010, p. 1–38. http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52010XG0504(01)

[3] From a methodological stand-point these phases correspond to specific steps. The rationale behind the TGM design is explained in Sections 3 and 1.

Despite being primarily focused on the development of the Trial Guidance Methodology, WP922 also works in close collaboration with WP923. The building blocks of the DRIVER + Test-bed (i.e., methodology, Test-bed reference implementation and support to Trials) are conceived as inherently related. Hence, this document positions itself in a broader context, both within SP92 and in relation to other Sub-projects. The support tools developed in the context of WP923, like the Online Observer Support Tool and the After Action Review Tool are in fact key elements to be used during the evaluation phase.[4] While the first will support the data collection from observers during the Trials, the second will facilitate the evaluation of the trialled solutions against pre-defined objectives. The functional specifications of the Guidance Tool as defined in this deliverable are the basis its development in SP93 (Solutions). Moreover, the initial TGM will be evaluated during the (preparation, execution and evaluation of) Trials and subsequently improved based on the feedback received from Sub-project 94 (Trials).

The present deliverable is in fact the first version of both the Trial Guidance Methodology and the specifications of the Guidance Tool. The second and updated version will be submitted in M58 and the final Handbook in M66.

This first version sets out the basis of the TGM. As such, it focuses on the following three main topics:

- The **theoretical foundations of the TGM**, in particular the Knowledge Base on which it draws.
- The **actual TGM**, namely the steps that Trial owners must follow to carry out Trials in a systematic way.
- The **functional requirements of the Guidance Tool (GT).**

While D922.21 provides the first version of the framework of the methodological approach, version 2 will be more focused on the improvements of the actual TGM based on lessons learned from the Trials, and the final Handbook will have, besides a further update, a didactic scope.

Rather than being a methodological quick-fix that fits all Trials, this deliverable provides the above-mentioned common framework with the ambition of being systematic as well as pragmatic, while also flexible enough to fit Trial-specific requirements and to be improved and revised during the project life cycle.

The main target group of this version are high-level crisis managers as it offers support *in investigating innovations in terms of new capabilities leading to improved crisis management operations*. Such investigations take into account the nature of the operational context (dynamic, uncertain, complex) and the way of working (procedural and hierarchical, as well as experience-based). Hence, methods of investigation are not imposed upon but rather developed together with practitioners so that these dimensions are adequately captured.

Besides high-level crisis managers, solution providers benefit from this approach. By giving practitioners the opportunity to assess a solution, the providers will get direct feedback. This enables them to gradually adapt the solutions to better fit operational conditions and it reinforces acceptance among users of the solutions via their active involvement and it provides evidence to decision-makers that the solutions have added value and are cost-effective.

In sum, integrating the perspectives and expertise from practitioners, solution providers, policy-makers and researchers in the design of a Trial is essential for stimulating innovation and true capability development within the Crisis Management domain.

[4] Information on the Test-bed is provided in: D923.11 and D923.21

1.1 Reader's guide

The document is organised as follows:

- Section 2 focuses on Trials. It shortly describes the purpose and the scope of a Trial by introducing the key performance measurement dimensions to be considered during Trials. Moreover, it shortly described the main roles and responsibilities of those involved in Trials, especially the roles referred to in this deliverable.
- Section 3 deals with the foundations of the DRIVER+ Trial Guidance Methodology. Specifically, it focuses on the three main sources of knowledge that guided the development of the TGM design, namely: the concept development and experimentation approach (CD&E), a systematic literature review (SLR) and lessons learned from past experiments conducted within the first phase of the project.
- Section 4 describes the design of the TGM from a broad perspective while.
- Section 5 presents the actual TGM. Tasks and activities are outlined for each phase of the TGM (preparation, evaluation and execution) by emphasising: objectives, input, output required activities and examples.
- Section 6 covers research ethics and Societal Impact Assessment (SIA) by providing both recommendations for Trials and a plan for implementing the SIA methodology into the TGM.
- Section 7 describes the functional requirements of the Guidance Tool to be used by Trial owners to design a Trial. The tool is based on the steps of the TGM.
- Section 8 focuses on the way forward, namely how and when the TGM will be improved and updated.

The Annexes provide details on:

1. The DRIVER+ terminology used in this document.
2. An extended description of the Systematic Literature Review.
3. The Lessons Learned template.
4. The Trial Action Plan (TAP).
5. UML-version of the Guidance Tool.

2. Purpose and scope of a Trial

This section describes the purpose (section 2.1), the scope (section 2.2) of a Trial, as well as some main roles and responsibilities of those involved in Trials (section 2.3).

2.1 Purpose of a Trial

In the domain of disaster resilience and crisis management, exercises have a primary role in testing the capabilities of organisations. At European level, Civil Protection exercises (full scale and module-field or table-top) are organised every year with the dual aims of both enhancing collaboration in disaster preparedness across borders and improving preparedness among EU civil protection authorities and teams. Exercises are considered to be important opportunities "for testing specific response capacities, as well as the self-sufficiency, interoperability, coordination and procedures of response teams and equipment. Table-top exercises, in turn, focus on in-depth training of key-personnel."[5] In such exercises, the *testing* element is the key and differentiates these activities from, for instance, Concept Development and Experimentation (CD&E) campaigns traditionally used in the defence domain in which cause-and-effect relationships underlying capability development are investigated.

Trials differ from exercises and they do not aim to train or test the capabilities and preparedness of the involved organisations or teams. Instead, *the purpose of conducting Trials in DRIVER+ is to find out if and how some innovative solutions can help resolve the needs of the CM practitioners*.

Additionally, the term "experiment", which was used in the first phase of the project, may be confusing as the conceived "controlled nature" of experimentation activities is seen as a pre-condition for conducting scientifically valid experiments. However, this laboratory-test like setting under strict controlled conditions does not apply to the activities carried out in DRIVER+. While, as outlined in section 3 some significant elements of the CD&E have been retained and adapted to the context of the project, the more neutral term "Trial" is considered more appropriate as DRIVER+ supports the identification of game changers that provide the needed innovation for CM practitioners.

The aims of conducting Trials are in fact not about carrying out scientifically validated experiments. It is about systematically finding and assessing valuable solutions in realistic environments for current and emerging needs in such a way that high-level crisis managers can do this using a structured yet pragmatic approach. The purpose of the TGM is to help assessing solutions. Proper assessment can take place only if the overall design of a Trial follows a structured method.

The different stakeholders in a Trial consist of one or more solution provider(s), one or more practitioner(s) and the Trial owner, who organises the Trial. The TGM is really dedicated to tackling the last mile problem of innovative solutions.

By carrying out a Trial (Dry Runs as well as the actual Trial), participants are able to introduce the operative reality at an early stage of solution development, and they get support in shaping the design of new solutions and approaches. The result of this approach is that innovation dynamics are aligned in such a way that a real added value for crisis management can be created in the end.

However, for a Trial to produce valuable results, and in order to create a complete and well-balanced Trial environment, the following key factors need to be taken into account:

1. **Gaps and needs as defined by the practitioners**
   The starting point for each Trial is the identification by practitioners of a gap or a requirement to improve and support operational processes. A gap and requirement analysis should therefore underlie a Trial. It should be specified in detail in advance which kind of user needs are to be the main focus of a Trial so that a suitable Trial environment can be created for the assessment of potential innovative solutions[6].

[5] https://ec.europa.eu/echo/what/civil-protection/simulation-exercises_en

[6] More details on the identification of gaps in the context of the project are provided in D922.11

In line with the identified gaps and the context in which these occur, the required types of practitioners and their roles can be defined.

2. **Involvement of CM practitioners as users of solutions**
   A comprehensive view of CM also requires a multi-functional approach, involving practitioners in the Trials and covering the full range of functions involved in CM, from emergency services, law enforcement, public health and medical services to public decision-makers and non-governmental organisations. It is essential that these practitioners, who will be using the solutions, are involved in the actual assessment of these solutions. The planning and implementation of the Trials is foreseen to be planned as cooperation between CM practitioners and solution providers.
3. **Involvement of solution providers**
   In order to assess the potential value of a particular solution, the respective provider should be actively involved as well, both during the Trial phase and in the preparation phase. The solution provider can adapt the solution to fit the purpose of the Trial, can indicate how to best measure the performance of a solution and can train the practitioners in using the solution. Within the scope of the project, solution providers are selected via a Call for Applications, followed by a review and selection Process[7] .
4. **Test-bed to create a space for trialling**
   The DRIVER+ Test-bed, defined as a distributed technological infrastructure enabling the pooling and sharing of resources across Europe, as well as the gathering of experiences from Trials in different contexts to stimulate each other, is developed.
5. **Innovative solutions, their assessment and evaluation.**
   The Trial environment is not primarily about inventing new solutions, but about achieving innovations based on the systematic assessment and adaptation of existing ideas and (emerging) solutions. The added value of these solutions in supporting the CM and their cost effectiveness is described and stored via a content-based management system, the so-called Portfolio of Solutions (PoS). The results can be content-oriented (for instance: Did the solution lead to a better Situational Awareness?) and process-oriented (for instance: Did the combination of solutions lead to a more effective decision-making process?).

2.2 Scope of a Trial

As mentioned in section 1, proper assessment of innovation can only take place if the overall assessment process follows a structured method. In this context, the object of investigation is a key as it refers to the ability to detect and assess the potential impact of a change on the socio-technical set-up of crisis management organisations. This involves a systematic investigation into the multiple effects of the solutions using mixed research methods. The primary focus is not solely the cause of the change (namely, the solutions), but rather the effects and the impact of the change on the so-called **crisis management dimension,** which is the key performance measurement area in DRIVER + Trials[8] .

As explained in D23.21, there are three DRIVER+ performance measurement dimensions to be considered during Trials: the Trial dimension, the Solution dimension and – as the core dimension – the CM dimension (Figure 2.1). All three performance measurement dimensions [9] are covered by the TGM containing methodological, procedural and logistics-related elements (such as specific data gathering techniques, checklists or relevant templates). The three performance measurement dimensions are explained below:

1. The Trial dimension covers the perspective of the Trial owner (i.e. the organisation hosting a DRIVER+ Trial) and measures all relevant data related to the pre-defined Trial objectives. As an example, in the context of spontaneous volunteer management, a Trial could investigate the question as to how many voluntary participants can be motivated to join a Trial in order to fill sandbags needed to build a dike.

[7] More details are provided in D942.11

[8] The introduction of the performance measurement scope in DRIVER experiments is provided in D23.21

[9] The dimensions are only introduced here. The importance of the dimensions within the actual TGM is explained in Section 5 .

For measuring purposes in order to answer such questions Key Performance Indicators (KPI) are used (e.g. *"the quotient participating volunteers/required volunteers"*.

2. The CM dimension is the key performance measurement area. The identification of CM objectives, described as mission objectives, is the foremost place to indicate whether a change of a process, the application of a new technology or a training module has an impact on the CM performance. Besides, the CM objectives need to be understood as the determining element of experiment objectives and the decision support objectives. Due to the different relief situations, stakeholders and time horizons the measurement objects vary in terms of specific roles, tasks, and processes. The question if a particular performance is effective or not can only be evaluated once the involved actors including their responsibilities and practices are defined. In the context of a chemical spill, one exemplary KPI can be derived from the major objectives targeting the evacuation of affected population (e.g. "number of evacuated persons/number of persons to be evacuated").
3. Finally, the Solutions dimension must be measured in order to learn whether a particular solution (e.g. a piece of technology or a new process) has the potential to drive innovation in CM. In the presented example, it could be a solution supporting evacuation tasks through the interaction with citizens; here, one solution function could be to identify the location of evacuees through the application of drones (one related KPI could be "time to locate evacuees with a drone/time to locate evacuees without a drone").

The identification of CM objectives, described as mission objectives, is the foremost place to indicate whether a change of a process, the application of a new technology or a training module has an impact on the CM performance. Besides, the CM objectives need to be understood as the determining element of experiment objectives and the decision support objectives. Due to the different relief situations, stakeholders and time horizons the measurement objects vary in terms of specific roles, tasks, and processes. The question if a particular performance is effective or not can only be evaluated, once the involved actors are defined, including their responsibilities and practices. These definitions have to be used to identify and configure the appropriate KPIs.

Taking the three dimensions and their interrelations into account, a clear and structured approach allows for the identification of relevant KPIs capable of measuring the *real impact of new solutions in CM*. This process is supported with generic rules of performance measurement approaches, procedural guidelines and recommendations.

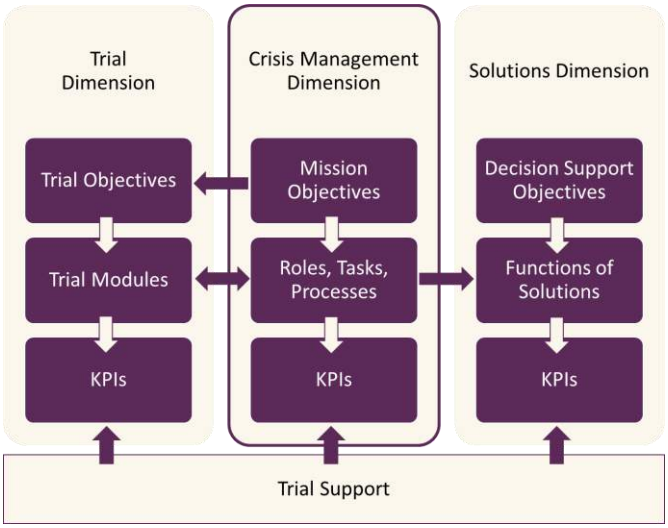

Figure 2.1: Key Performance Measurement Dimensions

Defining KPIs given the objectives in each of the Dimensions, is not an easy process for many practitioners and requires guidance and support. Therefore, during the preparations of the Trials within DRIVER+,

dedicated support is being provided by a methodological team[10]. This methodological team does not work in isolation, but rather offers on the guidance to the Trial Committee, starting from the identification of the Trial objectives to the evaluation phase. Furthermore, the guidelines and recommendations of the TGM can be tailor-made to the specific context of a Trial. While some general guidelines are provided (section 5) methods are specifically tailored to the characteristics of a particular crisis management organisation and the (Trial) context in which it operates.

There is no methodological "silver bullet" wrapped up in forms of guidelines that can empower practitioners without taking into account a number of specific conditions: gaps at a regional and local level, specific processes and procedures within different crisis management organisations, tactical and strategical crisis management plans etc. Special socio-cultural conditions demand *ad hoc* methods to ensure that the potential impact of a change is measured within a specific context and is relevant to be considered in that context. Context-dependency implies that methods are transferrable but not entirely "replicable": via the TGM and the GT, practitioners will have access to a wide variety of recommendations so that they can implement best practices in their respective contexts. Conversely, the approach used in the course of the project, namely the guidance process (the establishment of an iterative Trial development) adopted with the stakeholders, is of course reusable.

Additionally, the methodological team works with IT developers so that the GT is consistent with the TGM. Structured feedback provided by the Trial stakeholders and the GT developers is crucial for developing the appropriate environment in which to Trial solutions, namely DRIVER+ Test-bed. As specified, the Test-bed evolves during Trials thanks to feedback mechanisms that revolve around co-creation and mutual learning. This allows for working processes and learning patterns that are circular, instead of linear.

There are a few challenges to consider related to this practitioners-oriented approach:

1. While Trials are not scientifically validated experiments, the ambition of the TGM is to be scientifically sound. This implies a robust method that has to be translated into both the language and the real-life experiences of the users.
2. The ambition of being sound, rigorous and simple – but not simplistic – also implies an iterative development process with all the stakeholders. In this context iterative means that the concept matures and grows until it can be trialled. The iterative nature of this process is yet another important aspect of the CD&E, which is still valid in the context of the methodology used in DRIVER+ Trials. Likewise, the Test-bed itself evolves and matures during Trials. While this approach reduces complexity, it requires a participatory method that may be difficult to sustain after the end of the project. In the course of the project, face-to-face meetings with the stakeholders are organised regularly to discuss and refine concepts (e.g. Trials objectives, research questions, key performance indicators – KPIs - etc.). A sustainable process needs to be put in place so that DRIVER+ Test-bed can retain its "support to end-users" nature.
3. Exercises are more commonly used than Trials. Practitioners are more prone to testing teams and procedures. The inherently different nature of Trials calls for a different framework; this, in turn, may lead to new standardization needs.

[10] The methodological team consists of the main partners involved in WP922, specifically the organisations involved in the methodological support to Trial owners.

2.3 Roles in Trials

While roles and responsibilities are explained in the Trial Action Plan (TAP), the following explanations provide an overview to ensure a shared understanding of roles which are referred to in the deliverable:

- Trial Owner. The Trial owner is responsible for the overall management and success of the Trial as well as well for the acceptance of gaps, scenario and solutions selection. He/she coordinates the Trial Committee.
- End-users coordinator. The end-user coordinator makes the first contact with relevant End-users and support the External Coordination Manager in contacting the End-Users and informing them on the Trial.
- Scenario coordinator. He/she coordinates the selection of gaps and research questions in a Trial and prepares the scenario. The scenario coordinator is also involved in the actual execution of the Trial.
- Test-bed Guidance and/or methodology support team ensures the correct understanding and implementation of the TGM, specific support is provided for all Trials.
- Solution coordinator. The solution coordinator controls the use, the integration and the assessment of the solutions. He/she supervises the training of selected solutions.

The next section describes the foundations of DRIVER+ methodology. The design of the TGM as well as the TGM itself will be illustrated in sections 4 and 5.

3. Development of the Trial Guidance Methodology

In this section an overview of the Knowledge Base which supports the methodological approach is provided. The Knowledge Base serves as the foundation of the TGM design and is therefore presented first. The body of knowledge draws on three main sources: the CD&E approach, the results of the Systematic Literature Review (SRL) carried out within T922.22 and the lessons learned from previous experiments conducted in the first phase of the project.

To ensure consistency between the SLR and the analyses of the lessons learned, a template or codebook has been used (Table 3.1). The template draws on past experiment descriptions (and consequently reflects the former methodological approach of the first phase of the project) and includes the items shown in the table below:

Table 3.1: Template to collect lessons learned

Experiment No XX	Full title of the experiment and relevant documents (e.g. DXX, Experiment Report, Templates etc.)
Experiment objectives	E.g. investigate the benefits of …etc.; measure community resilience … etc.; test a specific tool …. etc.
Research questions	E.g. how did the solution contribute to solve …
Experiment planning and deviations	E.g. Timeline and causes of delays.
Methods	E.g. quantitative (e.g. survey), qualitative (e.g. focus group), mixed methods research.
Key Performance Indicators (KPIs)	"A set of measures focusing on those aspects of organisational performance that are most critical for the current and future success of the organisation" (5).
Data collection plan	E.g. questionnaires distributed during/after the experiment etc.
Data analysis	E.g. qualitative analysis of textual data though specific tools etc.
Ethical procedures	E.g. informed consent.
Results	E.g. answers to the research questions.
Methodological LL (Lessons Learned)	E.g. non-representative sample etc.

The template was designed to facilitate drawing conclusions on methodological lessons learned, but it was also used, as shown in Annex 2, in the context of the systematic literature review. The purpose of the SLR was to ensure relevance of the method "beyond" DRIVER+, and this was done by analysing peer-reviewed academic papers that could shed a light on e.g. data collection plans and the most commonly used analytical techniques in the wider CM community. By doing this, the scientific foundation of the TGM was strengthened.

These three important sources of knowledge offer insights into the conceptual and theoretical framework of the TGM on the one hand, and provide examples that are worth considering when planning, executing and evaluating Trials on the other. As depicted in Figure 3.1, the flow of information is bi-directional, especially during the evaluation phase of the Trials. Lessons learned on Trials will be collected and will feed into the Knowledge Base.

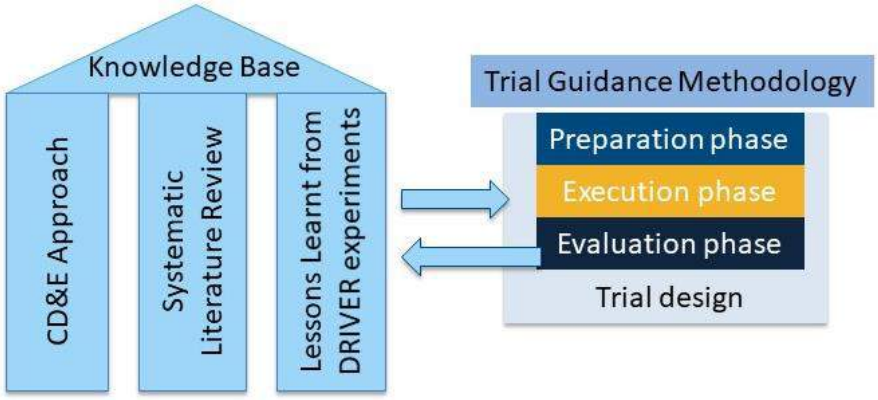

Figure 3.1: Knowledge Base for the Trial Guidance Methodology (TGM)

3.1 Concept Development and Experimentation in the Context of DRIVER+

In the previous phase of the project, the foundations of the methodology were identified in the CD&E approach. As mentioned in section 1, the use of this approach remains valid in DRIVER+ albeit to a lesser extent. In this section, after providing a short description of the approach, an adjustment to the context of DRIVER + is suggested.

The CD&E approach was pioneered in military defence research[11] and is used for example at NATO[12]. They define CD&E´s purpose as: "A solution-oriented transformational idea that addresses a capability shortfall or gap." (MC 0583)". It is seen as an adaption of basic scientific methods to the concept development and validation process in the military and defence domain[13]. CD&E defines a way to develop new concepts by experiencing the challenges and by developing and evaluating the new concept in a realistic setting before expensive resources are acquired or before organisational changes are implemented. It is a creative process whereby a concept is developed through brainstorming, evaluation sessions and analyses combined with input from experiments.

According to (4) the focus of the experimentation is twofold:

1. All key concepts should be understood by all involved members and advisory practitioners.
2. The focus should be set on refining the concept in a learning-by-doing approach.

Starting point is an initial concept idea stemming from either a need, a capability gap, or from a new opportunity or new solution. The lines of development are defined and the concept grows while including them all. The concept matures until it can be demonstrated or trialled in a relevant operational setting. During the development, the concept will be partially and, if possible, fully assessed in experiments. The experimentation results provide important input for the further development of the concept, or its rejection if it does not provide added value. This is the iterative nature of CD&E. The final evaluation of the CD&E process results in an evidence-based recommendation on the implementation readiness.

This methodology was previously determined to be applicable for crisis management capability building during the FP7 ACRIMAS project.[14] Proceeding from this finding, in DRIVER, the "experimentation campaign" was developed. In this approach, every experiment was followed by an analysis, which led to a refined concept and ultimately a better experiment design. This showed a direct relation between the concept development and the experimentation. However, the term "experimentation" might be misunderstood as a

[11] A short description of the CD&E is also provided in D23.11

[12] http://www.act.nato.int/images/stories/events/2014/cde/cde2014ra_1a.pdf

[13] According to NATO, CD&E is one of the tools enabling the structured development of creative and innovative ideas into viable solutions for capability development [1]

[14] D23.21 Executive summary

classical experiment known from the natural sciences focusing on quantitative research methods (like setting up controlled laboratory experiment environments or the evaluation of specific hypotheses).

As described in D23.21, DRIVER+ adapts and adjusts the CD&E process to the CM domain in general and the Test-bed in particular. More specifically, the CD&E approach is used as a method that will support the evaluation of new solutions. The related CD&E guidelines (e.g. foundations of integrated analysis or experimental design considerations) are considered as valuable sources for the DRIVER+ Knowledge Base. Starting with small cases, the solution requirements increase through a higher complexity of the test cases, e.g. by adding more CM organisations, extending the period of relief operations or considering cascading effects.

Furthermore, the CD&E explicitly suggests several qualitative data collection techniques in order to identify the impact of a particular concept on a given problem or need, e.g. the execution and analysis of interviews during observations. This in turn allows DRIVER to explore and discover “real” effects in CM as perceived and experienced by those who are actually doing the work in the field. At first glance, such a mixed approach of quantitative and qualitative research appears contentious given that it builds upon contrary philosophical assumptions and epistemologies. However, in the context of a demonstration project like DRIVER+, it is the required method of choice in order to meet the practitioners’ needs with respect to learning, experiencing and understanding the performance of new CM solutions within the context of a Trial.

In turn, the CD&E approach needed to be adjusted from DRIVER experiments to DRIVER+ Trials. Trials focus on closing one or more gaps, which are identified by practitioners. All gaps are embedded in a realistic scenario. Moreover, as explained in section 1, the investigations carried out in Trials do not take place in laboratory-like settings. Instead, Trials take into account the complexity and dynamic nature of the world in which practitioners operate.

In a Call for Application (CfA) for solutions, the practitioners look for solution providers who purport to fill the identified gap(s) (see D942.11). Promising solutions are then trialled in as realistic as possible scenarios in order to identify game changers that provide the needed innovation for CM practitioners.

The Trial-concept fits indeed very well with the NATO definition (see above) of the CD&E´s purpose:

1. Finding capability shortfalls and gaps is the very basis and starting point of each Trial.
2. Each Trial aims at finding transformational ideas – game-changing innovations for crisis management
3. The solution-oriented approach is reflected in the whole procedure of the Trial set-up, especially the call for application.

A major concept of the CD&E methodology is to enable a maturity increase early in the process. This is ensured through the two steps “interpret evidence” and “draw conclusions” as these are not only limited to the solutions but also concern also the whole Trialling process as well as the Test-bed. As there are four Trials and a final demonstration in DRIVER+, the TGM as an iterative CD&E approach ensures that the overall Trialling-concept itself matures already in its early steps. Furthermore the level of maturity increases more and more until the concept can be trialled in a relevant operational setting – which is the overall goal of our sustainability efforts. Hence, the CD&E is not entirely dismissed but rather adjusted to the context and the purposes of the Trials.

The next section describes the second pillar or main source which nourishes the DRIVER+ Knowledge Base, namely the knowledge gained from the systematic literature review.

3.2 Systematic Literature Review (SLR)

The second main source of knowledge draws on a systematic literature review (SLR). The aim of the SLR is two-fold:

1. To provide a solid and robust Knowledge Base for Trials.
2. To identify Trial-like examples in the scientific management community.

More pragmatically, the idea of the SLR is to support DRIVER+ in two ways:

- Analysing the state of the art (SotA) concerning the use of methods etc. over the course of the past decade (*What kind of methods were used? What kind of research questions was asked?*)
- Turning the state of the art into a knowledge-base that can be used for further Trial planning

The long-term vision is to have this Knowledge Base provided through the Guidance Tool to everyone who wants to set up a Trial. While the SLR is explained in details in Annex 2, a summary of the results is provided in the sections below.

3.2.1 Analysing the SotA of the past decade

In order to carry out the SRL, the approach presented by Antônio Márcio Tavares Thomé, Luiz Felipe Scavarda & Annibal José Scavarda (2016) was followed and then combined with the template of codebook mentioned at the beginning of this section (2). (2) analysed existing literature review techniques and developed a step-by-step guideline for such a process. This guideline is also implemented in the software tool StArt16[15] which was developed by the Laboratory of Research on Software Engineering (LaPES) of the Computing Department of the Federal University of São Carlos (DC/UFSCar).

There are three major phases of a SLR, which are first planning, second execution and third summarization. This is also the way the software tool StArt is constructed. By using StArt it can be assured the user (reviewer) follows the eight steps that (2) have developed as part of their methodology:

1. Planning and formulating the problem.
2. Searching the literature.
3. Data gathering.
4. Quality evaluation.
5. Data analysis and synthesis.
6. Interpretation.
7. Presenting results.
8. Updating the review.

The search in the literature (only peer-reviewed academic papers) gave 20,420 results for the time span 2007-2017. At first glance it showed, that all results were “somehow” related to the topic. However, this relation was pretty weak for a big number of them. Therefore, the first adjustment was to apply the search only on title, abstract and keywords. This resulted in 2,934 results. After adjusting to the search in title, abstract and keywords only, it was important to delete any duplicated papers, as these will not add any value. All in all, 319 papers were identified, that were listed twice and therefor one of their version was deleted. This reduced the number of papers to a total of 2,615. The second selection-step was filtering in StArt. By using this method and filtering out all duplications, the number of peer reviewed papers was reduced to 949.

[15] StArt is the acronym for “State of the Art through Systematic Review”. The tool is used by graduate students and has been refined since 2010.

In the next step, all these were rated as “relevant/accepted” or “irrelevant/rejected” by reading the title, keywords and abstract. This resulted in a reduction to 231 relevant papers.

For analysing the data, the software MAXQDA Analytics Pro 2018 (release 18.0.3) was used. This software is used for text mining and coding. In the following pages, the most interesting results for DRIVER+ are presented.

Though the codebooks were filled out conscientiously, it was not possible to fill in each criterion in all cases. Figure 3.2 provides an overview of the number of filled-in fields obtained from the different papers. On average, only 5.5 codebooks per criterion are missing, which is 2.5% of all analysed peer reviewed papers. An aberration is the attribute “ethical procedures”. Here, nearly 80% of codebooks do not contain information on this. For example, although 40% of papers conducted interviews or surveys, only half of these reported to have followed any kind of ethical procedures prior to, during or after performing these activities.

Figure 3.2: Overview of filled in data per criteria

As it can be expected, some of the criteria extracted for each paper relate to the very topic of the paper itself. In this case the attributes “Results” as well as “Methodological Lessons Learned” were mostly filled in with information specific to the text. Therefore, a generalizable extraction of these fields has not been made at this stage of the TGM development.

In the following sections, an overview of the main findings is provided.

3.2.1.1 Research questions

The first characteristic about a research question is that the expression is worded in an interrogative form. While this might not be true on a general level (one can elicit information without a question mark), the interrogative form is important in the context of DRIVER+ Trials as it facilitates the first phase of the Trial design by directly linking gaps both to questions and to Trial objectives[16]. Defining research questions is also important in the evaluation phase, during which answers are provided. Surprisingly, only one out of ten of the peer-reviewed papers contained a statement in the form of an interrogative question or questions. Figure 3.3 depicts the distribution of these questions and their type of formulation.

[16] More detailed explanations are provided in Section 5

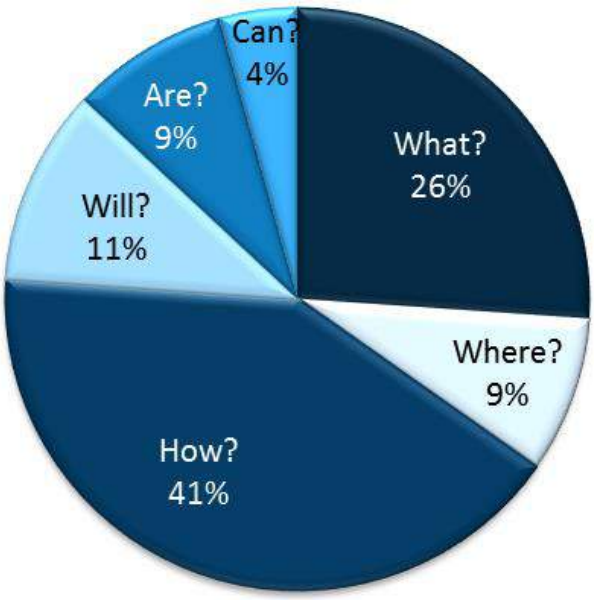

Figure 3.3: Split of interrogative pronouns in research questions

With more than 40%, the "How?"-questions are by far the most frequently used of the interrogative pronouns. "How"-questions focus mainly on understanding the effects/influence that methods or technical solutions have on organisations or groups of people. This means that they aim to examine and assess the change brought about by a solution within a specific set-up (e.g. "How to examine nontechnical skills in simulations"). As one of the core elements of the DRIVER + Test-bed is to assess the impact of solutions (or the impact of a specific aspect of one or more solutions), it might seem sensible to consider the formulation of "How" questions for the Trials.

The second most commonly used interrogative pronoun is "What". The analysis shows that these types of questions are used with the objective of providing a definition or quantification of a specific subject or measure respectively. Examples of these definitions can be processes, success/crucial factors and procedures. Moreover "What" questions also help to set a direction as to the steps/tasks to be followed for a specific procedure.

This pronoun can also be used to widen a theme or to narrow down a specific subject. In the first case, an example of such a question is "What produces change in the Standard Operating Procedures (SOP) of our medical team when solution X is used?". For the second case, the variant "To what extent…?" may be added.

As mentioned above, not every research question needs an interrogative pronoun. 13% of the questions were phrased using Can/Is/Are- constructions. When using these, it is important to make sure that the questions refer to a specific, measurable subject. If this is not considered, there is a risk that the formulated questions lead to very subjective or broad answers (e.g. "Is this a good solution?"). On the contrary, a question like "Is this solution usable on our fire truck?" will result in a measurable Trial setup.

The rest of the field for research questions was filled in with the aim or objective the papers meant to address. Recurring topics were the construction of frameworks or methodologies for the design and development of decision-support systems, simulation testbeds or even training programs identifying the critical skills for them. Another topic studied within this domain were training programs for which simulations are often used in order to evaluate the effectiveness of a program or to establish the training itself.

3.2.1.2 Experiment planning and deviations

By conducting the SLR the aim was to get an overview of experiment planning and deviations used often in the past decade. While the results revealed that this criterion is closely connected to the specific topic of each paper, it is possible to identify six broad terms (see Figure 3.4) that are highly connected to the experiment planning, and which are in line with the research method followed by the paper.

Additionally, it was also found that, in order to plan an experiment, there seems to be two possible alternatives to tackle this: 1) develop the experiment theoretically or 2) design and execute a practical experience. 32% of the reviewed research followed a theoretical approach through the use of case studies or self-analysis/synthesis. The majority of cases, however, make use of the experiential approach through questionnaires, exercises or workshops.

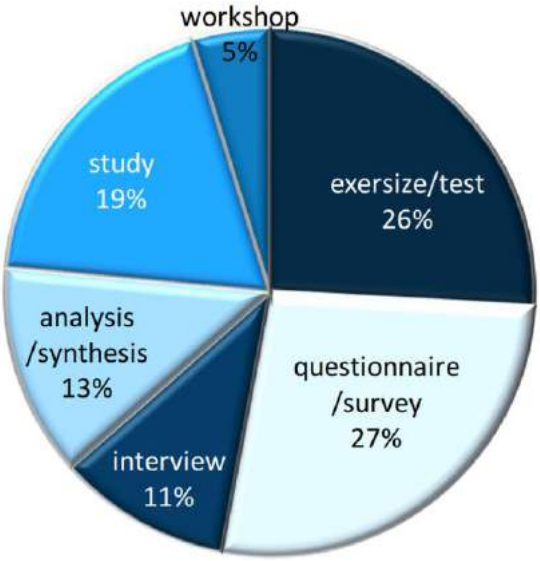

Figure 3.4: Overview of Experimental planning

The "Experimental planning" attribute of the codebook is focused mainly on providing guidance for planning the experiments prior to their execution. This is why recurring topics in the analysis were "scenario planning", "roles assignment" or "protocol construction". These refer to important aspects of the proper scoping of the experiment, the roles participants play in each of the scenarios and number of runs, the content which will be evaluated and how it will be presented to the participants.

Another interesting example that can be derived from this criterion is the explanation for a suitable simulation space for which special attention to the physical space should be paid. For instance, furnishing, availability of appropriate observational equipment like audio and video recorders, space for providing instructions and teaching, etc.

3.2.1.3 Research methods

Research methods for the domain of crisis management have proven to be quite distinct from study to study. As shown in Figure 3.5, it is challenging to identify a specific trend towards which research is heading. In the sample of studies analysed, simulation was found to be the preferred methodology, with 3 out of 10 papers using simulations either to imitate existing scenarios from past disaster/crisis situations or to simulate new potential disaster scenarios based on predictive models and historic data.

Two other important methods used throughout the literature are interviews and surveys, accounting for a combined total of 29% of the methods used. Through the use of surveys and (semi-structured) interviews, these studies gathered data on the requirements to consider when designing a simulation environment or when deciding on the relevant skills to evaluate as a product of a simulated learning/training experience.

It is worth noticing that a mix of quantitative and qualitative data gathering techniques is the preferred approach for evaluating or validating the outcomes of a Trial. Examples include the creation of a virtual reality learning environment through simulation, supported by software and the use of surveys and focus groups. In addition, the use of participatory approaches such as focus groups or debriefing sessions has helped to collect significant insights from the participants or stakeholders involved in an experiment.

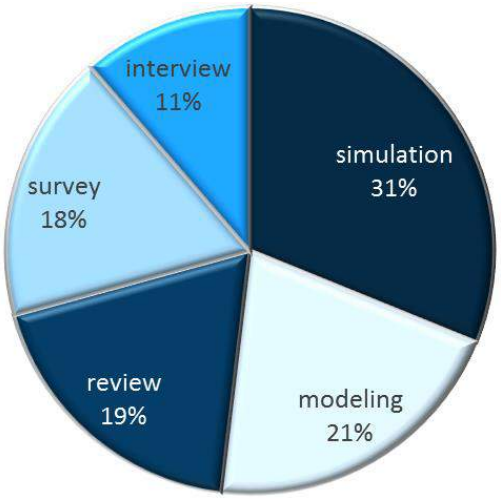

Figure 3.5: Research methods

3.2.1.4 Experiment, exercise, simulation, or Trial objective

Different types of exercises, simulations and Trials have been conducted in the domain of crisis management over the last decade. In this section, a brief explanation of the main objectives is presented (cf. Figure 3.6)

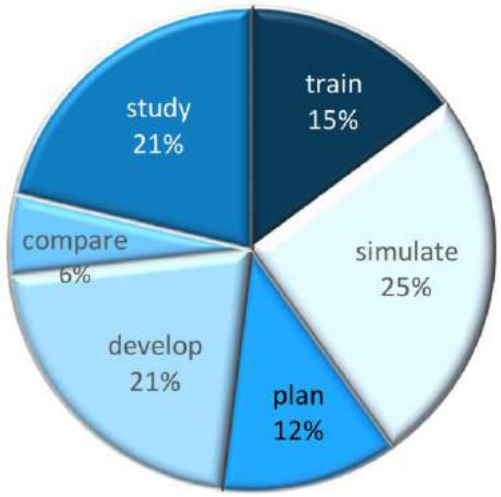

Figure 3.6: Objectives of experiments, exercises, simulations and Trials

As the word is already part of this criterion, it seems natural that “simulating something” was often the aim of a Trial-like event. This method was translated into reality through different forms (e.g. virtual-reality systems or computer-enhanced mannequins). Another interesting approach is the execution of table-top exercises. This is a participatory method with discussion-based sessions. In this case, a table-top could be used for validation purposes of plans and policies, while also identifying potential gaps or weaknesses in the execution of an experiment.

Through the simulation of different scenarios and crisis situations (e.g. forest fires, earthquakes, or even infectious disease outbreaks), experiments have allowed to identify best practices regarding how to detect relevant skills or develop better evacuation/response plans.

Another important objective identified in the literature refers to the development of a method or a product. This might be of particular relevance for DRIVER+ as it aims to, *inter alia*, trial innovative solutions that, in some cases might require further development.

A recurring aim for conducting experiments has been "training". In this sense, training can be understood as:

1. The development of new skills for agents or personnel who deal with disaster management situations and crisis.
2. The development of improved training programs for crisis management.

As depicted with the objective to "plan", a special emphasis was put on the identification of different decision-making processes when a crisis occurs. With this it is expected to understand what the different roles of solution providers and people in the field are, or which decisions are critical for executing a successful operation. Finally, some attention is paid to teamwork practices and the identification of successful behaviours in activities, tasks, communication, etc.

3.2.1.5 Metrics and Key Performance Indicators

Metrics and Key Performance Indicators (KPIs) are important for analysing a Trial. Only if the objects of investigations are defined together with appropriate measures, the performance can be assessed. Still 32% of the codebooks did not include any information about metrics and KPIs.

Some of the typical key words that are used for KPIs were found in the literature, such as time, cost and quality. Though time is the most often mentioned metric (29 times) it cannot be considered as a common metric or KPI. As the objective of 15% of the Trial-like events was to "train", it seems fitting that 14 papers measure the performance of people or systems. The typical keywords for measuring performance in this field (for example accuracy, efficiency, applicability, reliability or satisfaction) are mentioned in only 2 to 7 codebooks. These findings corroborate the observations made in D23.21 regarding the difficulties to establish generic performance measurement approaches in CM. A dedicated literature review on this (D23.21) concluded that common sets of metrics can be used, but that they always need to be reflected and adjusted to specific (Trial) contexts. (Figure 3.7)

No pattern was found in the SLR. In each case, specific metrics directly linked to the topic of the peer reviewed article were identified. Moreover, the use of a real metric, such as a number, could be found in only 12 papers.

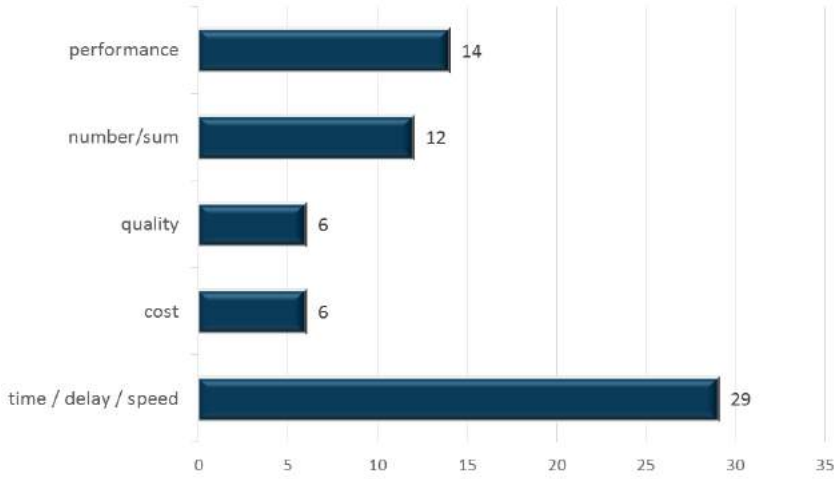

Figure 3.7: Metric and key performance indicators

3.2.1.6 Data collection & analysis

In order to collect data, relevant information needs to be measured. The data, either of quantitative or qualitative nature, must address the research questions identified in the preparation phase. While quantitative data can be statistically analysed, qualitative data needs to be analysed by appropriate methods like hermeneutics or semiotics. Most likely, questionnaires or surveys are used to collect quantitative data, while focus groups, interviews or case-studies are used to collect qualitative data.

The SLR confirmed the need to apply a mixed research approach in Trial-like investigations in the context of crisis management. The identified data collection methods are listed in Figure 3.8 according to the distinction between quantitative (lower part) and qualitative (upper part). As shown, quantitative approaches are used more often than qualitative ones.

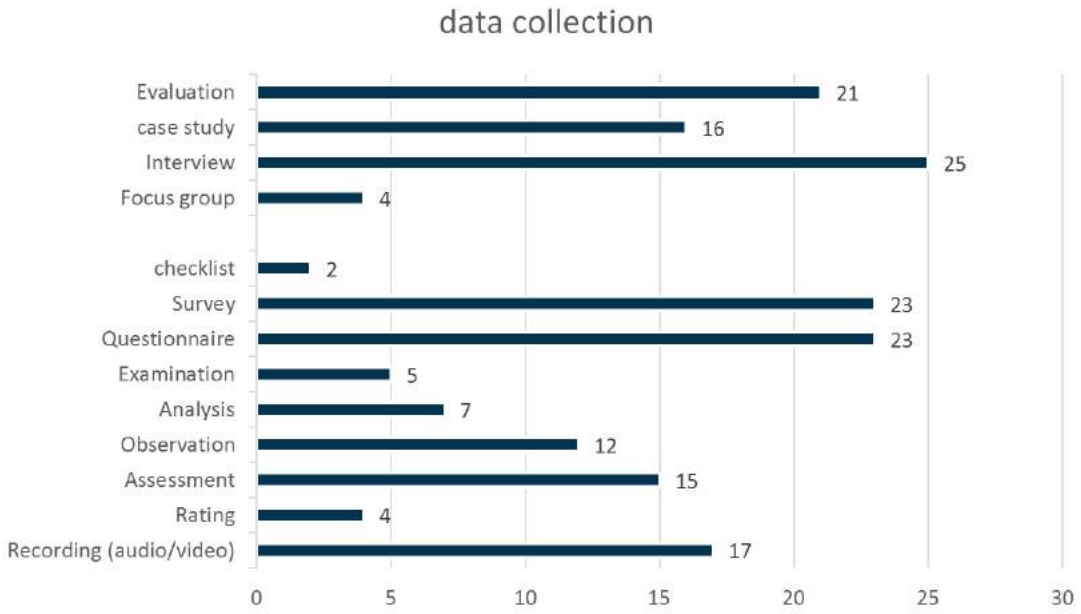

Figure 3.8: Data Collection

Interviews, evaluations, surveys and questionnaires are preferred. While training is essential to conduct e.g. focus groups in a proper way, untrained personnel can conduct certain types of surveys, especially those which revolve around “training” or development capabilities”. These might be the reasons for why, in Trial-like events with practical aims, quantitative data collection techniques are preferred to others.

As depicted in Figure 3.9, there are different techniques that can be applied to analyse data. However, by text mining, the three striking patterns were “simulation”, “evaluation”, “comparison” and “statistical analysis”. Attempts to identify more specific data analysis methods revealed fewer than 10 mentions per technique identified, the majority of which merely provide additional details about the kind of mathematical analysis.

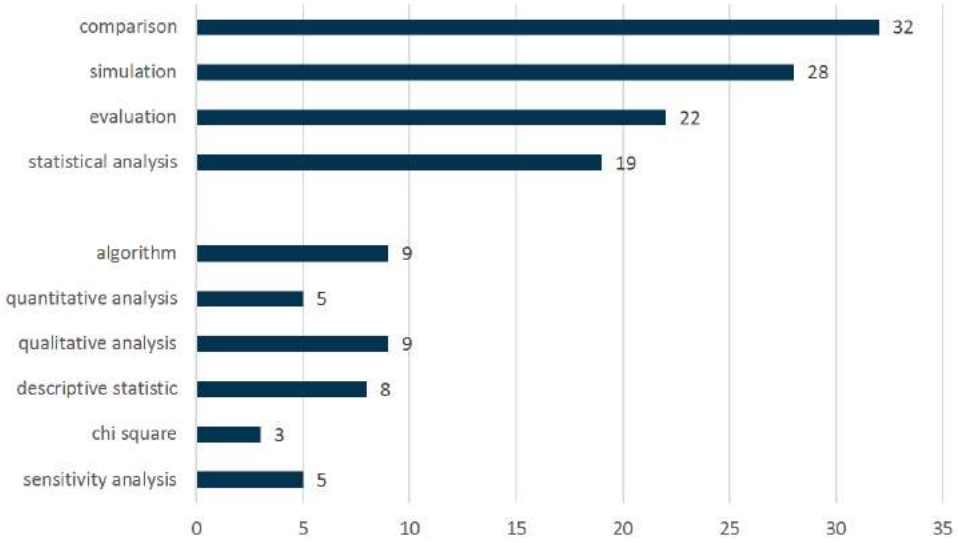

Figure 3.9: Data analysis methods

3.2.1.7 Ethical procedures

Only 21.1% of the analysed peer reviewed paper included information on ethical procedures. The most common way of addressing ethical issues is through approvals. As depicted in Figure 3.10, in 30 papers some kind of approval is used. The degree of specificity varies, with some papers merely asserting that approval was obtained, while others indicate the source of such approvals. While there is papers that just state, that they got approved, others mention exactly by whom: 15 papers tell of an ethics committee, 11 mention a review board and one was approved by a Total Quality Council. Few papers mention the exact protocol that was followed.

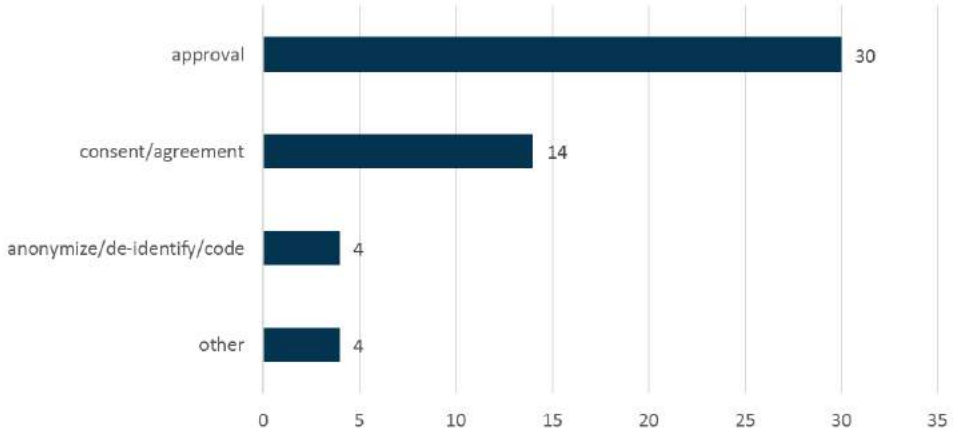

Figure 3.10: Ethical approach

The second most common approach was to obtain the (informed) consent of the participants. It has to be mentioned that seven papers mentioned using both: the approval and the consent.

Further thoughts about ethical issues revolved around topics like: confidentiality obligations, information requirement, voluntary participation, disclosure and anonymization. One paper states that it uses an “ethics-by-design approach” [1524]. Some very practical, yet highly relevant, research ethics considerations were mentioned, such as “hard copies in a cabinet in a locked office” [ID 1885] or “files are stored in a locked file cabinet located in a locked room” [ID 2378]. Though these examples clearly relate to a form of data protection consideration, they also reveal that ethical issues appear to remain unclear to many researchers in the field on which the SLR focused.

3.2.1.8 Conclusion

All in all, the analysis and syntheses of the SLR give a good impression about Trial-like events in the past decade. It attracted attention to the fact that in most cases, Trial-like events pursue more than one objective and also apply more than one method. By using the twofold approach of turning the SLR into a Knowledge Base via the Guidance Tool (in addition to undertaking a systematic review of the literature as such), the impact of the SLR is maximized.

3.2.2 Turning the SotA into a Knowledge Base

By looking at the state of the art concerning the use of methods throughout the scientific crisis management community over the past decade, it was important to not just analyse it, but to make it available for DRIVER+.

During the SLR, 218 peer reviewed papers were turned into one codebook each by using a predefined template. These codebooks do not always appear to share commonalities as the topics of the papers tend to vary. However, by using the codebook, the content of each paper has been structured in a uniform way, making it is possible to compare codebooks despite their diverging topics. In a relational database this is done by using a table as in depicted in Table 3.2.

Table 3.2: Relational database

attribute

	ID	objective	Research question	Experiment planning & deviations	Research methods	Metrics & key performance indicators	Data collection plan	Data analysis	...
tuple									

A characteristic for relational databases is the existence of attributes and tuples. A **tuple** is a data set of a single item – in our case a codebook. An **attribute** is a specific element of such a tuple – in our case the overall topics of each codebook. A **relation** is now a set of tuples that have the same attributes, as all codebooks have. By using a relational database it becomes possible to create a new set of data (selected attributes and tuples) that shows only the information one is interested in. In order to make this usable it is important not just to fill the fields in the table with the content written in the codebooks, but to go a step further and abstract this content by giving it a specific code. This is best demonstrated using an example:

For codebook 65 the content for "research method" is: *"Authors describe the way to combine different theories through following their technical research step by step. However, someone who understands the formulas of these theories should read the article for further information."* This can be further abstracted for example by tagging this with the appropriate keyword for the research method that could be "experimental", "opinion based" or "observational". Following this procedure, every attribute can then be refined until the query mentioned in the beginning: "research questions" in relation to "serious games" is possible.

To make the most of the SLR and the knowledge-base, the idea is to go one step further. Figure 3.11 presents a search in two steps:

Step 1: Horizontal search - search for every codebook that has information on serious games in the metrics & KPI in the same way as explained before for the research method. Results will be in the same attribute – in this example now the metrics & KPI attribute (highlighted with yellow boxes). These results could be depicted, for example, in a list giving the ID and the info about metrics.

Step2: Vertical search – look again at the whole codebook for one ID, the whole tuple. The idea is to enable the possibility to discover more relevant information as depicted here for a specific ID, and maybe even motivate the user to go deeper and read the whole paper and its underlying research.

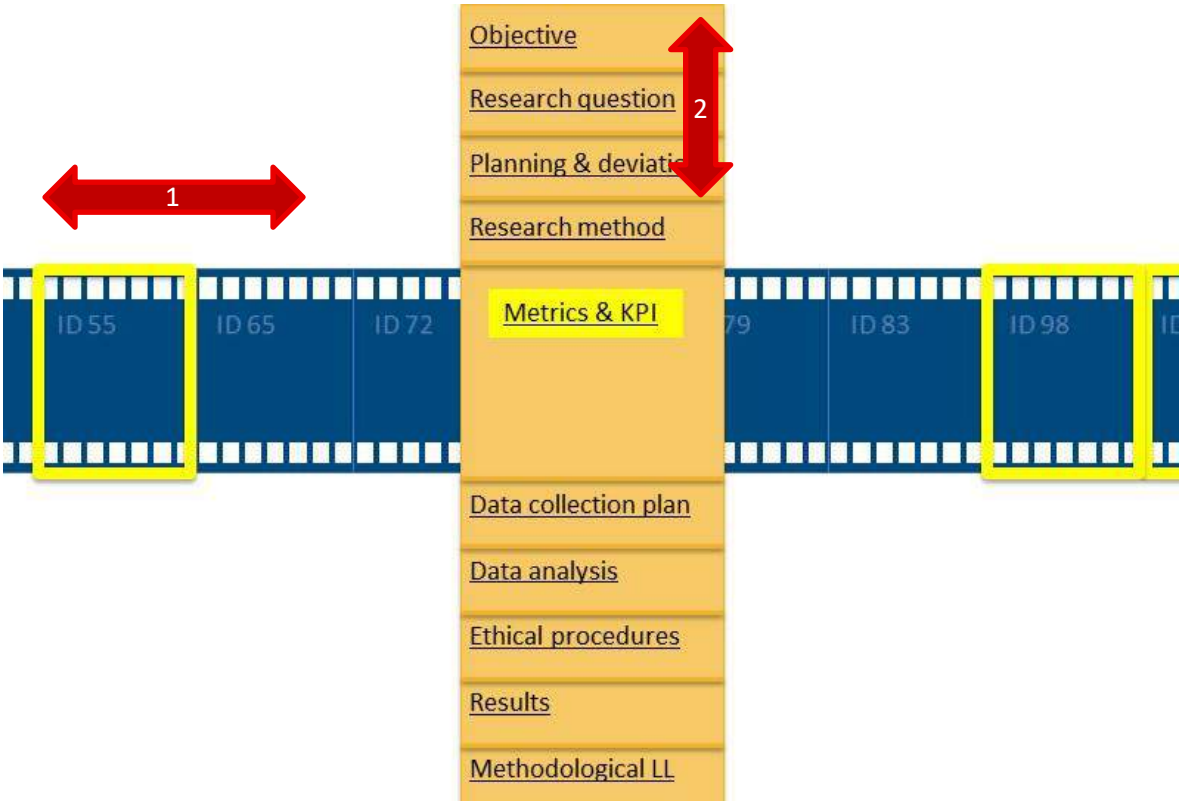

Figure 3.11: Re-use of SLR results for the search engine in the Guidance Tool

There could, however, be a third step in which all information from one attribute will be depicted for all relevant tuples (yellow boxes). In this way, it would be possible to identify further similarities – or differences – for Trials in one specific area, such as serious games.

3.3 Lessons learned

Another important source of knowledge is the lessons learned from the experiments conducted in the first phase of the project. This body of knowledge has been analysed in two ways:

1. By inferring generic lessons learned already captured in D610.1 and applicable to DRIVER+ Trials.
2. By using the same template or codebook of the SLR to collect more specific lessons learned on the experiments drawing on the respective deliverables.

The overall aim is to identify experiences that can be helpful for Trial owners (e.g. examples of research questions and/or data collection analysis and techniques).

Similar to the SLR, the idea is to support the project in two ways:

1. Turning the lessons learned into a knowledge-base by generating lessons learned codebooks.
2. Using the first item to further support Trial planning through quick and condensed access to examples.

In doing so, both Trial-like *examples* derived from the SLR as well as *experiences* from past experiments can be made available in the Guidance Tool (the relational database mentioned in 3.2.2) to support Trial design at different stages.

This section mainly elaborates on general lessons learned that have guided the new TGM design. Detailed information collected through templates (experiences in carrying out experiments) will be included in the Guidance Tool. An example of a completed template is provided in Annex 3.

As mentioned above, D610.1 provides some lessons learned in designing, conducting and evaluating experiments carried out up until M24 of the project. Several challenges have been identified in all stages, as shown in Table 3.3.

Table 3.3: Identified Challenges (D610.1)

Preparation and design	Experiment execution	Experimentation approach and methodology
Ensuring appropriate RQ and data collection.	Maintaining and ensuring effective communication.	Designing and executing an end-user driven solution evaluation.
Ensuring timely and appropriate availability of representative volunteer groups.	Defining and agreeing on the role of participants.	Implementing an ad hoc methodology.
Ensuring timely and appropriate involvement of all relevant participants.	Respecting the different levels of experiences of involved participants.	Evaluating experiments.
Ensuring the creation of a realistic and useful scenario.		
Ensuring proper adaption, interoperability and implementation of technical solutions to the scenario.		

Some general lessons learned were also derived as shown in Table 3.4.

Table 3.4: General Lessons Learned (D610.1)

Preparation and Design	Experiment Execution	Experimentation Approach and Methodology
Stronger involvement of end-users in the early phases of experiment preparation.	Roles, responsibilities and training must be decided and agreed upon in the preparation phases.	The evaluation should be dependent on the overall methodology.
Organisation of regular meetings and agreements (e.g. sharp deadlines) with all relevant stakeholders.	Bilingual computer assistants, as well as local translators are the key to overcome communication constraints.	Apply a robust frame of reference for the activities.
Replay a real disaster to ensure realistic conditions, data, extent and practice.	Extend and reinforce DRIVER+ terminology.	Include feedback rounds with the participants during or after the experiments.
Ensure alignment between the scenario and the solutions.	Keep the scenario simple with a limited number of solutions.	
Agree on the scenario early enough to allow efficient planning.	Have an appropriate physical environment for the experiments.	

These lessons learned are of different nature: e.g. the organisation of regular meetings and the robustness of the evaluation plans. These recommendations were taken into account to design the new methodological approach to DRIVER+ Trials and will be expanded upon in section 5.

Additionally, *the identified challenges have shed light on the need to develop a new TGM and guided the new TGM design*. The design described in section 1 illustrates how the difficulties of the previous phase of the project have been carefully considered to ensure a more detailed and tailored, step-by-step approach to end-users.

The methodological approach used in the previous phase of the project has also been revised on the basis of both the outcomes of the SLR and the feedback provided by the experiment owners (D601.1). Therefore, the first set of challenges and recommendations described in D610.1 have shaped the design of the methodology and the approach to Trials, more specifically but not solely the working processes mentioned in section 1 (e.g. involvement of the end-users). The involvement of the end-users in the methodological work is in fact a key to ensure that the methods support the Trial owners by focusing on the specific objectives of their Trials.

However, to turn the lessons learned into a knowledge-base, additional information and input were needed. In other words, the necessity to go beyond generic recommendations in order to provide meaningful experiences ("dos and don'ts) was considered a key element of the support to Trials.

The starting point of the work presented in the following section is the definition of lessons learned provided in D530.1: "A lesson learnt is a knowledge or understanding gained by experience. An experience may be positive or negative, a mishap or failure. Successes are also considered sources of lessons learned. A lesson must be significant in that it has a real or assumed impact on operations; valid in that it is factually and technically correct; and applicable in that it identifies a specific design, process or decisions that reduces or eliminates the potential for failures and mishaps or reinforces a positive result" (1).

The word experience is the key in this context as it refers to the process of getting knowledge (as well as learning) from one or more than one event. Acquiring knowledge involves learning both from positive and negative experiences. Additionally, it involves the opportunity of relying on the experiences gained from others to use best practices or to avoid common mistakes.

3.3.1 Data collection and presentation of the knowledge

During the data collection, the main challenge was harmonizing different types of collected data from past experiments to generate knowledge that can be helpful for Trial owners. The data comes in different formats for two main reasons. First, as various tools are used, the data varies in typology, quantity and quality. Second, the data depends - especially the lessons learned data - on approach, previous experience and previous knowledge of the data provider. Experiment reports and deliverables focused on the experiments carried out in the previous phase of the project were analysed.

Based on the information collected through the templates relevant knowledge has been structured in a way meriting DRIVER+. In doing so, the theoretical knowledge is organised and presented in a practical way, taking into account the potential actions required during the preparation, execution and evaluation phases of a Trial. The collected inputs reveal several challenges according to the phases of the Trials. Considering first the same function areas and parameters, some insight is presented in Table 3.5.

Table 3.5: Actions and methodological steps for Trials

Factor	Parameter	Preparation	Execution	Evaluation
Facilitate a common understanding	The chosen Gap / Solution	• Frequent teleconferences. • Gap assessment workshop. • Conducting rehearsals. • Preparation of the definition of terminology that will be used in Trials. • Match gaps, risks and legal settings with the context of involved practitioners.	• Choose some main gaps and solutions, and focusing on them only. • Use dashboard.	• More discussion & feedback sessions to avoid passive, inadequate participation and informal results. • Ensure that Trial owners and end-users have the same understanding as to what should be evaluated.
	Language	• Ensure that Trial participants speak English. • Provide simplified materials to deal with multi-lingual taxonomies. • Use a simplified and terminology free language in all the materials.	• Ensure that simultaneous translation can be provided. • Print and distribute to participants an explanation of the terminology and taxonomy used.	• Being sure that participants are comfortable with the language to provide evaluation.
	Address the end-user's need	• Choose the specific purpose, decision making, collaborative learning, mediation, model improvement etc.	• Depart from new skills, insights and design the Trial for truly user driven innovation.	• Check together with the end-users whether the results of the Trial are aligned with their needs.
	Research question	• Follow the criteria on how to formulate a research question. • Assess its validity. • Check former research questions. • Link research questions with gaps/objectives.	• Allow interaction with appropriate participants. • Facilitate a common understanding for answering the research question.	• Check whether all the questions have been referred by the participants. • Allow the participants to ask further questions that can enlarge the affected area of the research question. • Compare the results among Trials.
Methodology	Data collection	• Prepare a customized checklist. • Facilitate a common understanding of which data to collect, how to collect it and by whom the data will be collected. • Distinguish well the data streams that can be automated and those that cannot.	• Observer support tool.	• After action review tool. • Check with the research ethics to understand how to store the data and for how long.

Factor	Parameter	Preparation	Execution	Evaluation
		• Check with the research ethics about how to collect data, what to prepare before data collection to meet the ethical requirement.		
	Data analysis	• Find the appropriate tools. • Link the data analysis tools/techniques with RQ and data collection plan. • Prepare templates to structure an evaluation approach to be filled by participants and Trial owners.	• Communication and visualisation during Trials should be linked and support the data analysis.	• Modelling the data after analysis to communicate it with the participants and end-users. • Facilitate how to share the data after analysis with the participants. • Consult with the ethics board. • Complete the templates together with participants.
	Experiment planning / deviation	• Define objectives. • Prepare the setting. • Define how to identify and select the participants. • Define roles and share it with the responsible people of timing and team building (if different).	• If necessary, any deviation can be done without affecting the other methodological steps, including data analysis and data collection.	• Trial owners will assess the performance of the planning processes. • Trial owners will provide feedback to the project partners. • Interpretation of how it was affected by the solution.
	Key Performance indicators	• Define KPIs and prepare a list. • Connect KPIs with RQs, gaps and solutions.	• Facilitate a common understanding on different KPIs that indicate the effects of solutions • How to measure and interpret the different KPIs.	• Scoring of KPIs by practitioners and end users. • Group discussion on what and how to improve the scores. • Trial owners to explain the evaluation process.
Means	Timing	• Prepare the timeline for the scenario. • Prepare a set of actions for defined periods.	• Provide support to keep the timing.	• Allocate time for evaluation and discussion.
	Final resources & Physical setting	• Minimise the potential acoustic disturbance in advance through some physical implementations.	• Separate groups physically.	

Factor	Parameter	Preparation	Execution	Evaluation
	Team building	• Define the team according to the concept of the Trial.	• Dividing participants into small groups to let them establish teams.	• Providing evaluation forms to teams to evaluate/assess the new solutions.
Participants	Level of participation	• Define and agree on the role and level of responsibility of participants. • Define how to instruct and train the participants to work with new solutions.	• Involvement in solution providing is different than the drills conducted in a controlled environment.	• Providing participants access to solutions to validate them further on.
	Getting a representative sample	• Selection of a heterogeneous group of volunteers with a variety of age, gender, education, experience level.	• Good coordination. • Timely and appropriate involvement of all participants.	• Share information with the participants and keep them in the loop.

Capturing lessons learned is also crucial in the context of DRIVER+ Trials. The way in which the DRIVER+ Lessons Learned Framework described in D530.2 will be implemented in the context of the Trials will be explained in the future versions of the methodology.

4. Design of the TGM

As described in the Description of Work, the Concept Development and Experimentation approach (CD&E) served as a starting point for the DRIVER Test-bed. Based on the experiences described in the previous section, limitations concerning the applicability of the CD&E methodology were identified. As described earlier in this deliverable, the CD&E was originally developed for the military domain. Due to the uncertain, complex and dynamic nature of crisis management operations, especially the laboratory-like setup of CD&E, this led to unsatisfying results.

On the one hand, the experiment "users", namely the involved parties, ranging from the platform providers to the solution providers, perceived the approach as challenging rather than useful regarding the design, execution and analysis of experiments (D610.1). On the other hand, external consultations have shown that the main objective, which is to identify potential crisis management innovations in a secure but realistic scenario, was hardly reached in most experiments. Some scenarios did not reflect current practitioner realities and needs as the data collection and analysis was mainly technology-driven and, consequently, the results neglected to capture the actual impact of trialled solutions on the actual CM performance.

Therefore, it was decided to abandon a positivistic approach and to instead develop a well-structured and practitioner-oriented, mixed research methodology allowing a step by step guidance to systematically develop a space in which to Trial and analyse potential crisis management innovations for European resilience.

Figure 4.1 gives an overview of the main phases and the specific tasks of the proposed methodology, including several methodological inputs and outputs. More detail will be provided in section 5.

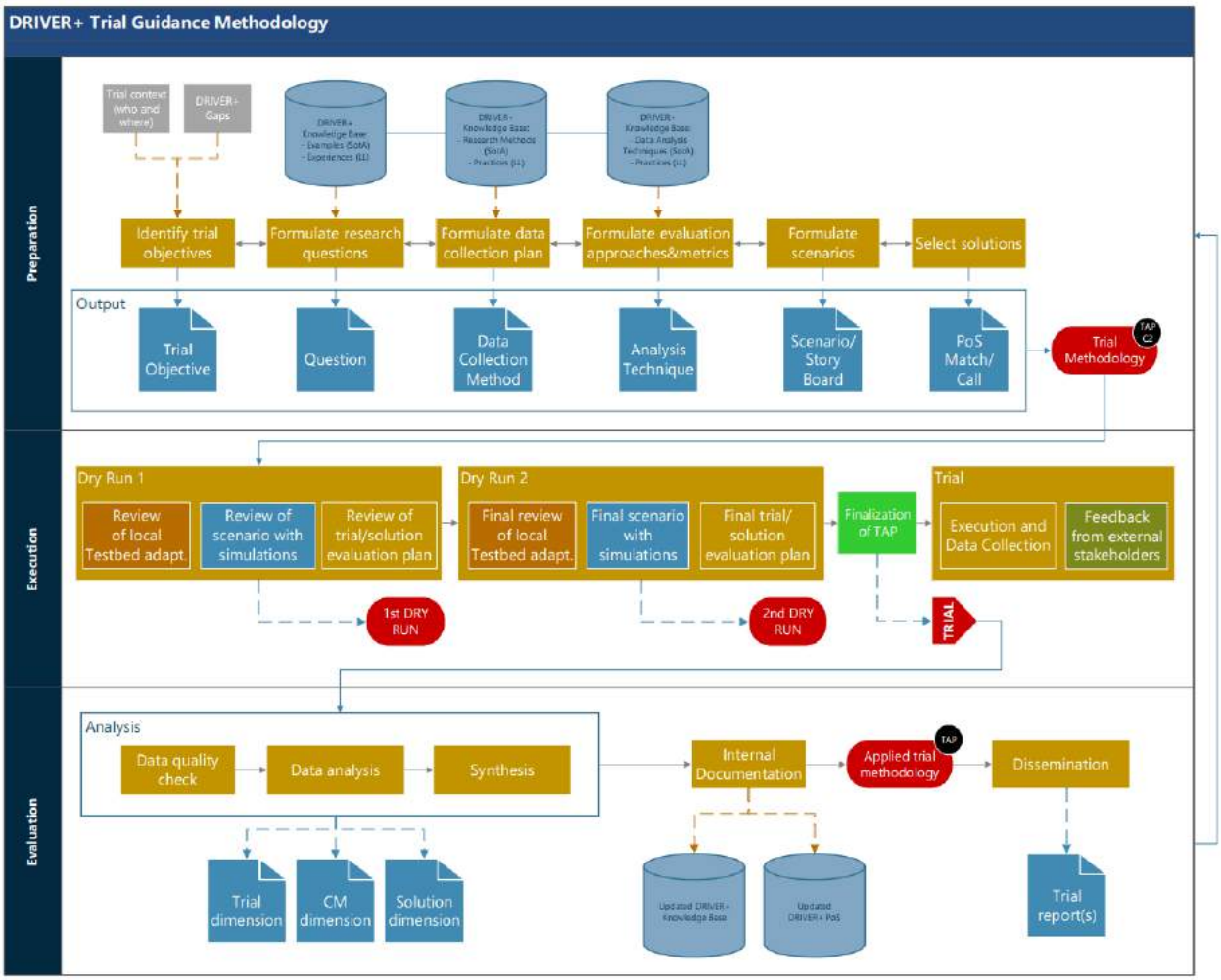

Figure 4.1: Driver+ Trial Guidance Methodology

The DRIVER+ TGM consists of three phases, which are briefly described in the following paragraphs.

The first phase, the preparation phase, consists of **the iterative and co-creative DRIVER+ six-step approach**. The process starts with the identification of the specific **Trial context** and relevant **CM gaps**. The Trial context is mainly determined by the interested Trial owner (platform provider), and it is supported by the related Trial committee including a Trial Coordinator, End User Coordinator, a Test-bed Guidance support, a Test-bed infrastructure support, a Solution Coordinator. To put it simply, the Trial context is where the so-called Trial dimension described in section 2 comes into play. It refers to socio-cultural and legal characteristics of the context in which the Trial will be carried out (e.g. roles, responsibilities, legal constraints etc.).

The validated **DRIVER+ CM gaps**[17] are reflected in the context of the Trial owner setup in order to identify and prioritize relevant gaps for the involved actors in their operational context (professional and geographic).

Both inputs are major prerequisites for carrying out the first step dealing with the identification of **specific Trial objectives**. By utilizing the **DRIVER+ Knowledge Base** (cf. section 3), the Trial committee gets support to define appropriate **research questions** through access to examples from past DRIVER experiments and well-documented experiences from the broader CM community. This information, the lessons learned and the State of the Art results, is stored in a relational database accessible through the Guidance Tool (presented in section 7).

As described in section 3 full text or key word search regarding the Trial objective points the user to potentially relevant research questions that can be used in order to define a new Trial specific question. An appropriate guideline ensures the considerations of several criteria of a good research question (see section 5). Once the second step is fulfilled, the same support is enabled for the third and fourth step, the **formulation of a data collection plan and related evaluation approaches and metrics**. Combining the results of the first four steps, the broader Trial **scenario**, which might have been envisioned during the formulation of the Trial objective, can be further detailed, and the first elements of a Trial story board can be designed here. In relation to the identified gaps, the **preselection of potentially useful solutions** can be done in the sixth step. To this purpose, the DRIVER+ taxonomy of CM functions can be utilized by accessing the Portfolio of Solutions (PoS). Besides, a specific call for applications can be launched in order to express the interest for support in certain areas.

It has to be noted that all steps are interrelated so that a decision in step four, e.g. the capability to execute specific interviews with citizens, might lead to an adjustment of the overall Trial objective. It might also happen that the absence of a desired CM solution, which was identified as a major need, affects the overall Trial.

Going through each of the aforementioned steps will lead to a specific Trial design that is relevant for the involved practitioners and which promises to gather new, transferable and robust conclusions with respect to the formulated questions of the CM community. In the end, each Trial design consists of a clear objective, questions, set of data collection methods, specific analysis techniques, a story board and a set of solutions to be trialled. All results are documented in the so-called Trial Action Plan (TAP), in particular in its dedicated section 2.

The purpose of the Trial Action Plan (Annex 4) is to provide a detailed plan of the Trial organisation and to facilitate the monitoring of the Trial preparation activities. The TAP not only covers methodological-related aspects, but rather serves as a comprehensive document which revolves around Trial planning (from the division of responsibilities to organisation and logistics). Therefore, while the scope of the TAP goes beyond methodology, it is a key supporting document for Trial owners and includes the outputs of TGM design[18]. It

[17] In the context of DRIVER+, gaps are validated through a specific process explained in D922.11.

[18] There is a strong connection between the TGM and the TAP, which is epitomized, as mentioned above, in the outputs of the Trial design. The main difference between the TGM and the TAP is that while the first aims to describe the methodology step-by-step as well as to offer insights into the rationale behind it, the TAP shows, *inter alia*, the results of the methodological steps (e.g. the Trial objective). The TAP collects in one document all key Trial-related information including the methodology. The template structure suggests the non-descriptive nature of the document.

should be considered as a "living" document as it is meant to be updated by relevant stakeholders involved in Trials until the end of Dry Run 2 (referred as "maturation phase" in the TAP).

It should be noted that each Trial event phase, as described in the TAP, corresponds to a phase in the TGM, as depicted in the Figure 4.2 below. The 6-step preparation phase corresponds to the initial phase until the Dry Runs where the actual execution (Dry Runs and Trial) is taken place. The recapitulation phase corresponds to the evaluation phase in the TGM.

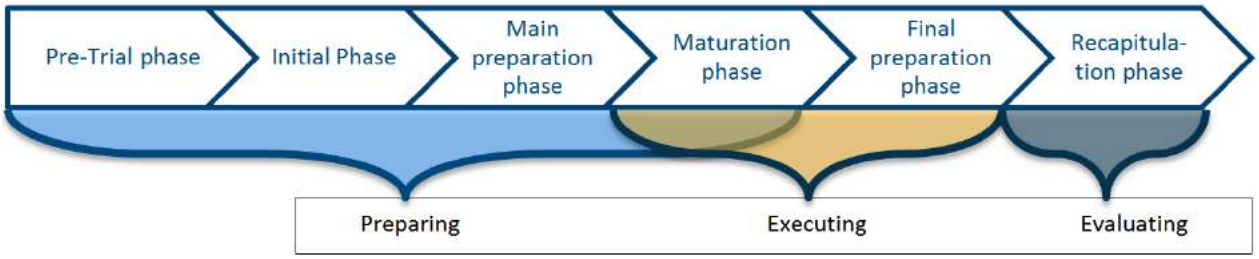

Figure 4.2: Trial phases and the TGM

The phases, which reflect the stages of Trial preparation, also include gateway events aimed at organising Dry Runs and validating the progress:

1. Phase A – Pre-Trial and Initial phase, completed with "Workshop 0" (gateway event).
2. Phase B – Main preparation phase, completed with Dry Run 1.
3. Phase C – Maturation phase, completed with Dry Run 2.
4. Phase D – Final preparation phase, completed with the Trial itself.
5. Phase E – Recapitulation phase, completed with the publication of the Results.

The main outcome, the design of the Trial methodology, will be applied and executed in the second phase. In this phase, the Trial committee ensures the feasibility of realizing all decisions taken in the first phase. Three main elements of each Trial are: the specific adaption of the Test-bed in accordance with the Trial design, the concretization and simulation of the identified scenario within the DRIVER+ Test-bed as well as the ability to run the evaluation approach covering the three DRIVER+ performance measurement dimensions (CM, Trial, solutions).

After ensuring the adequate functioning of the Test-bed, the simulated scenario and the selection and adjustment of the most promising solutions, the planning elements of the TAP are finalized. The last step of the execution phase is the actual Trial run: the defined scenario is simulated, the potential innovative solutions are applied and the relevant data is collected. In addition to the data collected during the Trial, additional feedback from evaluators and/or observers is gathered shortly after the Trial.

The first step of the evaluation phase is dedicated to the analysis of the Trial. This task starts with a thorough check of the collected data. The data collection method and evaluation approach formulated in the preparation phase determine the type, quality and quantity of data to be collected in order to derive relevant and significant conclusions on the trialled solutions. These requirements will be used to verify the actual data collected during the Trial. Based on the findings, appropriate data analysis techniques will be executed so that each performance measurement dimension is analysed in detail. The analysis is completed by a synthesis of the findings where interrelations of the three dimensions are investigated. As a result, the observed impacts of the trialled solutions are concluded.

Each step and artefact are documented thoroughly and the documentation is used twofold:

1. Experience gained and practices resulting from the conduct of the Trial will feed both the DRIVER+ Lessons Learned Framework and the Knowledge Base so as to extend the collection of information to the current activities of the project.
2. As an internal learning step, the results are transmitted into the DRIVER+ Knowledge Base (especially into the lessons learned database in the first place) and the PoS. These documents shall be used not only

for internal use, but also to be disseminated with the broader crisis management practitioner and scientific community.

In sum, in this section, the main sources of the DRIVER+ Knowledge Base were presented followed by a description of the overall TGM. Section 5 describes the exact way in which each of these steps is supported through the TGM.

5. DRIVER+ Trial Guidance Methodology

This section describes the steps that Trial owners must follow to carry out a Trial in a systematic yet pragmatic way. While the "backbone", namely the design of the TGM, is provided in section 3, in the following sections, relevant tasks and activities are outlined for each of the different phases of carrying out a Trial (preparation, execution and evaluation). When describing these tasks and activities for the three phases, the focus is on the following main aspects:

- Objectives (in yellow boxes).
- Input and Output.
- Actions and required participation or activities.

Moreover, each task is illustrated with an example to make it more understandable.

It should be noted that, as specified in the Introduction (section 1) this deliverable describes only the first version of the methodology, in the sense that it illustrates the foundations of the overall DRIVER+ approach. Hence, while the TGM design is complete, this section revolves mainly around preparation, while the evaluation- and execution phases are described at a more general level in this first version of the methodology.

Lessons learned from the Trials (which are still in planning at the time of delivery of this deliverable) will be crucial in order to provide less generic guidelines with regards to execution and evaluation in the next iterations of the methodology.

The long-term vision is that Trial owners are supported in following and implementing the TGM by via the application of an online tool (the Guidance Tool) that will help them with performing several steps necessary for carrying out a successful Trial. The functional requirements of the Guidance Tool are further described in section 6.

Figure 5.1 depicts the different phases which the Trial Guidance Methodology is structured along. These are explained in section 1 with an emphasis on the different steps needed for each phase (e.g. during the preparation phase: formulate research questions etc.) or on the main activities implied in each phase (e.g. execution and evaluation). As described, each phase consists of several steps that result in an output. The outputs of the preparatory steps will result in a robust Trial design.

The TGM phases imply a structured and well-defined approach to carry out Trials. From a methodological perspective, Trials require a "craftsman's way of working" (3). As further outlined below, *ad hoc* tools, as well as an experimental rhythm of problem finding and problem solving makes the DRIVER+ TGM a specific work process helpful to assessing solutions in different CM settings.

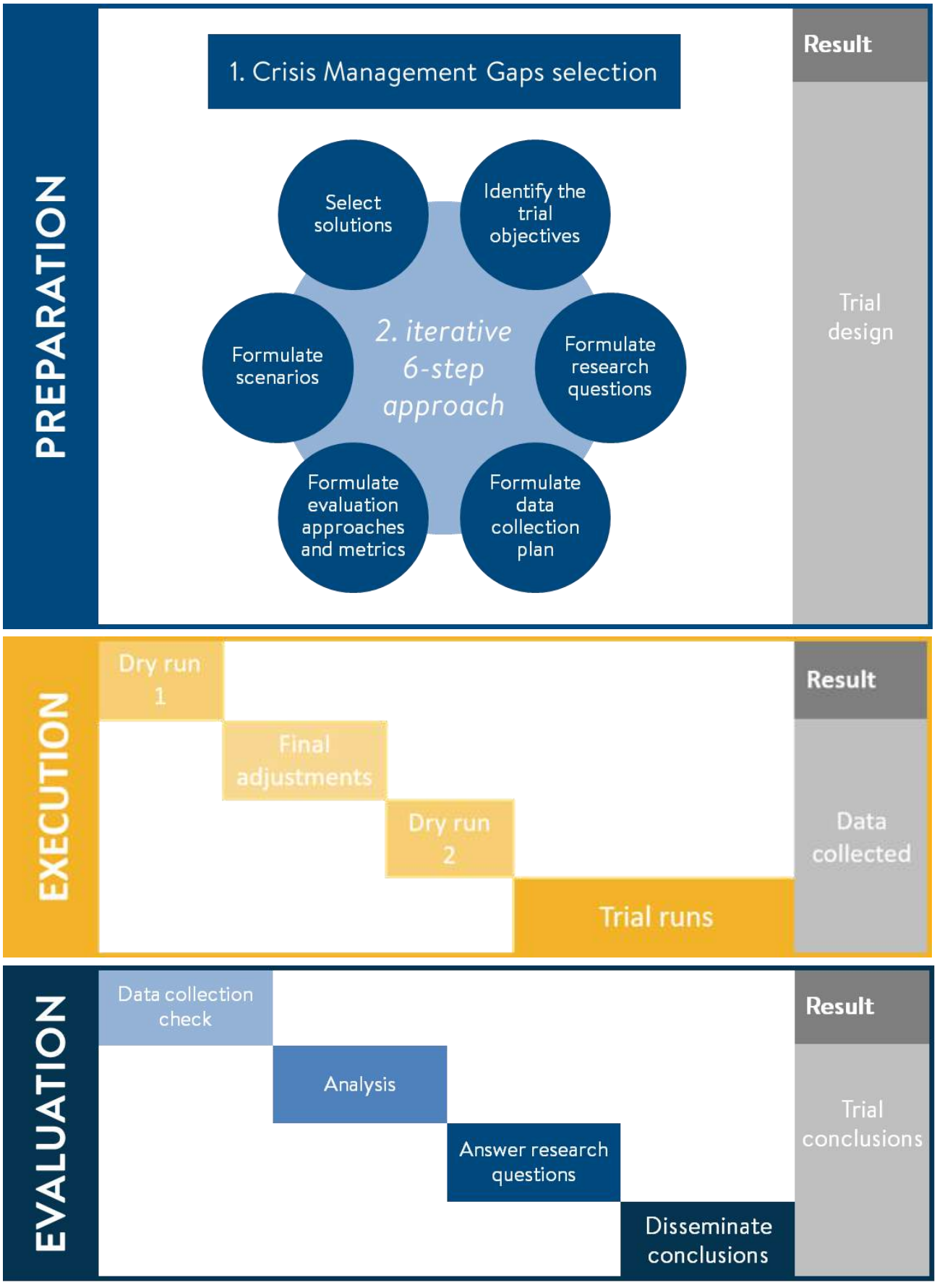

Figure 5.1: Zoom-in of the TGM phases

5.1 Preparation phase

As specified in section 1, the preparation of each Trial starts with characterizing the gaps in crisis management for which potential solutions should be investigated by conducting the Trial (task 1). Another important aspect is the context of the Trial itself, which refers to who, what, why and how; namely roles, responsibilities, constraints of the participating organisation(s) or the facilities or the organisations hosting the Trial. Once these gaps have been specified in more detail in the context of the Trial, the actual design can start by following by following an iterative six-step approach (task 2).

The TGM assists the Trial owner in executing the following steps in a consistent way (cf. Figure 5.2):

1. Identify the Trial objectives.
2. Formulate research questions.
3. Formulate the data collection plan.
4. Formulate evaluation approaches and metrics.
5. Formulate scenarios.
6. Select solutions.

By taking these six steps within task 2, the Trial design is developed and the supporting Trial materials can be developed (task 3).

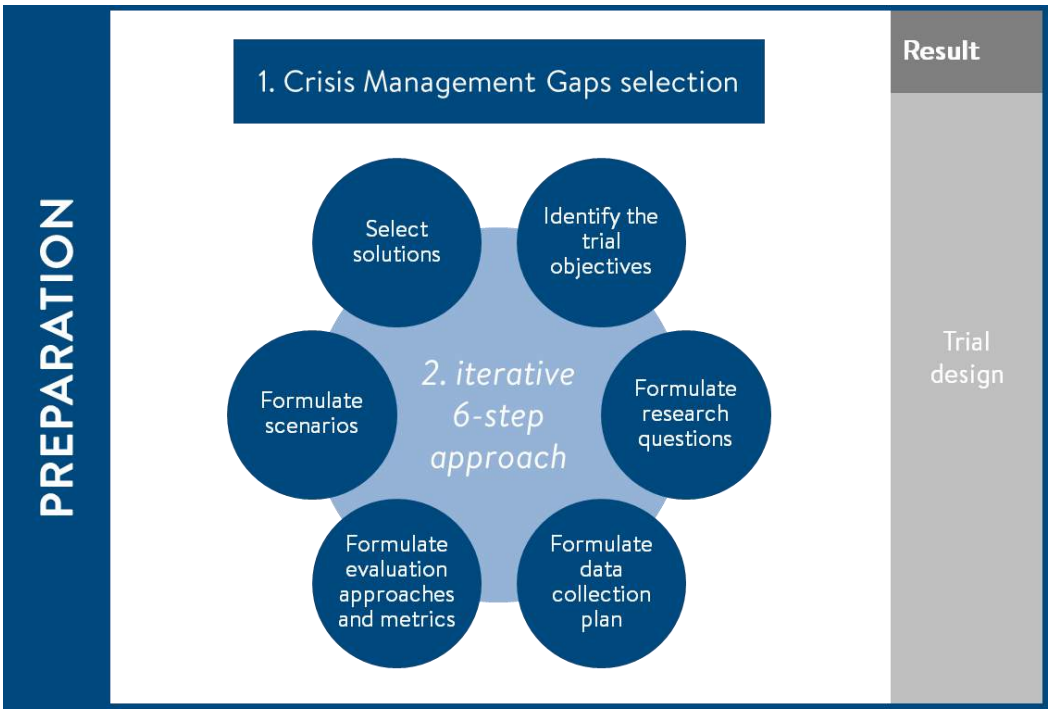

Figure 5.2: Iterative 6 step approach

5.1.1 Specification of gaps in the Trial context

Trials aim to assess the potential impact of solutions for crisis management problems (gaps) that practitioners experience in their operations. The preparation of the Trial begins with specifying these gaps before systematically addressing the relevant gaps via the 6-step approach. In the context of DRIVER+, this is done by following a specific process explained in D921.11.

This task should be executed by the Trial owner with assistance from the end-user coordinator.

The definition of a "capability gap" that was adopted in DRIVER+ draws from the First Responders study: "a 'capability gap' is understood to be the difference between a current capability and the capability considered necessary for the adequate performance of one or more disaster management tasks" (D922.11). Defining a gap is the expression of an operational (real-life) crisis management problem and should state a limit in the ability to perform a crisis management task to the adequate level of performance. The gaps can be of different natures: technical (e.g. the ability to link different systems, to integrate data from difference sources, etc.); or non-technical, i.e. organisational, political, legal (e.g. integrating different organisational processes, or overcoming legal incompatibilities); or a combination of several dimensions (D530.2).

Gaps, or problems, are considered to be context specific and refer both to the "current capability" in terms of processes, solutions and societal and legal constraints, as well as to the "necessary capability" in order to reach adequate levels of performance to overcome the identified problem.

An in-depth understanding of the context is a key to specify gaps. Gaps should not only be specific, but they are also the pre-requisite to start the work process of assessing solutions. This requires a detailed account of the setting and context in which the gap has emerged. Knowledge about how similar problems are usually dealt with, which processes are in place to solve them, and which constraints the crisis manager usually needs to relate with, all play a major role. Simply put, the definition of the context implies "*who* is doing *what, when* and *how"*. For instance, if a Trial owner is interested in assessing solutions to improve fire-fighting operations, he or she must be familiar with the way in which such operations are routinely dealt with: who is responsible for the operation, which are the tasks, processes and protocols followed by whom and when. Additionally, socio-cultural and legal aspects must be carefully considered (i.e. what can be done in a given context).

Having defined the objectives, the relevant input/ output and actions for specifying gaps in the preparation phase of a Trial are the following:

Input

The main input here is the definition of the operational problems that crisis managers experience in their daily job. In terms of scope, the gap should relate to:

- The focus of the Trial.
- The problems to be investigated throughout the Trial.

The CM system that the crisis manager is immersed in serves as the input for defining the context.

Output

The output is a clear definition of the operational problems of technical and/or non-technical nature with respect to crisis management tasks, processes, and/or roles, which should be addressed by the Trial.

Actions and Required participation

- Formulate a relevant and specific operational problem with crisis management roles, tasks, and processes of technical and/or non-technical nature in such a way that relevant solutions that can help solve the problem can be assessed in the Trial.
- Formulate the operational problem in such a way that it is not merely scenario specific or country specific, but specific enough that the closing of the gap can be monitored over time.
- Formulate which specific crisis management tasks, processes or roles are problematic (e.g. coordination; information exchange; situation assessment; resource management; communication; enhancement of a common operational picture; operational, tactical strategic crisis management roles).
- Formulate what is problematic about these crisis management tasks and processes (e.g. missing, slow, incomplete, inaccurate, inefficient communication, etc.).
- Formulate which actors and roles are affected by a crisis management problem (e.g. police, firefighters, ambulance, army, citizens; operational, tactical or strategic incident command teams; municipal, regional, national, cross-border, multi-national).

- Formulate to which disaster types the problem refers (e.g. fire, black-out, flooding, pandemic, cyber-attack, etc.)

To define the characteristics of the crisis management gap in the context of the Trial enables the Trial owner to work together more concretely with other stakeholders that have an interest in the Trial, like other practitioners, decision makers and solution providers.

Participation with the stakeholders can take various forms, depending on the circumstance, such as:

- Acquiring information from certain roles.
- Informing certain roles.
- Gathering suggestions for options.
- Gathering feedback on scope and focus.
- Working on the options, scope and focus interactively in a team.

Depending on the circumstance and approach to participation, the Trial owner can follow a directive, consultative, collaborative or facilitative style of leadership. Informal consultations with decision makers, for instance, can help to clarify problems, processes and potential challenges that may arise in a Trial.

Example

The following example illustrates how the task may look like.

Preparation phase: Crisis management gaps

Peter is a regional crisis manager in the North of Holland with a professional background in fire-fighting. In his Trial context, onsite operational command teams fight the source of fire. An offsite tactical command team manages the effects of the fire and the resources for the onsite teams. Incidents and exercises have repeatedly shown problems with the speed and accuracy of communication between onsite operational command teams and offsite tactical command teams when routing units for managing the source and effects of fires.

The Trial context of Peter consists of:

- The definition of roles and responsibilities of both the offsite and the onsite teams.
- The definition of problematic aspects.

Communication and building up a shared understanding takes a lot of time and is accompanied by misunderstandings, for example, about the location of the incident, the direction of smoke and the drive-up routes. Ineffective decisions were a result of these facts. Problems occur when radio communication is used between multiple command teams and when teams work with different paper maps.

While defining problematic aspects, Peter asks firefighters to explain their challenges. The majority of the firefighter team agreed on one challenge: sharing locations and directions via voice-communication only, and thus keeping track of this information on two different, paper-based maps, is very slow and error-prone.

The crisis management gaps that Peter formulates are:

- Limited ability in managing the source and the effects of fire.
- Shortcomings in the ability to exchange crisis-related information among onsite and offsite incident command teams.
- Limits in the ability to ensure a common understanding about the incident and response to it.
- Shortcomings in decision-making about the routing of units.

5.1.2 Trial design – "six step approach"

Once the context and the gaps have been identified, the preparation phase for the Trial officially starts. Each of the six steps is described in this paragraph. The elements of the Trial design that result from executing the six-step approach are ready for the next phase when all elements conform to acceptance criteria. Acceptable elements from the steps are achieved in an *iterative* manner. This means that elements of the Trial design, such as the research questions, are reformulated and refined a number of times as more information about the other elements is acquired. Although being iterative, the approach is linear: e.g. a plan to collect relevant data cannot be decided before deciding on the guiding research questions for the Trial. When elements in the Trial design conform to acceptance criteria (e.g. criteria on how to formulate good research questions), they can be developed and created.

When all accepted elements in the Trial design have been developed, such as observation lists and questionnaires, the successful application can be tested in a Dry Run during the execution phase of the Trial.

5.1.2.1 Step 1 – Identify the Trial objectives

In this step, the most important gaps that have been described in task 1 are reformulated as prioritized objectives in a Trial. In addition, it will be determined which effect(s) a solution or solutions should have in order to solve operational problems (e.g. improved decision support, uninterrupted communication even under harsh weather circumstances, etc.).

This step has to be conducted by the Trial owner and the end-users' coordinator.

The DRIVER+ Knowledge Base[19] can be used to gather examples and experiences of objectives from previous Trials and/or from literature.

Step 1 cannot be carried out without having an in-depth understanding of the problems and of the context (pre-requisite).

Having defined the objectives, the relevant input/ output and actions for identifying the objectives in the preparation phase of a Trial are the following:

Input

The previously identified Crisis Management gaps that have been defined in the context of the Trial owner are used as an input to formulate Trial objectives in step 1. The Trial objectives are identified by taking into account the performance measurement dimensions explained in section 2 in terms of: the Trial dimension, the CM dimension and the solution dimension.

Pragmatically, this means that the identification of the objectives depends on:

1. Which tasks and processes are required to fulfil a specific objective (e.g. number of volunteers needed) – Trial dimension.
2. The mission objective, namely the CM-related goal (e.g. extinguish the fire) – CM dimension.
3. The solution(s) whose effects will be assessed – solution dimension.

It should be noted that, at this stage, solutions have not been selected yet. Hence, the Trial objective should be mainly defined by taking into account the first two dimensions. The third one will be specified at a later point in the process, but Trial owners should consider this performance measurement area from the outset.

[19] DRIVER+ Knowledge Base is explained in Section 3

Output

The output of step 1 is captured in the Trial Action Plan (TAP) which defines the following issues:

- The crisis management objective and the crisis management roles, tasks, and processes that are to be improved in the Trial.
- What is to be learned during the Trial regarding the effect(s) of the solutions on crisis management and the factors that affect successful adoption of the solution when shown to be effective?
- The effects that solutions should have on achieving the crisis management objective and improving performance of crisis management roles, task, and processes.

Even if the type of solution or the characteristics of the solution(s) are not yet defined, the intended effects on crisis management performance can be considered (e.g. w.r.t. the exchange of crisis-related information).

The output of this step is a formulation of the above-mentioned objectives in the TAP in a manner that it is SMART:

- *Specific* for the crisis management processes, tasks and roles that are envisioned in the Trial.
- *Measurable* in that indicators of achievement of the objective can be defined.
- *Assignable* in that it is clear whose performance is improved and whose solution is assessed.
- *Realistic* in that desired improvement can realistically be achieved, given the setup of the Trial.
- *Time-related* in that the duration of the (final) Trial is specified.

Actions and required participation

To define the Trial objectives in terms of the CM dimension, the Trial dimension and the solution dimension, the following activities must be considered:

- Identify and structure how practitioners understand relevant crisis management incidents and scenarios, mission objectives to be improved, organisational structures involved (e.g. operational, tactical, strategic teams); the tasks to be performed (e.g. tasking and routing units, evacuation, etc.), crisis management processes (e.g. decision making, information sharing, etc.) or specific workflows.
- Define with practitioners within this context the crisis management mission objective and the crisis management roles, tasks, and processes that should be improved in the Trial.
- Define the overall goal of the Trial.
- Define the overall duration of the Trial, and of specific parts of the Trial (e.g., if higher level officials are required at a certain stage in the Trial, the duration of this stage should be aligned with their time-constraints).
- Define globally for which kinds of incidents and scenarios crisis management should be improved in the Trial, what teams and team members from which organisations should be involved and what tasks, processes and workflows should be fulfilled.
- Define relevant factors enabling and constraining crisis management performance that should be taken into account in the Trial (political, financial, organisational, technological, etc.).
- Gather opinions from Trial stakeholders about the identified Trial objectives in terms of the crisis management dimension, the Trial dimension and the solution dimension. Evaluate, rank and select the formulation that most Trial stakeholders agree on.
- Assess the feasibility of achieving these objectives in the Trial and assess the impact on defining the other steps of the methodology.
- When feasible, then decide on the objectives and capture this in the TAP.

Example

Preparation phase – Identify the Trial objectives (Step 1)

Peter decides to improve the performance of the crisis management processes that are related to the selected gaps. He has formed a Trial team to help him define the further steps of the preparation phase for the Trial. They discuss the selected gaps and formulate their objectives.

Peter and his Trial team browse DRIVER+ Knowledge Base to assess whether and how similar problems have been turned into SMART (Specific, Measurable, Assignable, Realistic, Time Related) Trial objectives. By browsing the DRIVER+ Knowledge Base, they learn that, in the South of France, another crisis manager practitioner called Monika had similar challenges, and that she carried out a Trial-like experience a few years ago. Peter notices that Monika's Trial objectives are helpful to identify his objectives. Hence, he uses the same formulation by capturing the main mission objectives in one main Trial objective:

The mission objectives are:

- *Managing the source and effects of a fire*
- *Improve communication between onsite and offsite command teams*
- *Develop shared situation awareness about the incident and about the response*
- *Improve decision making (e.g. the tasking and routing of resources)*

The Trial objective is:

- *To assess the effect of a solution on these tasks (managing the source of fire) and processes (develop shared understanding) and to identify factors affecting the adoption of the solution.*

5.1.2.2 Step 2 – Formulate research questions

In this step, for each of the objectives that has been identified in step 1, one or more research questions (RQs) will be formulated. Research questions are formulated to identify the appropriate mix of research methods and data analysis techniques and to capture relevant data during the execution phase. Moreover, RQs are needed to be able to evaluate the solutions in the Trial.

These questions consider the impact of solutions on crisis management in general, and on specific crisis management tasks in particular (such as command and control, communications among first responders in the field, etc.). In addition, some Trial-specific questions can be formulated. All research questions should be defined as SMART as possible.

The DRIVER+ Knowledge Base can be used to get examples and to take into account lessons on research questions from the literature and previous Trials.

This step has to be conducted by the Trial owner, the end-user coordinator and the methodological support to Trials. All Trial- stakeholders should understand and approve research questions.

Having defined the objectives, the relevant input/ output and actions for Step 2 in the preparation phase of a Trial are the following:

Input

- Gaps, Trial context and Trial objectives
- Criteria on how to formulate good research questions.

The following list contains criteria to consider when formulating research questions. These criteria should be considered as acceptance criteria, e.g. if a RQ is scenario driven or is already tailored to a specific solution,

Trial owners are advised to re-think the formulation so that robust answers can be provided during the evaluation phase.

Criteria and conditions for formulating good RQs:

- Actual questions. RQs should be formulated as questions. As outlined in 3.2.1, based on a systematic literature review, the interrogative form "how" is used most often to understand the impact of solutions on organisations and/or people. Therefore, it is suggested to use this form.
- Gaps. RQs must address a distinct gap. Each research question must address only one gap of DRIVER+ and must not subsume multiple gaps nor exceed the scope of the addressed gap.
- The dimensions. RQs should cover the performance measurement dimensions of Trials. In the context of the research question, the Trial dimension is concerned automatically. The task of the Trial owner is to make explicit its implications. As far the as the crisis management dimension is concerned, it refers to specific CM objectives (e.g. improve shared situation awareness). The solution dimension deals with the role of the solutions: does a solution have the potential to drive innovation in CM? In general, each solution could be measured by solution specific objectives (e.g. user friendliness, run time, etc.), but the Trial owner needs to be aware of the relation between the solution and its contribution to the central dimension, being the CM dimension. This means that the user-friendliness aspect of a solution is not relevant as such. It is only relevant if this aspect is innovative and effective in managing daily operations. In addressing all three dimensions, a question needs to comprise what is to be achieved, given by the overall objective, the aimed impact on crisis management and the opportunity for solutions to provide innovative and added value.
- Scenario and solutions. RQs must not be scenario-driven. Scenario refers to a fictive storyboard in which the solutions are assessed. In order to define such a scenario, the objective and research question(s) of the Trial need to be defined. It is therefore not possible that the research question is formulated after the scenario design. In other words, the research question is not a reformulation of the scenario in a question format. If, due to practical reasons, a scenario is drafted before the research questions are final, the scenario needs to be revised based on the research question and, if needed, changed accordingly. Accordingly, the research question is solution independent. However, the solution should have a relation to a specific application context and a corresponding problem or gap. Thus, the relevance of the research questions is ensured.
- Measurable. RQs need to be answerable and measurable by the Trial. While formulating the research question, one needs to ensure that the Trial is capable of answering the question. More often than not, yes or no answers respond to generic (not measurable) questions. Independent from the solutions being tested, the assessment of the question has to be considered in the later Trial design. A detailed and specific evaluation plan can be defined later in reference to the related CM objectives and trialled solutions.
- Participatory approach. RQs must be understood and approved by all Trial stakeholders. The research question is not only defined by the Trial owner, but in addition, it is crucial and mission critical for the Trial to ensure that all involved stakeholders understand and approve the relevance of the questions. To facilitate this, the writing style of the formulation must be end-user focused and specifically accepted by those involved.
- Main and sub-research questions. RQs can be organised in a multi-level, hierarchical structure. A leading research question fitting to the Trial objective can be deconstructed into several sub-questions, each addressing a more precise aspect. This multi-level, hierarchical structure can be detailed as far as needed in order to ease the planning and design of the Trial and the evaluation of results.
- Simple, but not easy to answer. Simplicity refers to the overall answerability of the question in line with the criterion revolving around participatory approach. RQs should provide new insights and findings in terms of the three dimensions mentioned above.

Output

The output of this step is a set of research questions for the Trial documented in the TAP. The answer to the research questions helps to determine the effect that a solution has on crisis management roles, tasks, and processes.

Actions and required participation

Research questions must specifically address the crisis management task (e.g. managing the source and effects of a fire), processes (e.g. speed and accuracy of communication), the content (e.g. threat evolution and response to it), and the actors (e.g. onsite and offsite command teams) and finally also the solutions that are researched (e.g. solution 1 and 2).

At the start of the preparation phase, when the crisis management gaps and the objectives of the Trial are described in generic terms, the formulation of the research question could be unfocused, such as:

- How can communication problems between crisis management teams be solved when managing the source and effects of a fire?

To make this research questions more focused on the operational problems of the Trial owner, the following questions about the crisis management gap needs to be answered: 1) What kinds of teams have communication problems? 2) What kinds of communication problems do they have? 3) What is causing these problems? 4) In which conditions do these problems occur? 5) Which problems are to be solved in the Trial?

When the crisis management gap and the objective of the Trial are more focused and specific, the research question may be reformulated as:

- How can problems with communication between onsite operational command teams and offsite tactical command teams regarding threat evolution, and the response to it, are solved?

To make this research question focused on specific solutions for this problem, the research question may be reformulated as follows:

- What solutions could solve problems with communication between onsite operational command teams and offsite tactical command teams when managing the source and the effects of a fire?

When, for instance, two potential solutions are expected to solve this problem, the research questions may be reformulated in:

- How does solution 1 affect problems with communication between onsite operational command teams and offsite tactical command teams regarding threat evolution and the response to it?
- How does solution 2 affect problems with communication between onsite operational command teams and offsite tactical command teams regarding managing the source and the effects of a fire?

To be able to gather data that indicates whether or not communication problems are solved in the Trial as a result of the solution, one has to be specific about which communication problems needs to be solved. The research question may be reformulated along these lines:

- How does solution 1 affect problems with the speed and accuracy of communication between onsite operational command teams and offsite tactical command teams about threat evolution and the response to it, when managing the source and effects of a fire?

If compared to the first general formulation, the latter includes a solution along with aspects that can be measured in terms of time and correctness of information. Additionally, it includes roles and processes. Therefore, it is considered specific enough to be answered in a Trial.
The formulation of proper questions is not a trivial, one-shot activity. Trial owners can work on this with the appointed methodological support so that, during each formulation round, questions are checked against the objectives.

Example

Preparation phase – Formulate research question

Before selecting the solutions, Peter comes up with three research question:

How does a solution affect the speed and accuracy of communication between onsite and offsite command teams about threat evolution and response to it when managing the source and effect of a fire?

How does a solution facilitate shared situation awareness between onsite and offsite command teams about threat evolution during an incident and response to it?

How does a solution have an impact on decision making about the tasking of routing of resources when managing the source and effects of a fire*?*

5.1.2.3 Step 3 – Formulate data collection plan

In this step, for each of the research questions that has been formulated in step 2, a plan to collect relevant data is determined. Key performance indicators must be taken into account in step 3. Hence, what data is needed and how it will be "weighted" are crucial here.

Key performance indicators (KPIs) represent "a set of measures focusing on those aspects of organisational performance that are the most critical for the current and future success of the organisation" (5). The identification of KPIs is crucial as it provides a way to quantify the outcomes of a Trial and assess the performance of the trialled solutions.

A data collection plan has to be developed that describes in which way all kinds of required data will be collected (measured), by whom or by which means, during the Trial. This should be done in a clear and consistent way to avoid ambiguity and to collect data of good quality. This plan should enable answering the research questions.

The DRIVER+ Knowledge Base can be used to get examples of research methods, and to take into account experiences on data collection of previous Trials.

This step should be initiated by the Trial owner, the end-user coordinator and the methodological support representative; in later stages of this step, all members of the Trial committee should be involved to ensure that the envisioned way of collecting data is realistic and achievable. Support from someone with experience in data collection is useful.

Having defined the objectives, the relevant input/ output and actions for Step 3 in the preparation phase of a Trial are the following:

Input

- Research questions.
- Knowledge Base.
- Criteria to define KPIs (D23.21).
- Recommendations and common problems for quantitative and qualitative methods for data collection (D23.21).

Output

The output of this step is a data collection plan that is captured in the TAP.

The data collection plan describes:

- Under what conditions performance measures and data is collected.
- *What* data is collected and the source and location of this data.
- *Who* will collect what data.
- *When* the data will be collected.

- *Where* the data will be collected, what performance measures are used and what the operational significance of these measures is.
- *How* data is collected to determine scores on measures.
- *How much* data will be collected (i.e. sample size).
- *How biases* in collecting data are minimized.
- *How ethical aspects*[20] concerning data collection are taken into account.

Actions and Required participation

- First determine in what conditions data is collected. The design of the Trial determines the conditions: e.g. data collection should be carried out in a condition in which the solution is not used and in a condition in which the solution is used to carry out a comparative analysis. Without some sort of comparison, it is not possible to determine whether a change in crisis management performance occurred as a result of a solution. For example, depending on the research question, data can be collected about performance on crisis management a) in a condition solution 1 and a condition with solution 2; b) with solution 1 in time segment 1 and time segment 2; c) with solution 2 in scenario A and scenario B; d) with participant group 1 or 2.
- Determine what data is to be collected. For example, what data is useful to determine performance of crisis management processes, tasks and roles (e.g. effectiveness, response time, errors, efficiency, safety, costs, etc.)? Do you need objective facts, subjective interpretations of participants or both to be non-biased and informative?
- Determine who will collect the data. Who is responsible for collecting relevant data during the execution phase? Observers (internal and/or external) or participants collecting this data must be able, competent and motivated to take measure seriously.
- Determine when the data will be collected. What is the time schedule of the Trial and when is what data collected by whom?
- Determine where data will be collected, and in what research setting. Is it a field Trial, where the natural environment is used to manipulate some factors? Is it a table-top? Determining which environment is best to collect data depends on the research questions.
- Determine what performance measures are used and what the operational significance of these measures are for assessing crisis management objectives, tasks, processes and roles (e.g. information sharing, situation assessment, decision making, tasking, coordination, mission effectiveness, etc.). What measures are required for answering the research question? The measures and metrics must be useful for assessing the expected effects of the solution on crisis management performance.
- The abstract terms in the research question have to be rephrased in concrete terms that can be validly measured. This refers to the extent to which measures and metrics actually measure what needs to be measured (time, quality, safety, efficiency, effectiveness, cost). Valid measures and metrics can be achieved by using clear definitions of the abstract terms one wants to measure, by using measures and metrics from peer-reviewed literature, or by using multiple measures of the same abstract term.
- Determine how data is collected to determine scores on measures. A difference can be made between self-reporting methods and observational method. With self-report methods, people are asked to rate their own behaviour (e.g. a questionnaire, interviews, focus groups). With observational methods, researchers observe the participants themselves. In addition, a distinction can be made between objective performance measurements (like logging duration, errors) or subjective measurements (like questionnaires, interviews, observations, focus group sessions, expert opinions). It must be clear whether data is subjective or objective, quantitative or qualitative. Discuss what type of data you need and what the advantages and disadvantages are.
- Determine how much data will be collected (i.e. sample size). How many participants use the solution? How many of them are observed or interviewed? Is this sample representative of the

[20] Ethical aspects are described in Section 6 .

population about which one wants to draw a conclusion? For example, if the participants are only male with a certain professional background and between the age of 40 and 50, the results cannot be generalized.

- A bias in collecting data influences the interpretation of data and must be minimized. Possible biases include e.g. how the participants are recruited, but observers can also be biased. For example, when observers know what solution is evaluated and what effect this will have on the behaviour of participants, he/she will be more likely to observe this behaviour.

Examples

Preparation phase: Formulate data collection plan

After having formulated the research questions, Peter thinks about a plan to collect the data that he needs in order to assess the effect of the solution on his identified crisis management gap.

Peter wants to measure characteristics of communication, shared situation understanding and decision making. Peter also wants a subjective appreciation of the solution by participants in the Trial.

He thinks about different techniques to collect data, such as observations, questionnaires, using simulator data, and group discussion. For questionnaires he considers using or adjusting existing and scientifically validated questionnaires for his Trial.

Measurement: Using observers and the conditions of data collection

Beforehand, the Trial committee has defined what the observers are going to observe and how. This was based on the performance measures that were defined.

The observation questions are incorporated in the Online Observer Support Tool. The tool provides Trial-specific pre-made forms (templates) to create observations.

Peter decides to assess communication in two sessions.

He wants participants to experience performance with and without the solution, and he wants to assess the effect of the solution on crisis management performance. Therefore, he will organise:

- One session where participants use the new solution (a Common Operational Picture Tool).
- One session where people work with their own tools and working procedures. The differences between these sessions indicate the positive or negative effects of using the solution.

When participants already know the scenario in advance of the second session, an improvement may not be the result of using the solution, but rather the result of already knowing what will be communicated and what is to be decided. Thus, the scenario will be slightly changed for the second session.

Measurements:

Peter will use the same measurement for both sessions to be able to compare them. He uses self-report measures (e.g. questionnaire, focus group session) and observational methods (using observers) to gain information from different perspectives.

To assess communication in the two sessions, Peter has defined what characteristics of communication he wants to assess in the Trial. He considered duration (is it faster?), the topics shared (it is relevant and complete?), as well as the number misunderstandings and errors (is it accurate?).

Peter searches the DRIVER + Knowledge Base to find existing observation protocols that could be used or adjusted for his Trial.

Other possible designs to evaluate solutions:

A disadvantage with this design is that Peter only gets the opinion of two teams in just two similar scenarios. This might not be sufficiently representative and reliable for drawing conclusions about the operational benefits of, for instance, a Common Operational Picture tool (COP tool).

Furthermore, the comparison between the two sessions is not really valid.

Different designs all have advantages and disadvantages. It is important to discuss different options. In these cases, the following options are also possible:

- Perform more sessions with different teams and change the order of sessions (either starting with or without the solution).
- Only perform sessions with participants using the solution. Let participants compare their experience with previous experiences. This way it is also possible to compare with previous situation.

5.1.2.4 Step 4 – Formulate evaluation approaches and metrics

In this step, it is formulated how the data that will be collected during the Trial will be analysed. It is described which techniques will be used and how analysis results will be reported (i.e. answers on research questions and conclusions about whether Trial objectives have been met). The evaluation approach depends on the data collection. For instance, qualitative data gathered during focus groups should be evaluated through specific techniques.

The DRIVER+ Knowledge Base can be used to get examples of data analysis techniques, and to take into account experiences on data analysis of previous Trials.

This step should be executed by the Trial owner, the methodological support representative and the end-user coordinator.

Having defined the objectives, the relevant input / output and actions for Step 4 in the preparation phase of a Trial are the following:

Input

- Data-collection plan.

Output

- Description of how data will be analysed when data is collected.

Actions and Required participation

- There are different ways of analysing data depending on your research question. Determine under which conditions crisis management performance is to be assessed. Does the research question require a comparison between a condition with and without a solution, between multiple solutions or changes in performance over time?
- Start with general descriptive statistics (frequency, means, etc.) to get an overall view of the data.
- The reliability of the score on measures and metrics is increased with a large sample size of data points and participants. Reliability is the extent to which the same scores on measures and metrics are obtained at different moments and by different participants. When there are too few data points, it is not possible to conduct statistical data analysis. Then it is better to describe the results, for example the experiences of the participants.
- Determine whether the data is analysed in terms of inferential statistics (e.g. regression)
- Think of how to visualize the different results.

- For qualitative data (collected from interviews, case studies, focus groups) it is important to think about how the results will be processed. For example, how to analyse these data, or to give an in-depth narrative description of thoughts and feelings of participants, or a combination.
- For each data analysis approach, the limitations need to be carefully taken into account when looking at the conclusions. There is no silver bullet to answer research questions, but the Trial results need to be framed in the current state of the art of the applied paradigm. For example, when looking at the results of an optimization model, the results must be reflected with the assumptions and side restrictions of the actual model and the real world. When looking at the analysis of an expert interview, the sample size and specific background of the interviewee has to be mentioned when presenting the results.

Example

Preparation phase: Formulate evaluation approaches and metrics

After deciding which data can and will be collected, Peter formulates specific evaluation approaches in order to analyse the Trial in a proper manner. Here, Peter needs to fulfil two main tasks:

1. *Depending on the data collection plan, appropriate analysis techniques need to be applied. Since Peter is interested in both the quantitative and qualitative impact of a COP tool, he needs to combine two different analysis techniques.*
    a. *For the quantitative part he concentrates on the main objective of the (simulated) response operation through comparing the duration of a certain task in a scenario without the solution (baseline) and with the trialled innovation. Here, the time needed for creating situation awareness in order to react, e.g. making specific decisions such as defining an evacuation plan, becomes a key performance indicator. As a second key performance indicator Peter decides to analyse the actual outcome of the (faster or slower) decisions. The actual operation outcomes, which may be partly simulated, are directly compared with each other, e.g. the ratio between evacuated citizens and citizens in need.*
    b. *For the qualitative part, Peter wants to consider the professional feedback of the crisis managers involved into the operation. Here, Peter decides to carry out semi-structured interviews addressing the perceived appropriateness of the new solution into the current way the practitioners work. Next to numeric estimations (e.g. using the Likert scale) in order to identify patterns of the group, Peter formulates open-ended questions in order to gather the individual perceptions and make sure he is not missing important subjects. Depending on the outcomes gathered directly after the Trial, Peter analyses topics of interest and develops follow-up interviews in order to catch-up observations he didn't anticipate in the initial questionnaires.*
2. *At the same time, Peter is aware that the observations are all of different nature and have to be put into a context. For this purpose, he assigns all relevant and available data according to the DRIVER+ performance measurement dimensions. He anticipates for example which and how many representatives are needed to Trial what, how and in which condition (e.g. the side restrictions of a time-pressing situation or disruptive telecommunication should be considered appropriately). For the crisis management dimension, he structures the main objectives of the Trial scenario according to the involved roles, tasks and processes so that specific operational effectiveness measures are clearly described (e.g. evacuation time). For the solution dimension he relates the crisis management tasks to the dedicated solution function so that a direct contribution can be deduced, but Peter also takes into account solution specific evaluation approaches in order to later make sense of why a certain impact has been observed (e.g. applying evaluation standards regarding human-computer interactions).*

5.1.2.5 Step 5 – Formulate scenarios

In this step, one or more realistic scenarios are developed. Scenarios must be realistic in terms of the context of the end-users and the environment in which they operate. While it is unlikely that scenarios are developed only at step 5 (ideas on potential scenarios may come into play earlier e.g. after gaps have been identified in the Trial context), in this phase they are refined, revised and tailored to the objective of the Trial. For example, if the gap is related to cross border communication between first responders in case of large-scale forest fires, the scenario script (and simulations) should contain the characteristics of such a situation. In addition, the scenario should enable the Trial owner to measure the performance of various solutions during the Trial by defining so-called key-events. (Note: for research purposes, a scenario can be split up into several stages or scenes.)

The DRIVER Test-bed should be used to consider and make use of its support features in scenario development and scenario simulation.

This step should be executed by the Trial owner in collaboration with the end-user coordinator and the methodological support representative.

Having defined the objectives, the relevant input / output and actions for Step 5 in the preparation phase of a Trial are the following:

Input

The results of steps 1, 2 and 3 are essential input to the scenario development. In fact, the scenario should serve to facilitate that Trial objectives can be met, that the research questions can be answered, and that the requested data can be collected in alignment with the selected research approach. In addition, the scenario should fit the type of Trial (field experiment, table-top, hybrid, etc.).

Output

This step results in one or more scenarios that can be used during the Trial (if needed, a scenario can be split up into one or more stages/scenes). A scenario consists of the following elements:

- The environment (arena, context) in which the scenario takes place.
- The various players described by their roles (contributing to crisis management tasks), primary objectives and resources, means (including means that are subject of the Trial).
- The storyboard: set of key events (e.g., the initial incident and its impact) within each stage.

Actions and Required participation

- Develop a fictive environment or select a real environment in which the context of the gaps and solutions can be simulated in a realistic way (e.g., if the topic of interest concerns a gap in forest fire-fighting in a cross-border situation, the Trial environment should contain a forest that stretches out to at least two countries/regions).
- Determine the crisis management organisations/functions that are related to the gaps and their solutions, and describe how these organisations/functions are interrelated (organisation structure and interdependencies).
- Select which of the crisis management functions should be played during the Trial and by whom: by professionals, by supporting role-players or by simulators. For each of these 'role-players', the primary objectives during the Trial and the relevant means that are at their disposal (relevant for comparison of candidate/ alternative solutions) should be described.
- Develop the storyline (or script) of the scenario by:
  - Defining key events related to the gap(s) that trigger one or more role-players while fulfilling their tasks.
  - Elaborating these key events in the context of the developed environment.
  - Adding other events to ensure a realistic situation (e.g. by additional messages and/or events to create time-pressure or information-overflow).
- Define instructions for role-players.

Example[21]

Preparation phase: Formulate scenario

Peter thinks about what elements the scenario should address to be able to measure the effect of the solution on the performance measures. It is important that events trigger the execution of the crisis management processes, roles and tasks one wants to improve. To avoid the so-called "learning effect", he decides that the events in the scenario will be different, but similar in the sessions with and without the solution, respectively. In doing so, he will be able to carry out a comparative analysis and draw conclusions about the impact of the solution.

But before he can develop the scenario he has to think about:

- *Teams and participants: what teams and team roles are responsible for crisis management performance and who are the actual users of the solution? The gap is about distributed teams that work on different locations, involving communication between onsite and offsite teams about the evolution of a threat like a smoke plume. Peter therefore decides that he wants to include onsite and offsite teams in the Trial.*
- *Crisis management task that has to be performed. In this case the onsite team has to assess a large incident, manage the source and effects of a large fire and make a request for additional resources; the offsite team has to assign the right units and route these units to the right location at the right time.*

Characteristics of the scenario that he wants to include:

- *Information dependencies between the two teams about the incident and the location of the incident.*
- *Resource dependencies between the teams. The events in the scenario require the onsite team to share information with the offsite team, because they need additional resources to, for example, assess smoke toxicity.*

Peter thinks about the main storyline of the scenario.

5.1.2.6 Step 6 – Select solutions

In this step, one or more solutions will be selected from the DRIVER+ Portfolio of Solutions (PoS). By entering key words that characterize the selected gap(s) and research questions, available solutions will pop up. When no or only a few solutions are available in the PoS, a search for potential solutions outside the PoS can be done, or a call for solutions can be initiated. Providers of identified and/or interested solutions can be invited to participate in the Trial.

This step should be executed by the Trial owner in collaboration with the solution coordinator and in consultation with the end-user coordinator.

Having defined the objectives, the relevant input/ output and actions for Step 6 the preparation phase of a Trial are the following:

Input

The specification of the gap(s) in the Trial context (result of task 1) and the DRIVER+ Portfolio of Solutions (PoS), from which potential solutions can be selected, are important sources of input for this step. In case

[21] The learning effect mentioned in this example refers to the ability of performing an activity when people are exposed to this activity. Practice and familiarity with a specific task have an impact on performance. Improvement on performance may only be due to repetition.

more solutions are available (e.g. when a specific call for solutions has been done), these will serve as additional inputs to this step.

Output

This step will result in a set of appropriate and available solutions that will potentially solve the investigated gap(s) and that can be used in the Trial.

Actions and Required participation

- Enter the Portfolio of Solutions (PoS) website and enter key words expressing the crisis management gaps and the roles, tasks, and processes that need to be improved (e.g. communication, information sharing, situational awareness, common operational picture, firefighting, etc.).
- Review which innovative solutions are available for the crisis management problems that have been defined for this Trial.
- Formulate selection criteria with the Trial committee and select solutions that are worth considering for a Trial.
- Read the descriptions and determine/ consider a number of factors: whether solutions are already on the market or still in a developmental / prototype stage, product/service description, reviews, interoperability with the DRIVER+ Test-bed, typical use cases, provider, price, freeware, local resellers, version, picture, movie, current customers/users, past experiences and lessons-learned as described by practitioners.
- In case no relevant solution is available in the PoS, the Trial committee should consider an open call within the DRIVER+ community, in order to identify relevant solutions that are not currently in the DRIVER+ PoS. The procedure can follow the same procedure for carrying out a call for applications, as was applied during the project duration. Here, the review criteria were formulated by the practitioner organisations within the DRIVER+ consortium. The double-blind review process might not be obligatory, but could help to ensure un-biased review results. Best practices to manage the call for applications can be derived from D942.11 and D942.21.
- Select solutions for the Trial.

Example[22]

Societal Impact Aspects

A key consideration when selecting solutions for a Trial is to assess whether the solution has any known unintended side-effects or societal impacts that Peter should be aware of. When selecting the solution from the PoS, Peter became aware that no such assessment currently existed for the specific solution since the COP-tool that he wanted to use is new, and thus he decided to make an assessment himself. Based on the selected solutions for the selected scenario, he carries out an assessment using the DRIVER+ Societal Impact Assessment Framework (SIA), which allows him to assess how the use of the COP-solution can potentially have a negative or positive impact on the broader society.

The SIA framework is not tool specific, but is developed for assessing the most common functions that CM tools have. This means that Peter could potentially use the same method for assessing all kinds of solutions that he might be considering. The assessment starts with identifying what kind of functions the solution has (e.g. does it collect or process data, or does it facilitate communication?), and then systematically linking the functions to a predefined set of societal impact criteria. In the PoS, Peter can also look up assessments and concluding recommendations that other users of the PoS have made of other solutions or tools. Thus, if solutions with similar functions as the COP tool have been assessed before, Peter can use these as inspiration.

[22] Societal Impact Aspects are outlined in Section 6

Preparation phase – Selection of solution

Erik, who is also part of the Trial team, told Peter about the solutions available in the online DRIVER + Portfolio of Solutions. Peter decides to search, evaluate and select a solution that is expected to improve the crisis management performance he wants.

Using key words that describe the crisis management tasks, processes and roles he wants to improve, Peter finds all kinds of solutions including experiences of others and lessons learned.

Together with his Trial team he formulates selection criteria and selects solutions that are worth considering:

- *Training for communication and decision making.*
- *Multiple software tools providing a Common Operational Picture (COP).*
- *Ways to monitor units, to monitor sensor data and predictive models.*

They finally decide to select a Common Operational Picture (COP) solution for Trialling that meets their criteria. Peter reads that the COP is an online software tool providing a shared map that multiple command teams can view and use to share information about incident, units or routes.

Preparation phase – Iteration of research questions

Now that the Trial team has selected a solution, it is possible to further specify the research questions, the measurements and Trial design.

The objective of this specific Trial is to assess the effect of the selected COP tool on communication and shared situation awareness between command teams using the COP tool, and its impact on making effective decisions in a simulated but realistic scenario. Research questions are now reformulated as follows:

- *How does the COP tool affect communication between onsite and offsite command teams?*
- *How does the COP tool facilitate shared situation awareness about incident and response to it?*
- *How does the COP tool affect decision making about the routing of resources?*

Other adjustments (iterations) based on the chosen solution and design

Because the COP tool is new, participants should be trained in using the COP tool and should receive instructions about their task.

Because Peter and his team decided to have two sessions with the same teams, they decided not to use the same scenario twice. To avoid a learning effect, Peter decides that the events in scenario will be similar, but not the same between the sessions with and without the solution, respectively. This is because he wants to use the comparison of measures between the sessions to draw conclusions about the effect of the solution.

Participants will not be instructed about the scenario, because in that case they can respond as they would normally do and have no previous knowledge that might influence their performance.

Specific questions about the COP tool are added to the different measurements (observation protocol, the questionnaire and focus groups). Examples of guiding questions for the focus groups:

What advantages/disadvantages did you experience in using the COP?

Can you provide specific examples?

5.1.3 Development of Trial materials

Introduction

At the end of the preparation phase, the Trial design is ready. Materials for the Trial and two Dry Runs need to be developed. The developed materials, such as instructions or questionnaires, will then be piloted in Dry Run 1, used for rehearsal in Dry Run 2 and used in the Trial.

Input

The inputs to fulfil this step are the decisions that were taken during the six-step approach, as described in the previous pages. Based on this, the design of these materials can be developed and configured.

Output

The output of task 3 step 1 is captured in and consists of the following materials:

- The scenario, source and effects of incidents, locations of relevant objects and people are detailed, developed and made available for Dry Run 1. The key events in the scenario that trigger crisis management processes, tasks and roles (including workflows between teams or team roles such that communication) required in each Trial session are made available in the Test-bed Trial scenario Manager and Time service. The simulators in the Common Simulation Space of the DRIVER+ Test-bed are configured[23].
- The Trial participants are identified, contacted, invited and informed for the Dry Run 1, Dry Run 2 and Trial sessions. The Trial participants are: the Trial owner, conductor, participating practitioners, solution providers and observers.
- Instructions to participants about the Trial and the crisis management objective, their tasks, processes and roles are developed and the solutions are ready for testing in Dry Run 1.
- Buildings, rooms, workplaces, systems and instruments are available, configured and ready to be used by all invited participants for Dry Run 1.
- The agenda and the instructions for all data collectors are clear about who collects what data, how and when and where and why and relevance of the conditions. It is clear how the observer and after-action tools of the DRIVER+ Test-bed are used.
- The selected solutions for trialling are connected to the Test-bed common information space and made available in the right locations for Dry Run 1.
- The approach to check, analyse and visualize collected data is ready for use after Dry Run 1 and understood by those who carry out the analysis.
- The template for reporting the Trial is configured and the protocol to answer research questions and drawing conclusions is ready for Dry Run 1.

[23] The above-mentioned tools are developed within DRIVER+ Test-bed. Detailed information is provided in D923.21.

5.2 Execution phase

Figure 5.3: Execution phase

Once the Trial design, including the technical Test-bed arrangements, has been developed, its applicability can be tested in Dry Runs to ensure everything is properly working when the 'real' Trial is run, thus enabling to collect the required data in a proper way. For the execution phase (cf. Figure 5.3), the methodology provides guidance for Dry Runs (steps 1 and 2) and running the Trial (step 3).

These subsequent steps are described in next sub-paragraphs. The execution phase results in sets of collected data. Acceptable data for the evaluation phase is acquired in an iterative manner by testing data quality assurance in a data collection plan and analysability of data before and after the Dry Runs. This means that elements of the data collection plan are adjusted as more information about data quality is acquired.

5.2.1 Dry-run 1

In this step, the Trial design and all technical Test-bed arrangements are tested at the location(s) where the actual Trial will take place. This concerns both technical and non-technical issues. The aim is to test whether or not the results of all the six steps have been implemented correctly and are clear for the involved stakeholders and/or users.

With respect to technical issues, it should be checked whether solutions can operate in a proper way, both stand-alone and – if necessary – in interaction with the Test-bed environment. Initially, all aspects can be tested separately. At the end of Dry Run 1 a complete test-Trial will be executed. For this Dry Run, it is not necessary that all roles (instructors, practitioners, observers, etc.) are played by different professionals, but it is key that all kinds of expertise is on hand to test the proper functioning of the Trial from both technical and non-technical points of view.

Dry-run 1 will result in a list of required adjustments, including an indication of who is/are responsible to carry out each adjustment and – if necessary - who should be involved.

The Trial-owner and the complete Trial committee should participate in this activity.

Having defined the objectives, the relevant input/ output and actions for the Dry Run 1 in the execution phase of a Trial are the following:

Input

- Results from preparation phase
- TAP

Output:

Insight into what needs to be adjusted in the Trial (check of all steps of the preparation phase and the TAP).

Actions and Required participation

- Testing the completeness and applicability of the data collection plan.
- Make sure that the procedure and methods for data collection are clear and known by data collectors. For example, by piloting the collection of data from simulators, observations, surveys, interviews and focus group sessions in one or more Dry Runs or pilots.
- Testing the completeness and usefulness of the collected data.
- Testing the relevance of scenario events to trigger the crisis management processes, tasks and roles of participants.
- Testing the availability of participants that are responsible for, and competent in executing the crisis management processes and using the solutions in the Trial.

Example

Execution phase: Dry Run 1

Peter wants to test the design of the Trial with a Dry Run.

He uses students to perform this Dry Run. In this way, he receives feedback about the design of the Trial and the scenario, without taking too much time from the practitioners. Also, by using students, the participants are not informed (biased) before the actual Trial.

After the Dry Run, Peter has collected a lot of feedback about the Trial design. He found out that the instruction was not sufficient to be able to use the COP tool effectively. He decides to train the participants who will use the COP tool during the Trials more thoroughly before the actual run. For this, he uses a totally different scenario, one from a previous exercise.

He also checked the questionnaire with a domain expert who is not participating in the Trial. The feedback he received was very useful. Some questions were not clear, and he reformulated these questions.

The observation questions they used were too difficult for the observers. They realized that some of the questions were not concrete enough to observe behaviour of the participants.

The focus group session went well and was very useful. It provided insight into the use of the tool and its added value.

Peter sees during the Dry Run that the events in the scenario required the onsite team to share information with the offsite team because they need additional resources to assess e.g. smoke toxicity. Peter confirms that events in the scenario actually do trigger the execution of the right crisis management processes. However, the participants (students) give feedback about the scenario and say that the two scenarios are too similar. This influences the performance of the second session. The second session was too easy because of this. He asks his colleague to adjust the scenario.

Execution phase: Dry Run 1, data collection plan

After the Dry Run 1, Peter analyses the data. This way he gets an idea as to whether the collected data is sufficient to answer his research questions.

He has two observers whom he instructed beforehand with elements to observe. He checks whether this results in data that is suitable to answer the research questions. Peter notes that the observation questions are not adequately incorporated in the observer tool. To assess communication in the two sessions, Peter not only wants to observe the duration of communication (a change in duration could indicate increased efficiency), but also the topics that are shared (is there a change in relevant topics shared?) and the number of misunderstandings and errors that occur (is there a change in accuracy?).

Peter also pilots performance measurement in the simulated world. He checks whether a difference in drive-up performance can be assessed based on the log in the simulated world. Peter sees that it can be assessed whether units arrive at the right or wrong drive up route, whether the units do or do not encounter dangerous smoke or obstacles like water hoses.

Peter decides to further specify how all data is collected and stored. The check of the data and a Dry Run of the analysis and visualisation of the results, show that he will get the data he needs to answer his research questions. Peter notes however that the number of practitioners for the Trial is not very large. This limits the use of inferential statistics. He decides to only use descriptive statistics. He decides to qualify any answers to the research questions since the sample size will be too small to be sufficiently certain.

5.2.2 Dry-run 2

Dry-run 2 is a full test: a general test in preparation for the 'real' Trial. In this step the Trial design and all technical Test-bed arrangements are tested at the location(s) where the actual Trial will take place. This concerns both technical and non-technical issues. The aim is to test whether (a) adjustments that have been appointed at the end of Dry Run 1 have been implemented in a proper way, and (b) that the constellation as a whole functions properly. It is recommended that in Dry Run 2 all roles (instructors, practitioners, observers, etc.) are played by at least one professional or someone who has enough expertise/know-how to play a certain role.

Note: After Dry Run 2, only minor adjustments can be made. If there are too many major shortcomings after Dry Run 2, the 'real' Trial should be postponed (to enable additional adjustments) or parts of the Trial should be skipped.

The Trial-owner and the complete Trial committee should participate in this activity.

Applying all adjusted elements in a rehearsal with the goal that all the actors involved in running the Trial (e.g. solution providers, Test-bed operators, scenario managers, observers, interviewers, etc.) are aware of their roles and responsibilities.

Having defined the objectives, the relevant input/ output and actions for Dry Run2 in the execution phase of a Trial are the following:

Input

- Outputs of Dry Run 1

Output

Insights into the overall Trial design.

Actions and Required participation

- Assess whether adjustments decided after Dry Run 1 have been implemented properly.
- Assess whether the team is ready to carry out the actual Trial.

Example

Execution phase: Dry Run 2

The feedback on Dry Run 1 is adjusted and the Trial team is ready to perform Dry Run 2.

Dry Run 2 serves as a final check for Peter to confirm that all of the materials are ready, the technique works and that everybody knows what to do. They perform the Dry Run as if it is the actual Trial.

Dry Run 2 went well, and the team is now ready for the Trial.

5.2.3 Trial runs

In this step the Trial is executed. During the Trial, all kinds of data, as described in the data collection plan, will be collected.

Having defined the objectives, the relevant input/ output and actions for actual run/execution of the Trial are the following:

Input

- All decisions taken during the preparation phase.
- Outputs from the Dry Run 1 and 2.

Output

- Collected data.

Actions and Required participation

Conduct the Trial based on insights and plans from Dry Run 1 and 2 during the preparation phase.

- Preparations
  - Technical and non –technical.
- Briefing
  - Instruct role-players and observers to know their roles and be prepared to use the tools that are at their disposal.
- Instruct Trial participants
  - Obtain informed consent (if relevant).
  - Train participants in using the solutions.
- Conduct the Trial as described in the preparation phase (in one or more stages).
- Executed scenario (stages) and collected observation data (via observation tool and other methods)
- Hot-wash (e.g. short questionnaire or a group session with participating practitioners, and one with observers).
- Collected feedback right after each scenario (stage) from
  - Practitioners.
  - Observers.
- Final wrap-up.
- Initial conclusions from the Trial by all participants with respect to:
  - Crisis Management improvement by using the solutions.
  - Performance improvement of specific crisis management tasks by using the solutions.
  - Relevance of the conducted Trial.
  - Experiences with the Trial supporting tools that have been used.

Example

Execution phase: Trial runs

In this step Peter has to carefully check if the result of all the preparatory steps are up and running. Unexpected changes (e.g. participation of key practitioners) need to be documented, analysed and considered for the rest of the Trial. Even ad-hoc adjustments of the data collection and evaluation plans are valid options. Generally speaking, although this phase might appear not to be influenced of a certain event, in the "Trial reality" Peter needs to expect the unexpected.

5.3 Evaluation phase

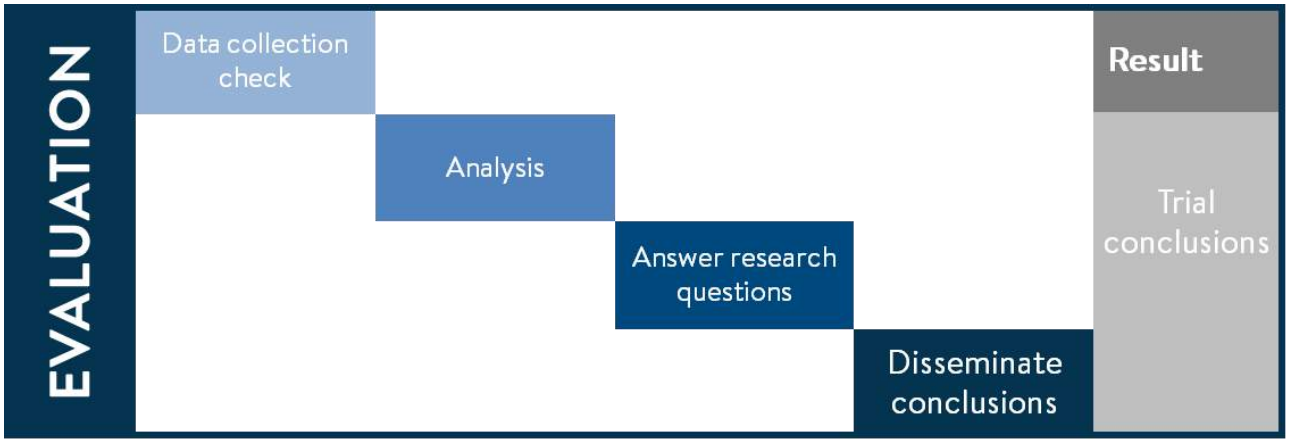

Figure 5.4: Evaluation phase

In the evaluation phase (cf. Figure 5.4), the results of the Trial are assessed and reported. For the evaluation phase, the TGM will provide support in the following tasks:

- Checking the collected data (e.g. the set of data collected from various sources during the execution).
- Answering research questions (answering the questions as defined in the preparation phase, drawing conclusions and providing recommendations with regards to the three key performance measurements dimensions and the Test-bed tools. E.g. was the observer tool helpful to capture relevant observation? Was the number of participants sufficient to execute the Trial? Was the overall set-up of the Trial comprehensive enough to answer to RQs?).
- Analyse the data and visualise the results.
- Draft conclusions, recommendations and lessons learned in alignment with the KPIs defined during the preparation phase. The aim here is to answer questions such as: Can the results be generalized? What is the impact of the solution on the CM dimension, e.g. on the routine operations carried out by first responders? etc.
- Disseminate conclusions.

Relevant topics to be covered in this phase:

- Analysis of results:
  - With respect to the tested solutions (data analysis, conclusions, practical implications).
  - With respect to conducting the Trial.
- Reporting results:
  - With respect to the tested solution in the DRIVER+ Lessons Learned Framework (see D530.1) / other type(s) of dissemination in the field of disaster resilience and crisis management.
  - With respect to the conducted Trial in a document that can be used by future DRIVER+ Trials.

5.3.1 Data collection check

In this step, the data that have been collected during the Trial via various sources will be checked for completeness and quality (vagueness or errors). In case of missing, vague or erroneous data additional information might be collected. This step results in a verified and structured set of collected data.

This step has to be conducted by the Trial owner and the methodology support coordinator

The goal of this step is to check, structure and verify the data that has been collected during the Trial, as well as to collect missing data.

Having defined the objectives, the relevant input/ output and actions for the data collection check in the preparation phase of a Trial are the following:

Input

- Rough data collected from the Trial.

Outut

- Achieve a verified and structured set of data.

Example

Evaluation phase: data collection check

The data is checked for outliers, or for any other remarkable findings.

5.3.2 Data analysis

In this step, the verified set of collected data will be analysed according to the evaluation approaches as determined during the preparation phase (task 2, step 4), in which KPIs for several dimensions have been defined.

This step has to be conducted by the Trial owner with support from the Test-bed guidance

The goal of this step is to combine, structure and present data that indicates – in accordance with the KPIs that have been formulated during the preparation phase – the degree to which crisis management performance was improved during the Trial, the effects of the solutions on this performance, how participants worked with the solution, and the role and significance of factors other than the solution.

Having defined the objectives and the goal, the relevant input/ output and actions for data analysis in the evaluation phase a Trial are the following:

Input

- Verified data from the Trial (resulting from the data collection check in the previous step)
- The result of the preparation phase: Step 4 Formulate evaluation approaches and metrics (5.1.2.4)

Output

Gather analysed data, including preliminary conclusions (from technical perspective of the Test-bed and methodological standpoint).

Actions and Required participation

Activities:

- Explore classified data in terms of similarities, differences and patterns.
- Structure data in terms of conditions with and without a solution or different solutions, and in terms of different aspects of crisis management performance, the metrics used to specify crisis management performance, etc.
- Cluster, summarize and visualize summarized data such that arguments for answers to the research questions can be supported with data from the Trial.

To analyse data from objective performance measures, expert assessments, surveys, observations, interviews, focus group sessions, etc. the Trial owner can work with the following Trial stakeholders:

- Quantitative data analyst.
- Qualitative data analyst.
- Methodological advisors.

Example

Evaluation phase: analysis

The results of the observers, questionnaires and focus groups are collected.

For the results of the questionnaires, means are calculated and compared between the two groups. Peter asks a Trial committee team member who has experience with conducting these analysis (t-tests). The group is too small to perform this test and to see significant differences; however a trend can be identified.

Communication time measured with the observation tool is shorter and clearer for the participants using the COP tool.

The results of the focus group and observers provide more insight into the use of the tool and how they support their tasks. An interesting finding is that communication without the tool is very explicit and takes a lot of time. However, with the tool, the communication is sometimes too implicit. Participants expect that filling in the information into the COP is sufficient, without explicitly contacting each other. This is confirmed by the results of the focus groups and by the results of the observers.

5.3.3 Answering research questions – Concluding / Synthesis

In this step, based on the analysed data, the research questions will be answered and conclusions will be drawn regarding the extent to which the objectives of the Trial have been met.

This step is to be conducted by the Trial owner and all members of the Trial committee.

The concluding step involves formulating the answers to the research questions and supporting these answers with empirical evidence gathered during the Trial. It entails formulating the degree to which the crisis management performance objective, the solution objective and Trial objective have been achieved. The answer specifies the degree to which crisis management performance is improved during the Trial. It specifies the effect of the solution on this outcome. It may also specify how participants used the solution. The answer to the research question is supported by arguments that are grounded in the analysed data and by a line of reasoning that justifies why the link between the analysed data and the answer is valid.

The goal of this step in the methodology is to formulate an answer to the research question and to capture the answer in the Trial report. The goal is to provide insight into the degree to which the crisis management performance objective, the solution objective and Trial objective have been achieved.

Having defined the objectives, the relevant input/ output and actions for answering research questions are the following:

Input
To formulate these answers, the following should be used as an input:

- The crisis management performance objectives.
- The solution objective.
- The Trial objective.
- Research question.
- Research method.
- Evaluation plan.
- Analysed data (resulting from the data analysis in the previous step).

Output
The result of this step is a set of answers to the research questions and a conclusion on the degree to which the objectives of the Trial have been met. In addition, for each dimension (crisis management, solution, and Trial) recommendations might be provided.

Actions and Required participation
Activities:

- Organise a meeting to discuss results with the Trial team. Provide a summary of the main results and present this to the team (without providing interpretations or conclusions). If possible, use graphics to visualize the results.

Example questions for the discussion:
  - What stands out? What results are remarkable?
  - Did you expect these results? Why or why not?
  - What are possible explanations for these results
  - What is/are the answer(s) to your research question(s)?
  - What advice would you provide about the solution?
  - What can you conclude based on these results?
  - Are the results generalizable to other teams/ contexts? Why or why not?
- Also, discuss the method of the Trial. What were advantages and disadvantages of the Trial design (also described in the preparation phase)?
- What activities are still needed to be able to answer your research questions?

To formulate answers to the research questions and to formulate the degree to which objectives have been achieved, the Trial owner can work with the following Trial stakeholders:

- Decision makers.
- Practitioners.
- Quantitative and qualitative data analysts.
- Methodological advisors.

Example

Evaluation phase: Answer research questions

The research questions were:

- *How does the COP tool affect communication between onsite and offsite command teams?*
- *How does the COP tool affect building up shared situation awareness about an incident and the response to it?*
- *How does the COP tool affect decision making on the routing of resources?*

The Trial team learned that the COP tool supported the teams in communicating information. It was faster and fewer errors were made. They also learned of some disadvantages of using the COP tool. A disadvantage is that team members expect that others will see and understand information when it is provided in the COP tool. This is not always the case. They learned that it is crucial to inform people when important information is entered in the COP tool and that in order to achieve a shared understanding, communicated information often requires an explanation in the form of a dialogue between the (two) people involved.

5.3.4 Dissemination of the results

As a final step of the evaluation phase, all the results and knowledge gained will be disseminated to ensure they are made accessible to the project stakeholders and beyond, which should in turn, support the sustainability of the DRIVER+ outputs in the longer-term. The dissemination will thus be two-fold so as to target both the internal stakeholders of the project (consortium members) and the external ones (beyond the consortium).

With regards to **internal** dissemination, the outcomes, final conclusions and recommendations resulting from the conduct of the three aforementioned steps will be documented in D911.91 (M72). It will serve as an important source of knowledge for all project partners, deriving lessons learnt, best practices, conclusions and recommendations for the future.

In addition to the above and following each Trial:

- The results of solutions assessment will be stored and made accessible in the Portfolio of Solutions (PoS).
- The experience gained and practices resulting from the conduct of the Trial will feed both the DRIVER+ Lessons Learned Framework (which will be included in an updated version of the TGM) and the Knowledge Base so as to extend the collection of information to the current activities of the project.

Furthermore, all the lessons learned deriving from the project activities, and therefore, the conduct of the Trial and the Final Demonstration, will be documented in the annual report to be developed under WP953 – Enhancing the shared understanding of Crisis Management.

The objective of this document is to report on lessons learnt and best practices synthesizing twice during the project duration the information collected throughout the project activities. Each edition will provide an analysis and identification of best practices and highlight success stories deriving from the project activities (and thus the methodology) but also beyond, suggesting future research activities. These documents will be elaborated following a book sprint (a collaborative writing session) methodology, and involving all SP leaders and Trial owners.

With regards to **external** communication, the results, best practices and lessons learnt will be disseminated via different means: the involved partners will participate in scientific publications and participate in third party events of relevance so as to inform the project stakeholders about the main findings and increase the project impact. Furthermore, the annual report and the public deliverable as mentioned above will be shared with the CM community to serve as entry point to the topic. The public deliverable and the initial edition of the annual report will be made accessible via the public website in the form of a flipbook and relayed on the social media channels of the project. The final edition of the annual report will be unveiled on the occasion of the project final conference in Brussels and distributed to the participants in printed versions. In close liaise with SP95 – Impact, Engagement and Sustainability and once the results are made available, the latter will also be promoted through news items on the project website and a dedicated newsletter will be circulated. Based on this, specific infographics will be designed so as to easily promote the outcomes and raise awareness about the added value of the activities towards the EU citizens. Finally, the results will be presented on the occasion of the Innovation for Crisis Management events organised by the project and the final conference.

6. Towards an Ethical Trial Guidance Methodology

As shown in section 3, a small amount of peer reviewed papers included information on ethical procedures. This important missing aspect triggered the need for including research ethics in the TGM based also on the more general consideration that, in order to establish a shared understanding of CM in Europe, societal values must not be overlooked. Furthermore, the overall objective of DRIVER+ Trials is to investigate to which extent potential solutions solve gaps and/or meet needs that have been identified by practitioners in the domain of CM in Europe. It is important for the success of DRIVER+ that this investigation is conducted in a way that is societally acceptable, that research ethics rules and regulations are followed, and that potential negative impacts are mitigated and minimized, or eradicated if possible. This is mainly taken care of via two streams of work[24]:

1. One on research ethics (i.e. data protection & privacy).
2. One on societal impact assessments. This section will present the integration of work from both of these streams into the TGM.

For the first stream, from a research ethical perspective, the DRIVER+ project involves the collection, processing and storage of data derived from individuals, both from members of the DRIVER+ consortium and individuals that are not formally part of the project[25]. The single most important issue for the research activity within the project currently relates to privacy and data protection, and how to safeguard the former via implementing the latter. In this section, a list of concrete recommendations for this is given. At the very core of research ethics are rules and guidelines for the participation of human subjects in research activities, which refer to the standard European Commission research ethics[26]. A plan for how to tackle the larger issue of ethics in the sense of societal impact is suggested and integrated into the TGM. By making the already developed DRIVER+ Societal Impact Assessment (SIA) framework a part of the TGM, the idea is that both approaches will be mutually strengthened in terms of sustainability throughout and beyond the scope of DRIVER+. In addition, by including the societal impact dimension in the TGM, it is ensured that the Trials incorporate an assessment method focused on potential impacts in terms of secondary in/securities (such as unease and calmness, misuse and protection) core societal and ethical principles (i.e. participation, diversity), sustainability, political and administrative principles (i.e. accountability, transparency), legitimacy, and legal values (i.e. in/justice).

Still within the first stream of research ethics, the Trials are a key component in DRIVER+, and it is crucial for the success of the project that the Trials are prepared, executed and evaluated in a well-thought-of way. The concept of 'informed consent' is at the core of an approach that respects the right to privacy. Informed consent implies that the individual whose data is collected is informed about the purpose of the research, and consents to the use of their data for these purposes. As the execution phase of the Trial results in collected data about CM and the effects of solutions, the need for, and importance of, using informed consent sheets whenever individuals are involved in the research activity is crucial. This is relevant both for individuals participating as solutions providers, but also for non-affiliated external participants such as

[24] Both of these are located in WP913, and their implementation in SP92, and in particular the TGM, is described in this section. The conceptual development, as well as the resulting deliverables relating to both streams can be found in WP913, and the following descriptions are to be regarded as highlights most relevant for the Trials.

[25] In short, research ethics principles and rules (i.e. with regards to data protection & privacy issues) are upheld and implemented via a set of already established administrational procedures. For project activities, including the DRIVER+ Trials, templates for both data protection approval and informed consent have been made available on the CoW (DRIVER+ Share Point). A more extensive informed consent form has also been prepared specifically for the Trials. This form, which doubles as an information letter, is aimed at external participants who are not necessarily solution providers but are involved in some way in the Trials. This could, for example, be volunteers or practitioners involved in the evaluation.

[26] The main concern of research ethics in DRIVER+ is not only to conform to given legal (i.e. data protection legislation) and moral codes, but also to enhance the legitimacy and scientific quality of the project[26]. Research ethics fundamentally refers to the need to govern the impact (both positive and negative) that research can have on the society, and the operationalization of this includes finding good ways to incorporate and integrate rules, regulations and best practises into the very fabric of the research activities on a fundamental level.

volunteers. A template for an exhaustive information sheet and informed consent sheet to be used for the DRIVER+ Trials has been prepared by PRIO. The template should be tailored by the Trial owner in the preparation phase of the Trial, and the information sheet and informed consent sheet should be distributed to all external participants two weeks before they are involved in the research activity. In case only a very basic form is required (for example because information has already been given in a Non- disclosure agreement (NDA) or in the Confirmation of Commitment), a simpler version of an informed consent form is also available.

For the first Trial (May 2018), a less extensive version of this form was deemed most relevant (because of the nature of the Trial activities including externals and because the required information was covered in the two other signed documents), and this will be distributed to all external participants (following the distribution also of the Confirmation of Commitment and the NDA) in order to secure their privacy and data protection rights. However, the forms will be revisited after each Trial, to ensure that they meet the needs of the Trial owners; hence they will also play a role in the evaluation phase of the Trials.

For the second stream, the method chosen is a comprehensive SIA framework (D840.11), designed for DRIVER+. Resulting from a systematic and dedicated work throughout the first two years of the project, the SIA framework is a method for making assessments of the broad positive and negative impacts that CM solutions can have on society. The aim of the framework is to be a practical and usable tool for conducting societal impact assessments to solution providers, practitioner organisations, end-users and researchers working in CM[27]. In the coming months and years this will be integrated into the TGM. While the current version of the SIA framework was developed on the basis of the solutions that were part of the project at the time of development, the next version will be broader, and support responsible and ethical research in CM in general. The *IsITethical? Exchange*[28] (hereinafter called ELSI-guidelines*),* which supports responsible ICT research and innovation and digital ethics in disaster risk management, follows a similar structure as the societal impact assessments already made using the DRIVER+ SIA framework. Firstly, the list of impact criteria validated and used in the DRIVER+ framework contains many overlaps with the list of what the ELSI-guidelines describes as “key terms”/ “concepts”, and which forms the basis for their guidelines. Furthermore, the ELSI-guidelines sort different problematic issues (such as “cultural/linguistic differences”) under larger headlines (such as “organisational interoperability”), and give guidance about the issues using guiding questions, contextual information, real-life examples and references to further reading. This is to a large extent the same structure as the DRIVER+ SIA framework.

For the upcoming revision of the framework however, which will mean an expansion of the scope, the ELSI-guidelines will be leveraged with the DRIVER+ framework to ensure a broad scope that also echoes experiences from other EU projects in the Disaster- and Risk Management (DRM) field. The current DRIVER+ SIA framework takes into account the various key societal issues that have been identified by different research disciplines, such as the fields of risk assessment, data protection, critical infrastructure protection, resilience, community and civic engagement, decision-making frameworks, communication, and critical security studies in general. The fundamental idea is that the actors and agents in CM research and implementation must consider the potential societal impacts of their activities, to increase the potential for successful implementation and societal acceptability. Such impacts are difficult to assess via quantification or existing cost-benefit methods. Therefore, the SIA framework offers a methodology that aims to increase the understanding and the management of, and response to, potential societal impacts of CM research and CM measures.

[27] In parallel to the SIA framework, a set of societal impact assessments were also delivered as D840.21, and the assessments were elaborated using the framework. Furthermore, a series of training events are currently (M47) being planned, and throughout 2018 training sessions with consortium partners will be conducted to train them in using the SIA framework.

[28] The *isITethical? Exchange* is an initiative led by a group of scholars from Lancaster University in collaboration with the Public Safety Communications Europe Network. It brings together guidelines from EU projects such as SecInCore http://www.secincore.eu/, EPISECC https://www.episecc.eu/; SECTOR https://www.sector-project.eu/; Redirnet https://www.cetic.be/REDIRNET-2068; COncORDE http://www.concorde-project.eu/; Bridge http://www.bridgeproject.eu/en .The guidelines can be accessed at: http://www.isitethical.eu/elsi-guidance/

6.1 Concrete data protection and privacy recommendations for the Trials

The General Data Protection Regulation (GDPR[29]) is part of the EU data protection reform package, along with the data protection directive for police and criminal justice authorities. It allows European Union (EU) citizens to better control their personal data. It also modernises and unifies rules allowing businesses to reduce red tape and to benefit from greater consumer trust. For the DRIVER+ Trials, the changes that come with this new regulation will refer to *citizens'* rights. While the new rules for *businesses* are also highly relevant for DRIVER+, the implementation and enforcement of these lie with the individual company/ business/ organisation taking part in the project[30]. This means that the ethical component in the TGM will not be aimed at assisting businesses in adapting to the GDPR, but it will first and foremost take into account the rights of the citizens who are potentially participating in the Trial activities. In sum, the GDPR has been developed to strengthen existing rights, to provide for some new rights and to give citizens more control over their personal data. The GDPR can be split into a handful privacy principles, which will structure the recommendations below[31]. In order to protect the privacy of participants in the Trials, but also for every other activity in DRIVER+, personal data needs to be processed in accordance with data protection rights.

While all these recommendations mainly refer to the preparation phase of a Trial, some are also relevant for the execution and the evaluation phase. In the list of recommendations below, the different recommendations are tied to which phase they are relevant for. The following recommendations- to reflect also the new rights described in the GDPR- should be observed[32]:

1. Lawfulness, fairness and transparency
   a. Preparation: Tell the data subject what kind of data will be collected and processed, and make sure that the data actually collected matches this description.
   b. Preparation: Make the conduct of observation or recording of people very clear. Give anyone potentially affected by it the possibility to refuse from being observed or recorded.
   c. Evaluation: Facilitate de-briefing for research activity participants when relevant (such as for external participants in Trials with a large field component with extensive scenarios).
   d. Preparation: Always inform all participants and potential bystanders thoroughly and well ahead of the conducted research.
   e. Preparation: Consult local data protection authorities to make sure that rules and regulations ensuring data protection rights are followed. Registration with national authorities must be made where required.
2. Purpose limitations: The GDPR states that personal data can only be obtained for "specified, explicit and legitimate purposes" [article 5, clause 1(b)].
   f. Preparation: Make sure that participants in any research activity provide informed consent.
   g. Preparation/ execution/ evaluation: Ensure that data is not being used for any other purpose than what was agreed in advance.
   h. Evaluation: Do not re-use data without written agreement of the owner.
3. Data minimisation: The GDPR states that data collected on a subject should be "adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed"[article 5, clause 1(c)]
   i. Preparation/ execution: Practice data minimization, i.e. avoid collecting unnecessary data.

[29] Regulation (EU) 2016/679 — protection of natural persons with regard to the processing of personal data and the free movement of such data. Available at: http://eur-lex.europa.eu/legal-content/EN/LSU/?uri=uriserv:OJ.L_.2016.119.01.0001.01.ENG

[30] A summary of the key rules for businesses can be found here: http://eur-lex.europa.eu/legal-content/EN/LSU/?uri=uriserv:OJ.L_.2016.119.01.0001.01.ENG

[31] A similar list describing the six key principles of GDPR has also been made by MThree Consulting. This list can be found here: https://www.mthreeconsulting.com/blog/2017/04/the-6-privacy-principles-of-gdpr

[32] Several deliverables in WP913 will deal with the GDPR and the overall task of research ethics, but this list provides an overview of current general key recommendations relevant for the DRIVER+ Trials. Specific considerations for each Trial, as they evolve, will be discussed between PRIO and the Trial owner/ Trial committee.

4. Accuracy: The GDPR states that data must be "accurate and where necessary kept up to date" [article 5, clause 1(d)].
   j. Execution/ evaluation: Refrain from processing data that is not up-to-date.
   k. Execution/ evaluation: Be aware that under the GDPR any person located in the European Union (anyone residing in the EU, not just EU citizens) can request their personal information be removed from a corporate database, or know the reason why it can't.
5. Storage limitations/ Integrity and confidentiality: The GDPR states that personal data should be "kept in a form which permits identification of data subjects for no longer than necessary". [article 5, clause 1(e)]. The GDPR also states that those processing data should do that "in a manner [ensuring] appropriate security of the personal data including protection against unlawful processing or accidental loss, destruction or damage". [article 5, clause 1(f)]
   l. Preparation/ execution/ evaluation: Collected data which is no longer required should be deleted. In case of a data breach, this will lessen the amount of affected individuals.
   m. Preparation/ execution/ evaluation: Ensure that personal data collected is stored in a secure way, for example by using the ISO/IEC 27000 family of standards.[33]
   n. Preparation/ execution/ evaluation: Anonymize and encrypt personal data as a general rule.
   o. Preparation/ execution/ evaluation: Use technology for data recording only if necessary. Provide justification.

6.2 Societal impact assessments and recommendations for the Trials

6.2.1 Background of the SIA methodology

The key idea behind the SIA framework is that CM *functions* (such as data collection) are assessed against a set of impact *criteria* (such as transparency). Figure 6.1 describes the current list of 25 societal impact criteria[34]. In order to facilitate a structured thinking about societal impacts, the different criteria are organised according to impacts of *secondary in/securities*, *core societal and ethical principles*, *sustainability*, *political and administrative principles*, *legitimacy*, *legal values* and particularly relevant *fundamental rights*.

Secondary in/securities	**Core societal & ethical principles**
Unease – Calmness	Social Cohesion & Solidarity
Suspicion – Trust	Participation
Misuse - Protection	Diversity
New Vulnerabilities - Progress	Open - Control Society
Technology Dependency - Flexible Solutions	Cultural & Gender Sensitivity
Function Creep - Specialized and Controlled Use	
	Legal values
Sustainability	Suitability, Necessity & Proportionality
Sustainability	In/justice & In/equality
Political & administrative principles	**Fundamental Rights**
Accountability	Dignity /Autonomy
Transparency	Non-Discrimination
Integrity	Privacy & Data Protection

[33] https://www.iso.org/isoiec-27001-information-security.html

[34] These criteria can be used to assess both the positive and the negative impacts of the function of a certain solution. A closer description and definition of all these societal impact criteria can be found in Section 3.3 of D840.11.

Negative - Positive Standardization International Cooperation **Legitimacy** **State-Citizen-Relationship** **Political Reputation**	Freedoms & Protest

Figure 6.1: The current list of SIA criteria

The criteria listed in Figure 6.1 were developed through an iterative process with several steps. This process is described in detail in section 3.3. of D840.11, but a short version is given below. The criteria in the table above are also largely reflected in what the ELSI- guidance defines as "Key Terms" relevant for iterative ethical impact and privacy impact assessment. The very onset for choosing the criteria was the indications in the original DRIVER DoW, which asked for assessment criteria to organise a general evaluation of the unease, fear, insecurity or secondary risks that CM activities can produce.

It furthermore asked to use these criteria to assess side-effects to societal values. Based on this, a first list of criteria was developed. Furthermore, the list of assessment criteria could be practically endless. Any culture, any societal context or group may be organised around different key principles and criteria[35]. As a consequence, it was crucial to strike the right balance between having enough criteria to cover a wide range of impacts, and at the same time not too many criteria, that means a concise number of criteria to make SIA graspable and constructive. It was also a key finding that the selected criteria allowed for meaningful assessments both of the DRIVER+ functions in particular, but also for European CM in general. The policy-relevance of the criteria was confirmed through D93.1 (submitted in M8), were they were validated through a systematic screening of different UN, EU, and RCRC CM policy documents**.** During and after the second meeting of the DRIVER+ Ethical and Societal Advisory Board in October 2015, the criteria (as well as the complete SIA methodology) were refined and revised into the current set.

6.2.2 Plan for implementing the SIA methodology into the TGM

The above-mentioned criteria are currently used to assess 16 CM functions (resulting in D840.21). While these functions relate to different features of a wide array of CM solutions (one specific solution can for example have data collection as one of its functions), the idea for further development is that the object of assessment can be made specific to the Trials.

For example, the integration of the framework into the TGM could imply that the solutions that take part in a certain Trial are first defined according to their functions (based e.g. on the updated taxonomy of functions), and that these identified functions are assessed against the criteria using the SIA framework. In its final version, the TGM (and the Test-bed) would then have an integrated method for taking societal impacts into account. As part of the preparation phase of a Trial, a structured method for doing SIA will be built into the TGM that future Trial initiators can use. The specific integration of this into the TGM will be explored over the next months and years, but the final result will allow the relevant user to carry out societal impact assessments of the solutions he or she is considering for a Trial. Instructive guidelines will be available, as well as a set of example assessments for inspiration. The integration of the SIA methodology in the TGM will place the societal impact assessments in the preparation phase of a Trial. Then, for each time the TGM is applied to a Trial, the SIA methodology will also be used to assess the solutions for each specific Trial and the results of this is foreseen stored in the PoS. This means that knowledge on societal impact tied to each solution in the PoS will build up over time, providing future Trial owners with a Knowledge Base when selecting solutions for a Trial.

[35] One could for example ask: How are the criteria relevant to different European Societies? How do they relate to different concepts of societal security? How do the criteria function in different societal, historical and cultural contexts?

Concretely, when considering a solution for a Trial, the various functions that the relevant solutions perform can be assessed by applying the criteria. This can include a scenario-thinking exercise (describing likely future scenarios of societal impact), research on concrete examples of impacts that happened in the past, background literature (e.g. on underlying logics and assumptions), or the assessment can draw on personal experience from the field. The assessment should be concise and critical, and at the same time draw attention to the effects that the planned CM function may have on society, but also be followed by recommendations for concretely how to avoid (unintended) negative impact and foster positive impact. It should also present a comprehensive view of the key issues that are relevant for describing the societal impacts of a function.

The aim of this assessment is not only to avoid negative impacts, but indeed to create an added value. Using the criteria, making a societal impact assessment would typically include the following steps:

1. A short description of the CM function/ assessment object, what it refers to, mainly with regard to its relevance and use within DRIVER+, but also to CM in general. This introduction also includes an illustration, which is practically an entryway into the assessment. It could be a situation or a development that describes how the implementation of a CM function has already impacted or could impact society. It should be simple and illustrative, showing that the assessment has relevance and the function has concrete effects. Already here, critical thinking about the respective function could be incited.
2. The actual assessment is the core of the procedure, which is basically a systematic analytic exercise structured by the different criteria. It assesses the function vis-à-vis each given criterion, following the questions described above:
    a. What is the impact of *function y* on *criterion x*? (E.g. what is the impact of the function “data collection” on the criterion “suspicion-trust”?).
    b. How is that impact positive/negative?
    c. Is there access to examples from personal experience or academic and policy literature to back such an assessment up?
    d. What are concrete recommendations for solution providers and implementers to avoid negative and to foster positive societal impacts?
3. Each assessment ends with a concrete recommendation in order to provide the user with actionable advice. It includes concrete tips and guidance on how to choose solutions in a way that negative impacts are avoided, and opportunities seized. A set of example assessments will be delivered to go with the final version of the framework so that premade assessments can be used for reference, inspiration or guidance for Trial owners in how to conduct an assessment themselves.

7. Functional requirements of the Guidance Tool

In the previous sections, the design of the Trial Guidance Methodology (section 1) as well as the steps that Trial owners must follow to carry out a Trial following the TGM (section 5) were described. Furthermore, section 6 described the ethical aspects of the TGM. In the following section, the technical and functional requirements needed for implementing the TGM through the so-called Guidance Tool will be explained. This section naturally builds on all the previous sections, and describes how the content of these will come to life.

The overall process of designing and conducting a Trial, and carrying out the specific procedures during the main Trial phases (as described in section 5), will be guided and performed by a Trial committee. The efforts of Trial committees and other participants in the process shall be supported by a software tool, the Guidance Tool (GT).

In order to visualise the Guidance Tool, a Unified Modelling Language (UML) was used. UML is a common tool in software engineering with the aim to provide a standardized way to depict the ideas for the design of software in an UML diagram. The UML translates and structures the initially identified requirements in an appropriate overall design. The UML of the GT supported the alignment between the TGM designers and the GT developers. While the whole UML is presented and described in annex 6, the following sections briefly list the desired GT requirements including potential mock-ups of the later artefact.

The functional requirements for implementing the TGM via the GT will be explained throughout this section following the three main TGM phases. The main focus will be on the preparation phase, for the reasons outlined in section 5. Additionally, it is foreseen that the GT will ultimately be used mainly in the preparation phase to assist Trial Owners with the Trial design, and to help them in implementing the TGM. However, during the execution and the evaluation phase, other Test-bed tools will be used (e.g. the Observer Support Tool).

As for the overall TGM, functional requirements will be revised based on structural feedback from SP94 (Trials). This first version of the requirements introduces a description and uses called mock-up screens: these mock-up screens are intended solely to illustrate the described functionality[36] and do not pre-empt the look-and-feel of the later developed GT. In describing the functional requirements of the GT, the steps are presented in a different order to the one presented in section 5. The main reason is that some steps can be more explicitly and easily addressed. Research questions, for instance, can be better defined when the solution is selected.

This approach is inspired by the web-form used in the Netherlands that people use to apply for a tax-return.[37] This application enables users to go through the process relatively easy, although the full process can also be complex.

7.1 General requirements

For the development of the GT, an incremental approach has been followed (Agile development). The functional requirements are therefore based on a more or less theoretical view of conducting Trials explained in sections 1 and 5.

Since the GT will mature over the course of the Trials to be conducted in Driver+, the GT must be a configurable tool. Changes to the tool will be proposed by the experts in the Trial guidance methodology. Examples of these configuration changes can be e.g. amendments in the workflow, modification in support texts and examples.

In the following pages, a web-based GT for Trial owners to design a Trial is described. The tool itself will be developed in the Driver+ project SP93 (WP 933). The ultimate goal, however, is the use of the GT by future Trial owners, e.g. high-level crisis managers in need of a new solution.

[36] This approach is inspired by the web-form used in the Netherlands that people use to apply for a tax-return for instance https://cdn.lynxbroker.com/wp-content/uploads/2017/03/belastingaangifte-1.png

Structured along the three phases of a Trial, in addition to general Trial management, the following sub-sections describe the specifications arising from the TGM structured along three main blocks of functional requirements:

- Trial preparation.
- Trial execution.
- Trial evaluation.

Furthermore, a vison on a possible realisation in the form of a software tool is given by using the technique of mock-up screens. Following the explanation of each main block (further segmentation may be executed on certain blocks), the related requirements for the GT are presented in a table. These requirements are used as criteria in the acceptance test for the current version of the GT.

In Table 7.1, the requirements for the GT are listed that are of a general nature and thus cannot be linked to a certain phase of the process. These requirements drawn on some general key elements of the TGM explained in previous sections e.g. experiences and examples of the DRIVER+ Knowledge Base that should be made available to Trial owners.

Table 7.1: General Requirements

no.	Requirement
1	The GT is used by Trial Committees in general and is not restricted to the Driver+ project
2	The GT is web-based.
3	The GT mainly support the preparation phase of the Trials.
4	The GT provides help functionality (explanations, checklists, references). *The starting point is the list of tips & tricks described in section 5 under the headings 'Actions and Required participation'.*
5	The GT contains a repository of examples. *The starting point for the repository is each example given in section 5. Insights from the Driver+ Trials will provide additional examples.*
6	The GT validates the Trial definition. *The validation comprises simple checks at first (i.e. all fields filled in; each gap/objective addressed). Experiences in using the Trial will provide additional checks.*
7	The GT supports different types of users.

7.2 Requirements: Trial management

Having described the general requirements, which are not clearly linked to a specific phase of the process of setting up a Trial, this section will describe requirements linked specifically to Trial management.

The tool opens with the landing page: a screen where the user (e.g. a Trial owner) logs in and authenticates (cf. Figure 7.1). The landing page also offers information on the Driver+ project and contact information for the GT site administrator. Login rights with/without permission to add content should be granted by the GT site administrator.

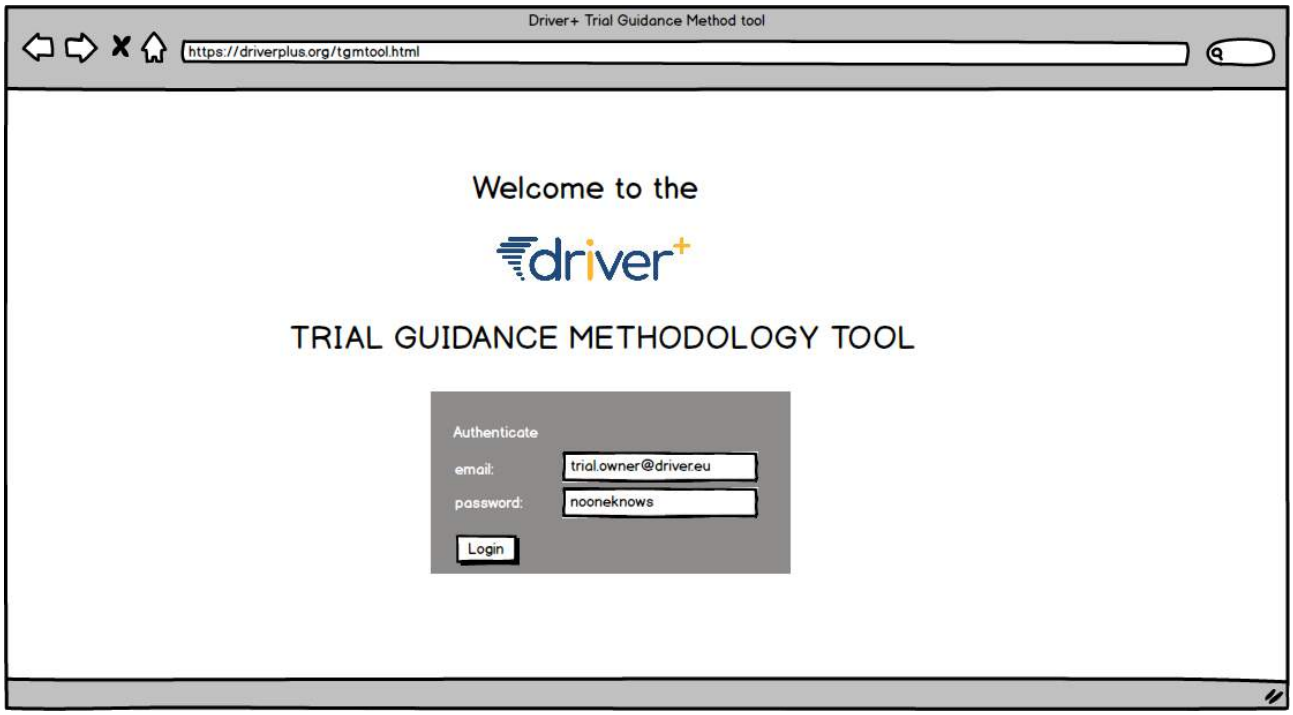

Figure 7.1: Visualisation Guidance Tool specification – authentication.

After a successful login, a table is displayed showing Trials to which the user has viewing and/or editing rights (cf. Figure 7.2). All Trials can be exported (some xml/json format). In case the user is the Trial owner, (s)he is allowed to amend the description of Trial. The user can open viewable Trials in read-only mode. The user can open an editable Trial in edit mode. If allowed, the user can be allowed to create a new Trial.

The logout button will log out the user and return to the authentication page.

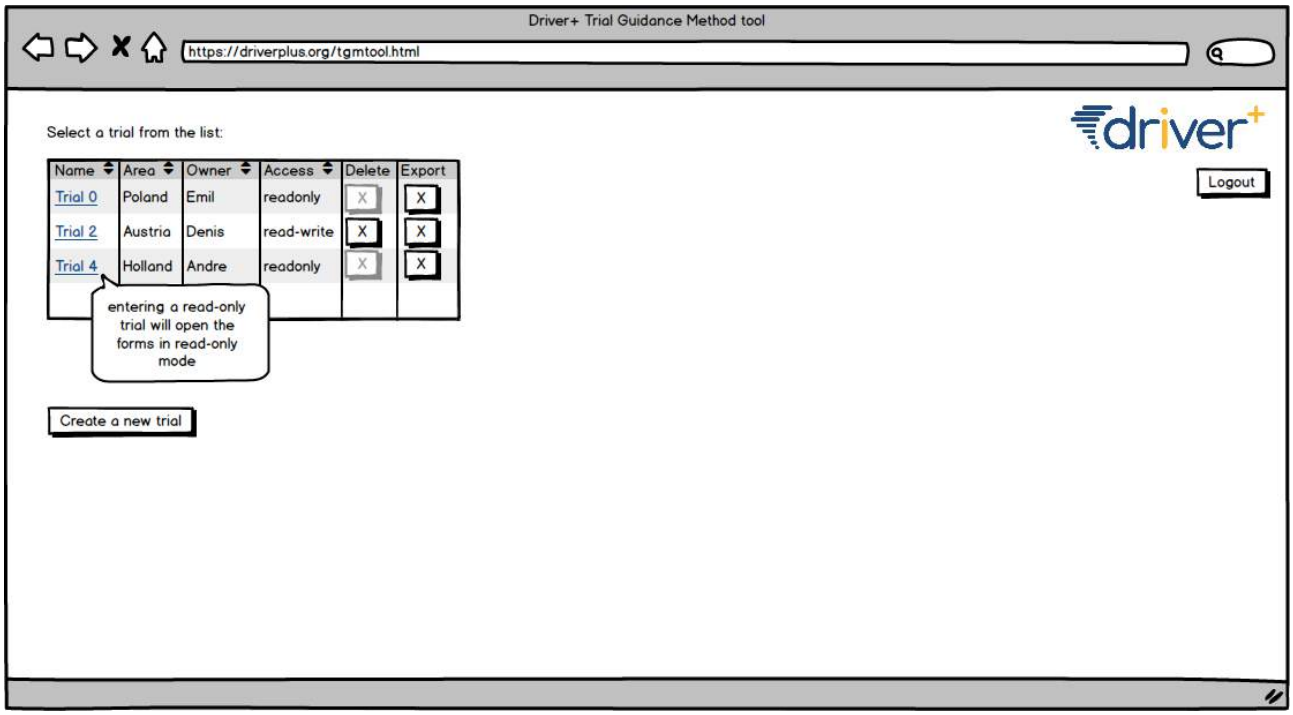

Figure 7.2: Visualisation Guidance Tool specification – Trial management.

The requirements listed in Table 7.2have been defined for Trial management:

Table 7.2: Requirements: Trial Management

no.	Requirement
8	Access to the GT for authorized users only.
9	Authorized users can add or modify Trials in the GT.
10	Trials can be exported (xml/json format).

7.3 Requirements: Trial preparation

Having described the general requirements as well as requirements specific to Trial management, this section will describe requirements linked specifically to the Trial preparation phase.

Figure 7.2 shows a mock-up of one of the screens in the GT with a “tree structure” comprising all of the topics that could be part of the GT. The topic comprises sub-topics and possibly sub-sub-topics. The list of topics, and their logical order, is fixed and based on the steps of the TGM. Depending on the choices made by the user, additional sub-topics may appear in the list. Topics that may not be relevant to every Trial may be de-activated by a check box, meaning that no questions will be presented for the topic. The user can go back and forth through the topics (no one-way traffic) and make changes. The user can save and close the application and re-enter at a later time.

Every topic ends with a validation of the fields entered (e.g. a. 'Next' or ‘Save’ button). This button triggers a control mechanism that gives the user feedback on the fields that have been filled. If the test fails, the user is asked to make adjustments. If the test succeeds, the topic is marked 'completed'. If the test fails, the users can postpone the adjustment to another time: the Guidance Tool marks the item as not finished. The complete guidance process is only accepted when all topics are approved.

In case the user starts a new Trial, a window is opened displaying information on the DRIVER+ methodology (cf. Figure 7.3) A link to the full methodology document is presented alongside a figure depicting the six-step approach (as described in section 1).

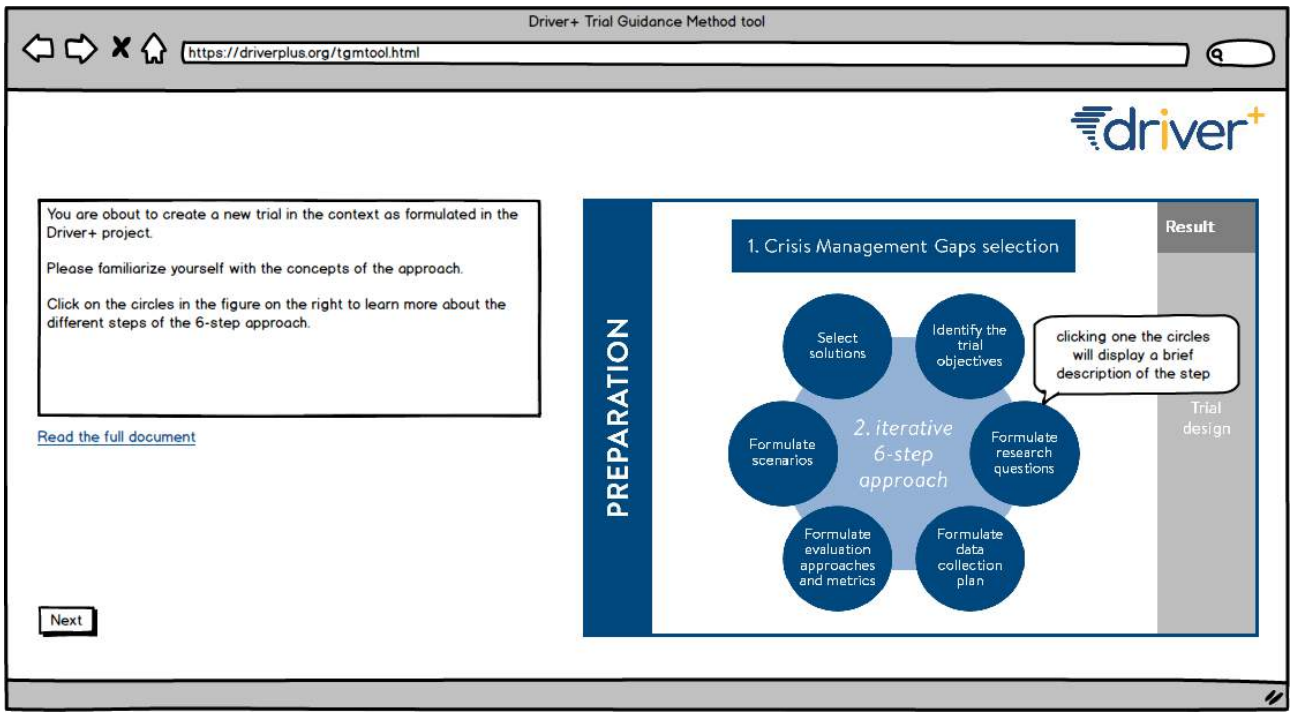

Figure 7.3: Visualisation Guidance Tool specification – concepts of methodology.

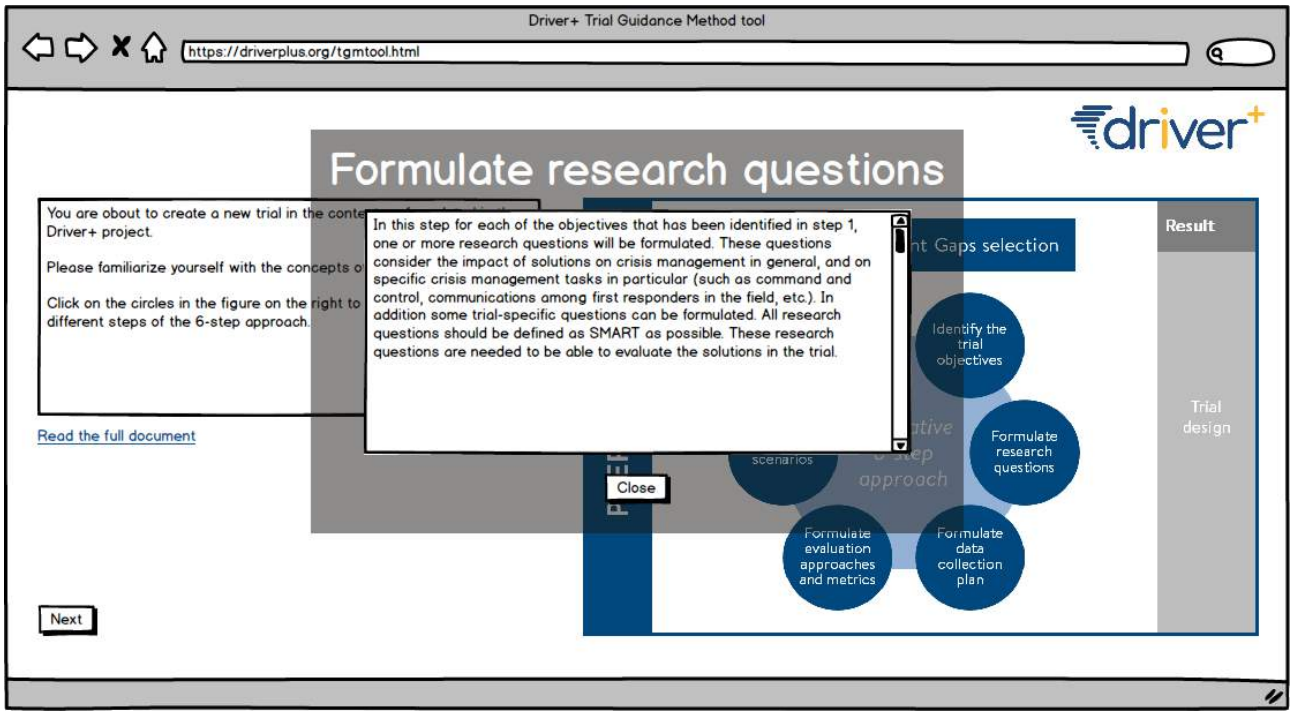

Figure 7.4: Visualisation Guidance Tool specification – pop-up with brief description of one step.

Clicking on one of the circles will display a brief description of the selected step (cf. Figure 7.4). This window provides an introduction to the structure of the GT. Note that the six-step approach can be used iteratively, which means that users can return to a previous step and revise it, if needed. However, in some steps, references need to be made to content specified in an earlier step.

The first step is to enter information on the Trial design (cf. Figure 7.5). This comprises general information on the Trial (like a Trial name, the date and its location) and the Trial context – a brief description of the Trial. This information is entered by the Trial owner.

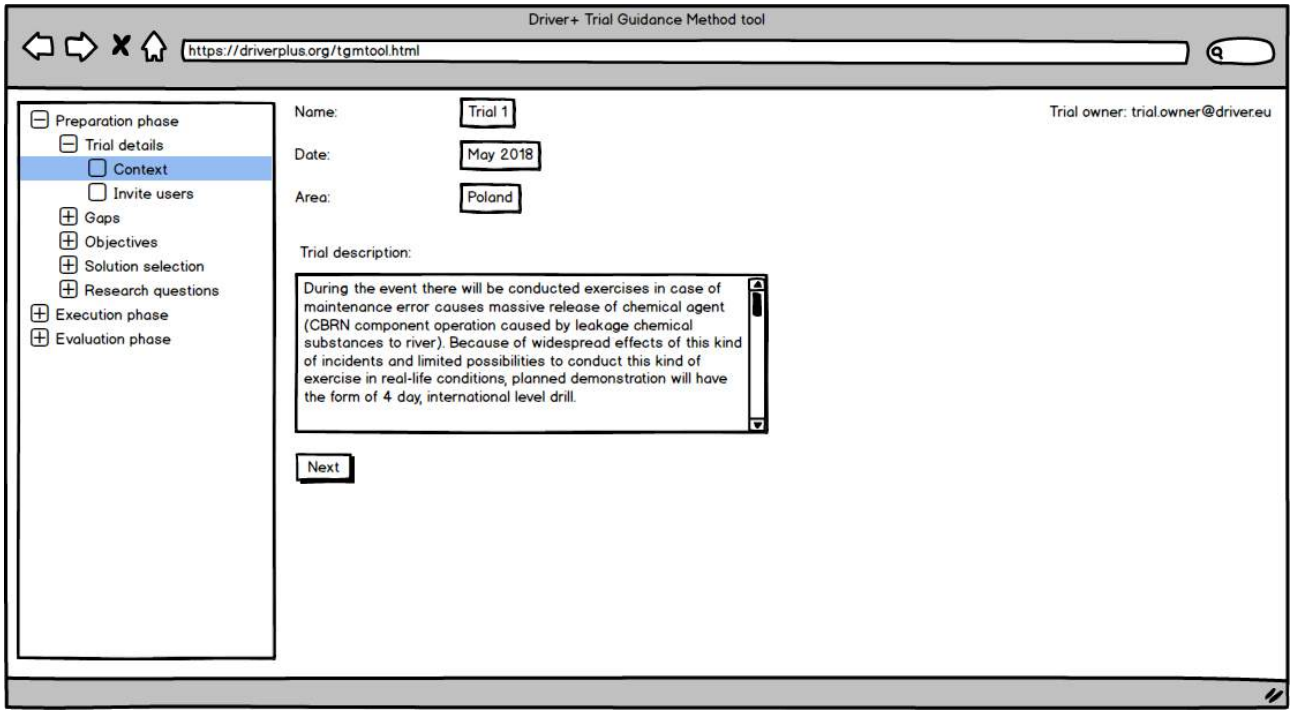

Figure 7.5: Visualisation Guidance Tool specification – Trial context.

The Trial owner can also invite other users (e.g. the members of the Trial committee) and grant her/him rights to view and/or edit the content (cf. Figure 7.6).

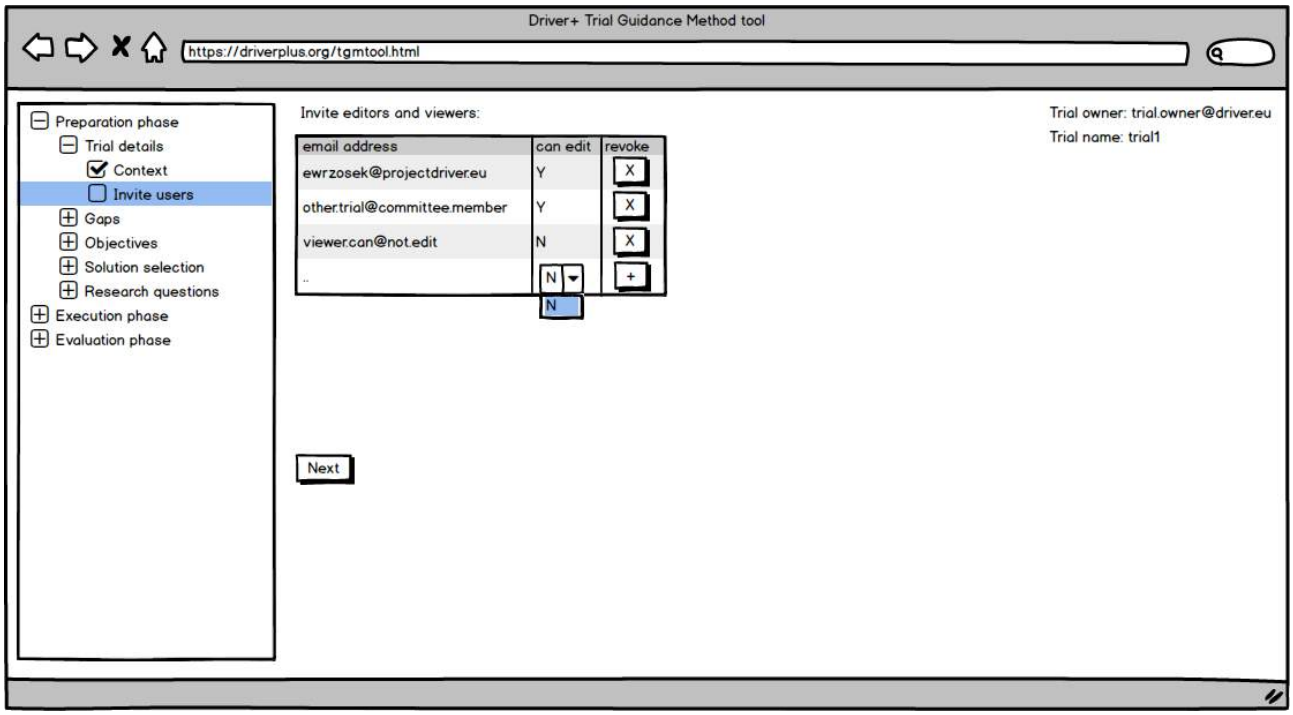

Figure 7.6: Visualisation Guidance Tool specification – authorisation.

Table 7.3 specifies the different users of the GT. The current version of the GT does not yet support the different roles in a Trial (as described in the TGM). The current first users are therefore requested to edit only those sections which they are supposed to edit.

Table 7.3: Guidance Tool users

user	Is allowed to do this:
The Trial owner	• Can create a new Trial. • Can edit his/her own Trials. • Can invite others by email to become member of a group. • Can authorise Trial member (read/write). • Can remove a member from group.
Trial member	Can view/modify a Trial depending on the authorization granted by the Trial owner.
Tool configurator	Can change the structure of the Guidance Tool. This means, doing CRUD (create, read, update and delete) actions on the steps in the workflows, the texts, and other content.

The user can then select one or more gaps from the list of validated DRIVER+ gaps (D922.11) to the Trial (cf. Figure 7.7 and Figure 7.8).

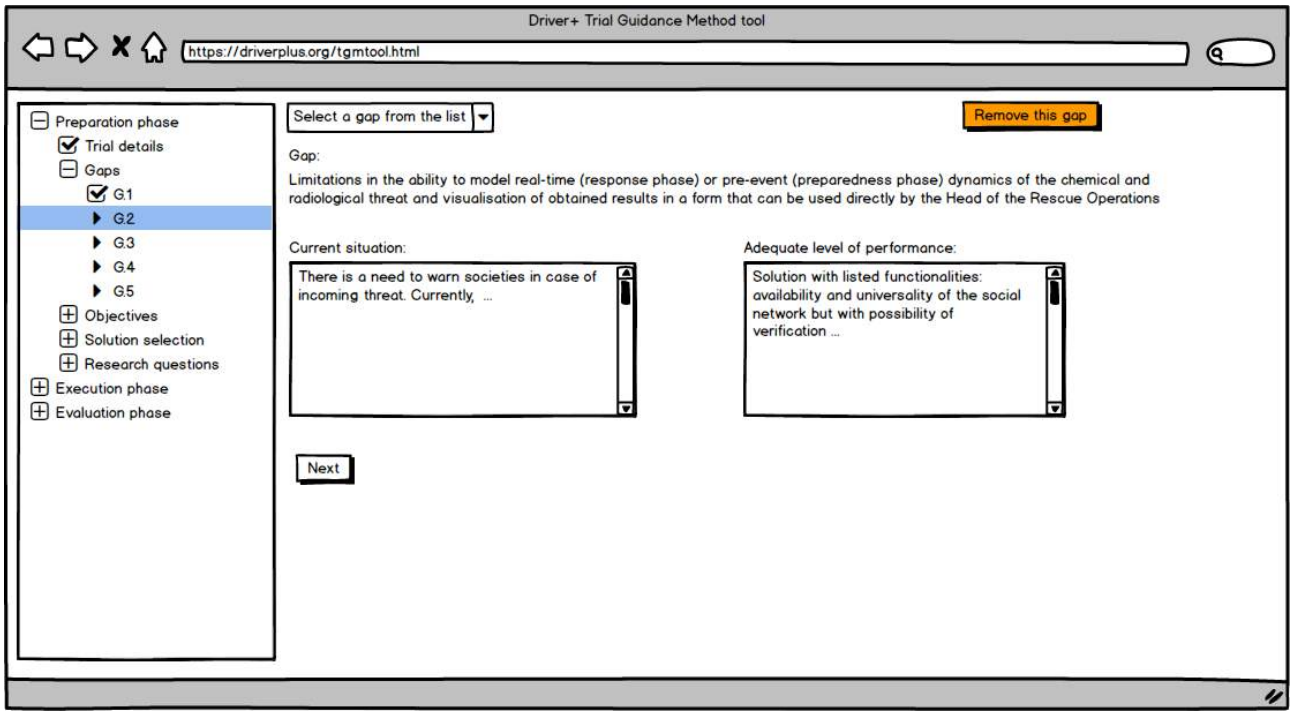

Figure 7.7: Visualisation Guidance Tool specification – selection of gaps.

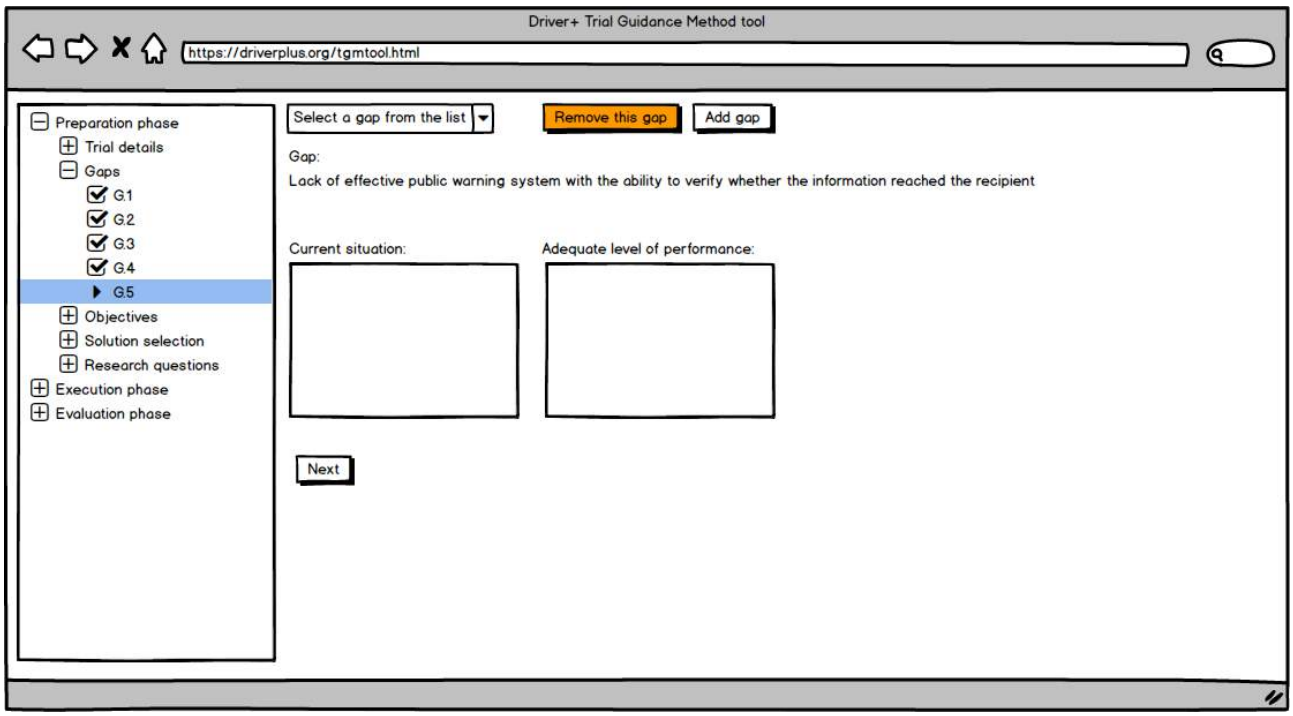

Figure 7.8: Visualisation Guidance Tool specification – selection of gaps.

The requirements listed in Table 7.4 have been defined for Trial preparation:

Table 7.4: TGM requirements - Trial preparation

No.	Requirement
11	The GT supports the iterative six-step approach.
12	The output of the GT may be directly imported into section 2 of the Trial Action Plan (TAP).
13	The GT extracts information from the Portfolio of Solutions (PoS).
14	The validated DRIVER+ CM gaps are input to the GT.
15	For each Trial, at least one gap must be selected.

No.	Requirement
16	Allow different users interaction with the Trial. *Users who are involved in preparation, execution or evaluation of the Trial, such as scientists or a scenario writer*

7.3.1 Requirements: Defining Trial objectives

As part of the Trial preparation, it is crucial to define the objective for the Trial. The Guidance Tool displays the gaps identified and prompts the user to formulate one or more Trial objectives corresponding to each gap (cf. Figure 7.9). Trial objectives comprise the three dimensions explained in section 2. Each objective is categorized either as a 'crisis management objective', a 'solution objective' or a 'Trial objective'.

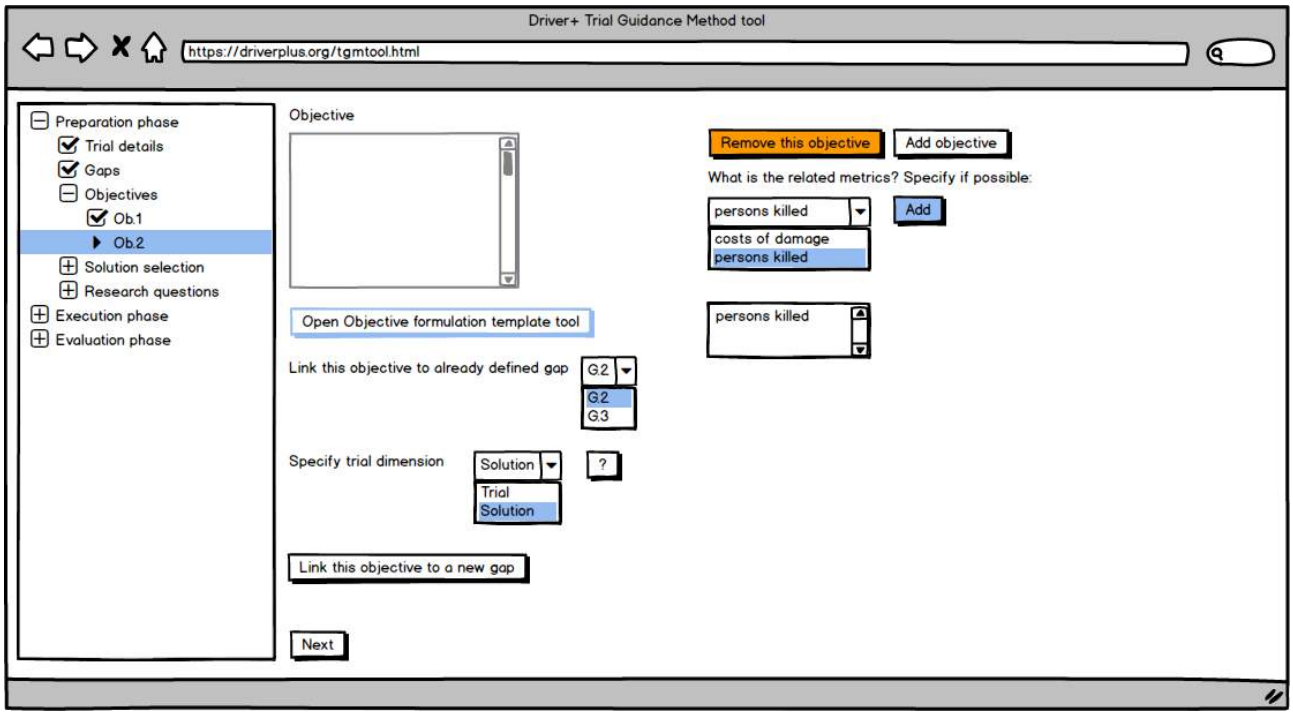

Figure 7.9: Visualisation Guidance Tool specification – formulation of objective(s).

The GT provides a definition as well as templates and examples of Trials objective(s). Such a template involves a generic formulation of typical objectives. The user is prompted to relate metrics to the objectives from a (not limited) list.

The requirements shown in Table 7.5 have been defined for Trial preparation with regards to Trial objectives.

Table 7.5: TGM requirements - Trial preparation (objectives)

No.	Requirement
17	Trial objectives are linked to at least one CM gap and each CM gap is related to a CM function objective.
18	The GT provides a template to facilitate the formulation of the Trial objectives in a manner that is SMART (specific, measurable, assignable and realistic).
19	Each objective is categorized as either 'crisis management objective', 'solution objective' or 'Trial objective'.
20	The GT provides a list of identified Trial objectives in the Trial. *Users can add/remove/modify Trial objectives in the list.*
21	Examples of Trial objectives used in other Trials are provided, supported by a search filter. *Users can copy such examples into his/her Trial definition and modify the Trial objective.*

No.	Requirement
22	Include metrics with Trial objectives. *User can select from a list, or enter additional metric.*

7.3.2 Requirements: Selecting solution(s)

The next stage in Trial preparation is to select one or more solutions to be tested during the Trial. There are three options for selecting a solution:

- Proposed solution based on a mapping from gaps and objectives in the PoS (cf. Figure 7.10).
- Selection from the PoS, using a filter based on the crisis management taxonomy of CM functions (cf. Figure 7.11).
- Call for solutions (cf. Figure 7.12).

While the call for solutions is to be used within the project itself, the first two options point towards the use of the tool after the end of project. The first option implies that a solution is proposed from the PoS based on the defined objectives for the Trial as well as an existing gap analysis.

If the second option is preferred, Guidance Tool suggests suitable solutions from the PoS, filtering out relevant solutions based on a comprehensive taxonomy of CM functions. Figure 7.10 below illustrates the first option. Here, the user may choose to select none, one or more from the presented list.

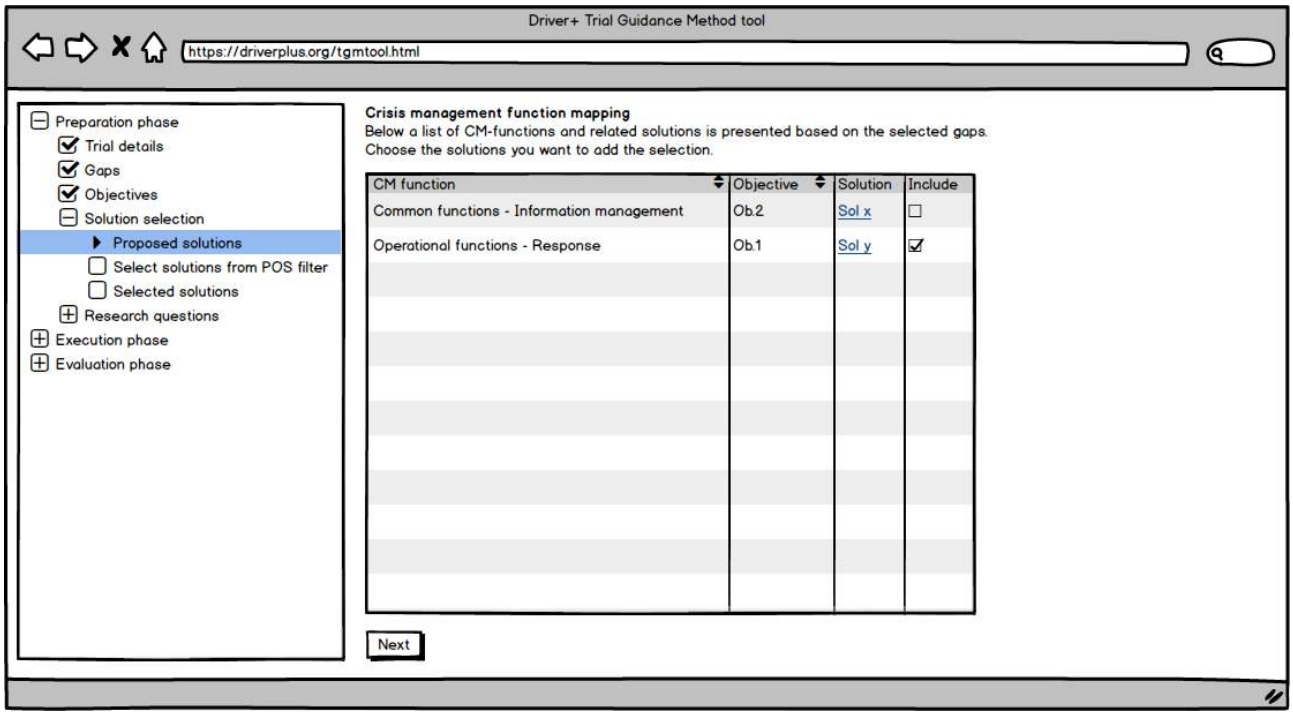

Figure 7.10: Visualisation Guidance Tool specification – selection of solutions based on gaps.

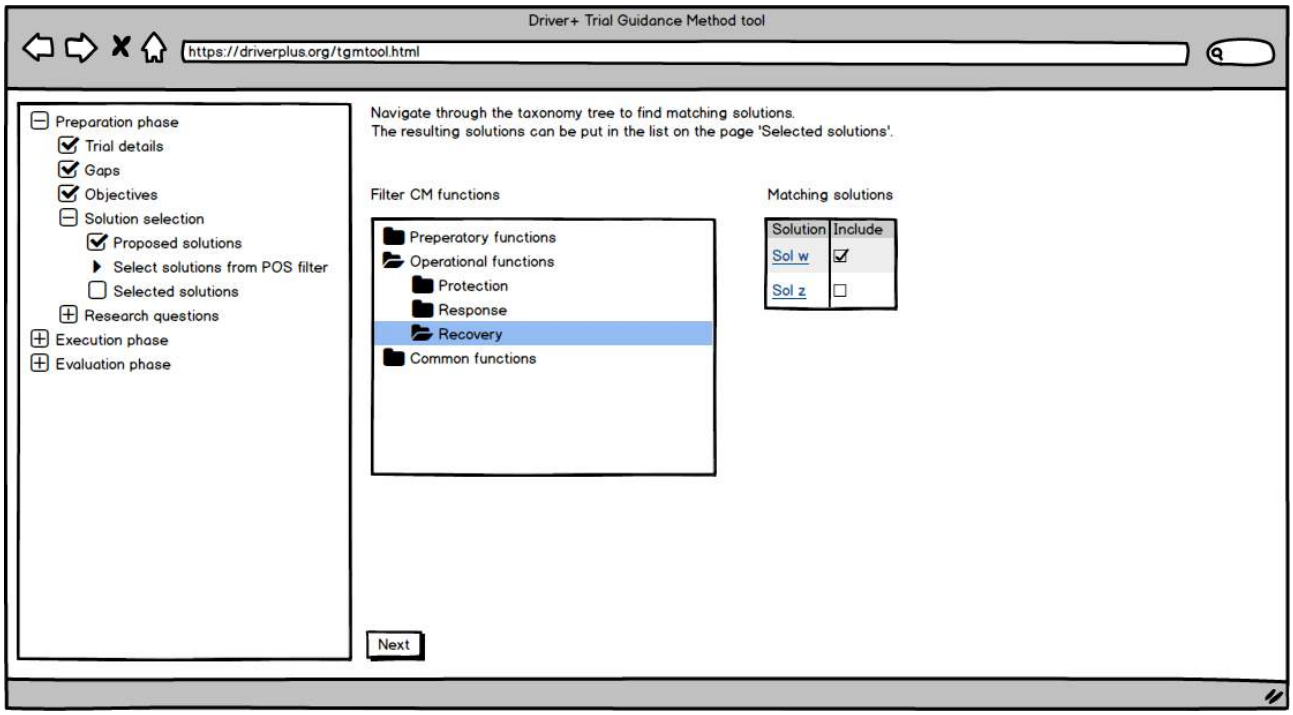

Figure 7.11: Visualisation Guidance Tool specification – selection of solutions based from PoS.

In case none of these two options are successful or relevant, the third option may be chosen. This means that the user can chose to issue a call for solutions. The user can open the 'call for solution form', which is available in the GT. In this form, the user can enter the necessary information to issue the call. The call for solutions is the same procedure used for the DRIVER+ Trials, where solutions are selected based on the agreed on procedure with reviewers. The Guidance Tool does not facilitate the process, but offers examples of which steps to take in the procedure, based on the DRIVER+ approach (e.g. scenario descriptions, timeline, reviewer network, selection criteria, etc.).

To carry out a call for solutions includes several aspects:

1. Call for solutions option.
   - Screen with info on 'call for applications' (ID, URL, date).
   - Add with option 'Load scenario' (from scenario) with edit functionality.
   - Export (to Word document).
2. Call for solutions schedule.
3. Review committee.
4. Review process.
5. Consolidation of review results.
6. Assessment and preselection of solutions.
7. Ethical concerns.

A visualization of the call for solutions form is presented in Figure 7.12.

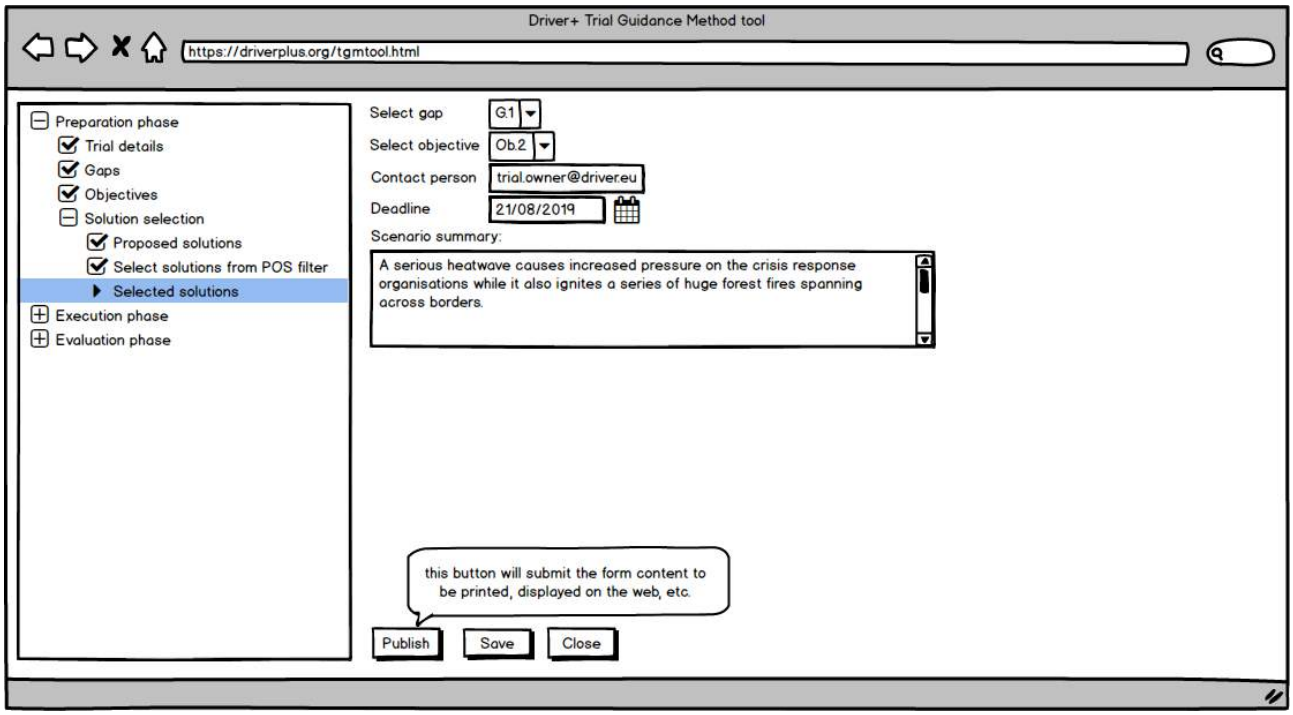

Figure 7.12: Visualisation Guidance Tool specification – call for solution form.

Regardless which of these three options the user decides to use in order to identify relevant solutions for a Trial, the result of the process is a list of proposed solutions from which to select the solutions to include in the Trial (Figure 7.13). The user can also look up Trials that have been performed before that addressed the same gaps and/or objectives. The user can consider the “do's” and “don'ts” for this experience, but also take into account the results from these Trials.

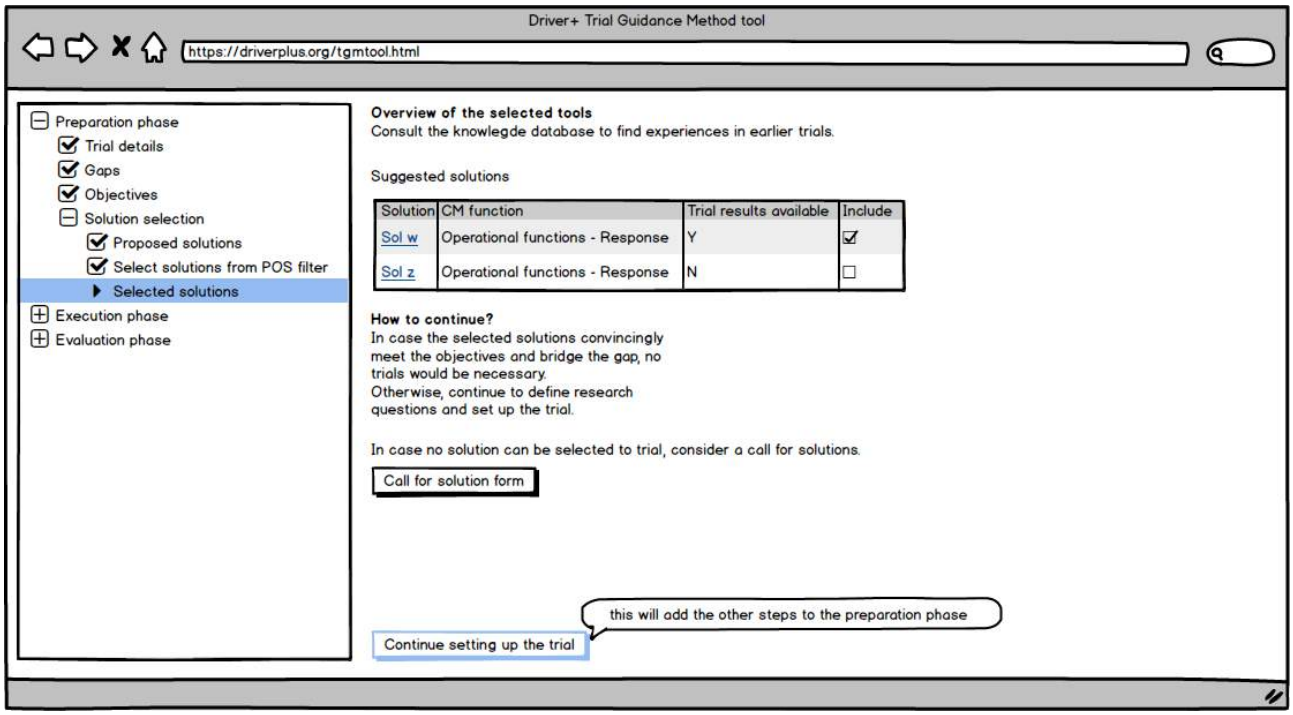

Figure 7.13: Visualisation Guidance Tool specification – selection of solutions from Knowledge Base.

The following requirements have been defined for Trial preparation with regards to selecting solutions for a Trial:

Table 7.6: TGM requirements - Trial preparation (select solutions)

No.	requirement
23	Solutions are related to one or more CM functions.
24	The GT supports the DRIVER+ CM function taxonomy.
25	The GT supports searching the PoS for possible solutions for the objectives formulated, using filter options. *The users can refine/broaden the search by changing the filter options or keywords.*
26	Selected solutions are presented in the GT for review, including all information relevant. *For example (if available) the description of the solution, previous Trial results, experiences from end-users, TRL level.*
27	Solutions can be included to / excluded from the Trial by the user.

7.3.3 Requirements: Formulating research question(s)

)Having defined the objectives for the Trial, and selected the relevant solutions, good research questions need to be defined. The Guidance Tool displays the Trial objectives entered and prompts the user to formulate one or more research questions for the Trial (cf. Figure 7.14). A research question is the specification of the objectives.

For each objective there is one research question[38] and vice versa.

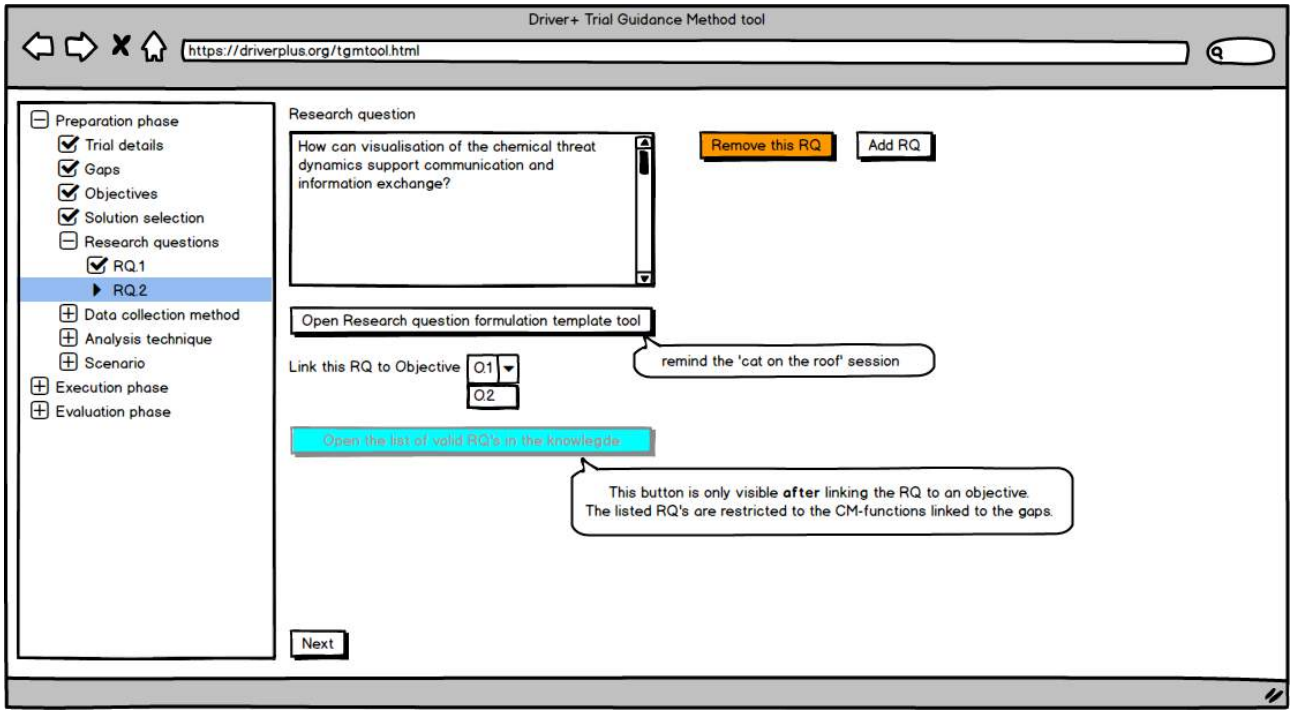

Figure 7.14: Visualisation Guidance Tool specification – Formulate research question(s).

For each research question, the user enters metrics which represent success (or failure) in the Trial regarding the specified question.

[38] It should be noted that, while in this mock-up, research questions are formulated as "free text", discussions are on-going between the methodological team and the GT developers whether this would be the better the option. For instance, another valid option to consider would be to present RQs using a "user-story" structure so that, instead of having a free-text box, must fill in: "who", "what" and "why" field to facilitate the formulation of research questions.

The following requirements have been defined for Trial preparation with regards to defining research questions.

Table 7.7: Requirements - Trial preparation (research questions)

No.	Requirement
28	A research question relates to a Trial objective.
29	The GT provides a template for the research question dealing with crisis management task, process, content, crisis management roles and the solution required
30	Examples of research methods are provided from the DRIVER+ Knowledge Based, including lessons learned.

7.3.4 Requirements: Evaluation approach and metrics

Depending on the specification of the research questions, indicators and metrics to evaluate the results should be defined. Concretely, so-called SMART[39] indicators (metrics) pertaining to the research questions should be identified (Figure 7.15). Per research question, one or more indicators/metrics are needed. The metrics comprise three dimensions in the Trial (the Trial itself, the crisis management and the solution in the Trial).

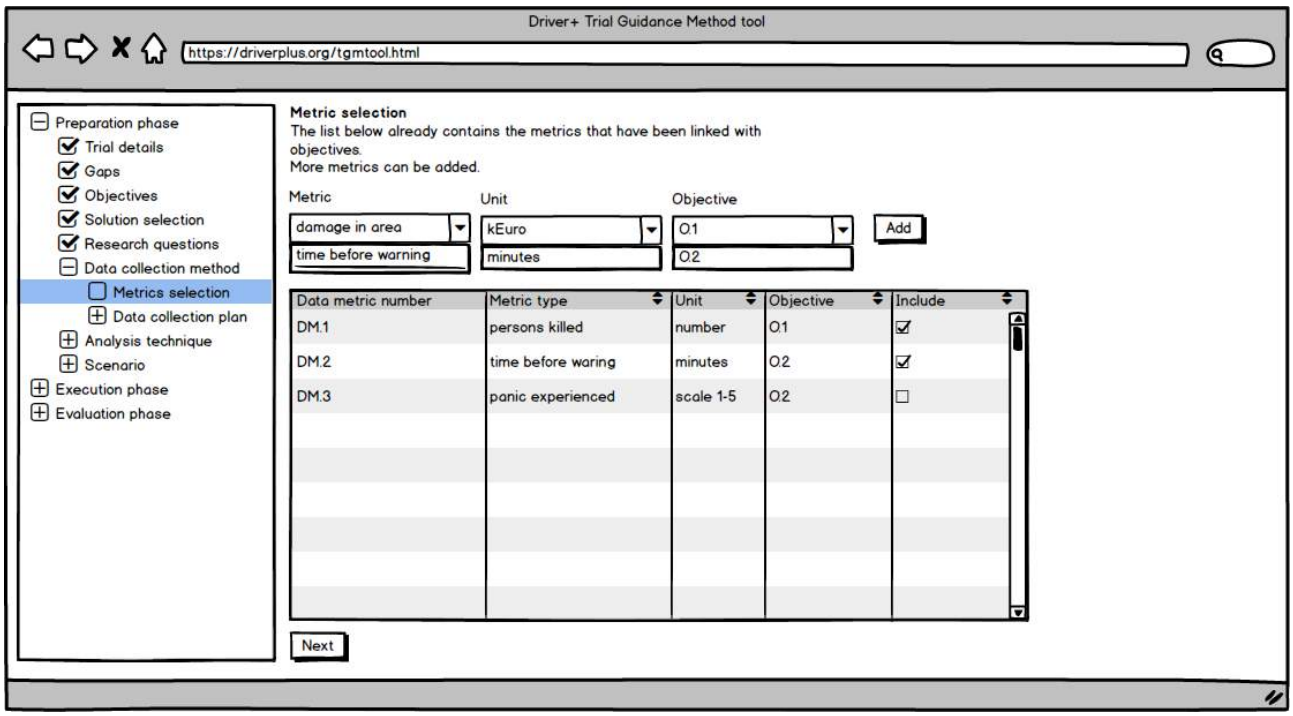

Figure 7.15: Visualisation Guidance Tool specification – select metrics.

[39] SMART: Specific, Measurable, Assignable, Realistic, Time-related

The following requirements have been defined for Trial preparation with regards to evaluation approaches and metrics:

Table 7.8: TGM requirements (evaluation approaches and metrics)

No.	Requirement
31	Examples of data analysis techniques and metrics from previous Trials are derived from the DRIVER+ Knowledge Base.
32	Examples of evaluation approaches applied in previous Trials.
33	Provide explanation on evaluation approaches, distinguishing between literature and practice (past Trials).
34	Examples for data techniques to measure/observe metrics in a Trial.

7.3.5 Requirements: Data collection plan

The data collection plan is an important part of preparing for a Trial, and it relates e.g. both to the defined research questions and the objectives of the Trial. At this point in the process, the GT offers a list of possible methods for evaluating the Trial. Each method is described and supported with references, tricks & tips and examples. Examples of methods[40] are:

- Observations.
- Questionnaire.
- Simulator data.
- Interviews.
- Group discussions.

The tool GT provides the template for the information on the evaluation methods to be used; the content is an input derived from the Trial Guidance Methodology (cf. Figure 7.16, Figure 7.17).

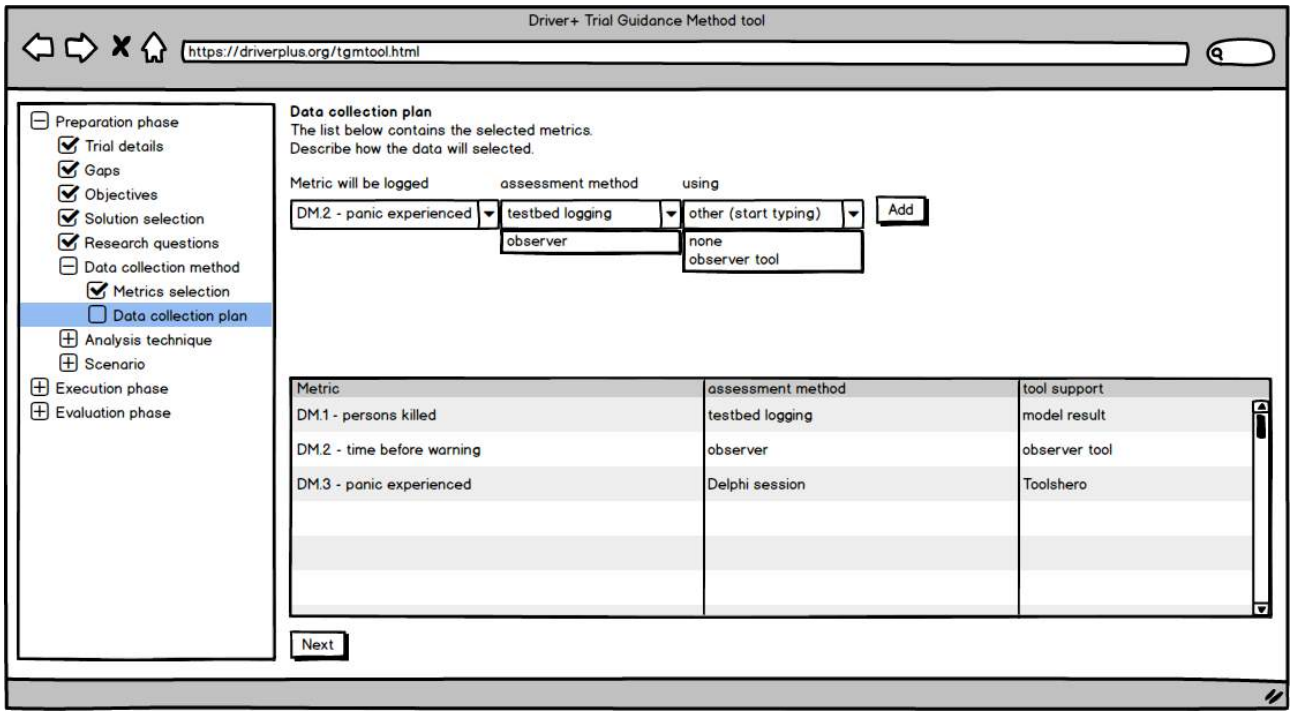

Figure 7.16: Visualisation Guidance Tool specification – data collection plan.

[40] The list with methods is not final, additional methods may be entered. Either the user of the GT enters (in free text) the method, or the GT application manager amends the method to the application file.

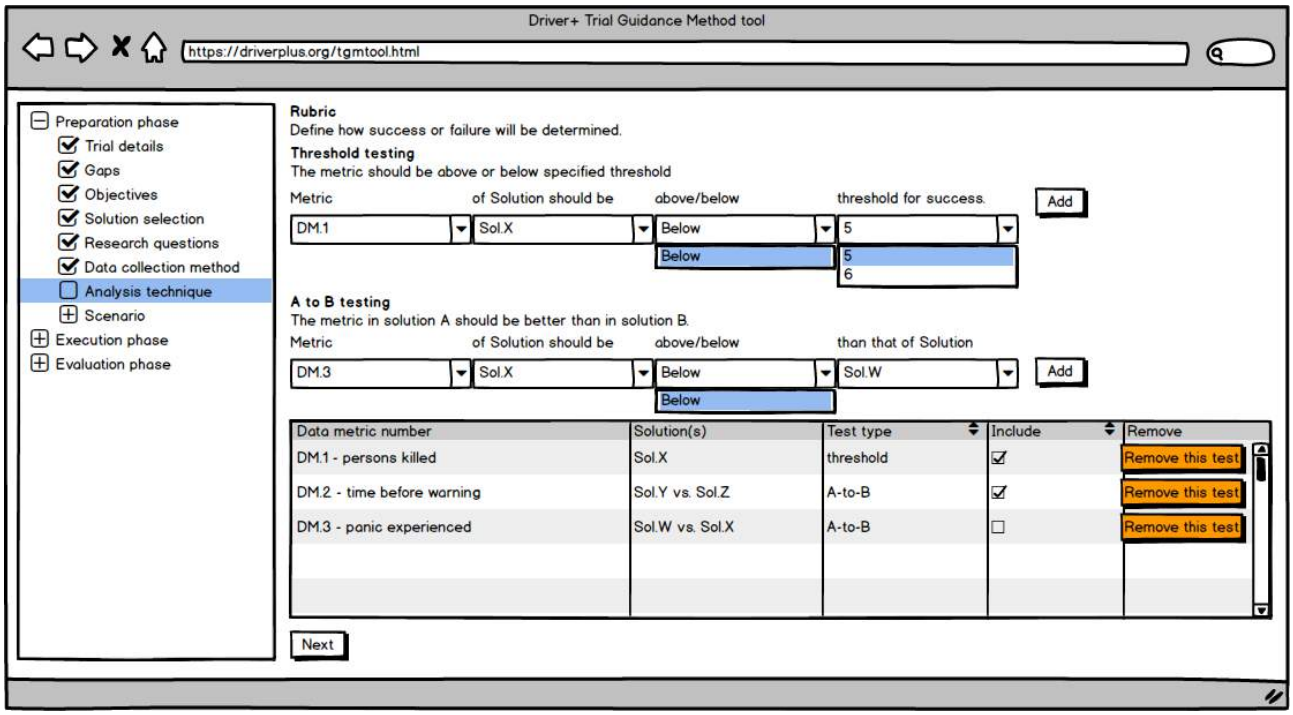

Figure 7.17: Visualisation Guidance Tool specification – analysis.

The requirements shown in Table 7.9 have been defined for Trial preparation with regards to the data collection plan:

Table 7.9: TGM requirements - Trial preparation (data collection plan)

no.	Requirement
35	The GT offers a list of possible methods for data collection.
36	Every metric is linked to at least one assessment method.
37	Examples of research methods with associated data collection plans are provided from the DRIVER+ Knowledge Base.
38	Provide a description of different data collection and analysis techniques.
39	Provide a checklist (for the data collection plan).
40	Relate metrics to the online observer tool which is a component of the reference implementation of the Test-bed. *The tool supports an export function with measurements/observations for the online observer tool.*

7.3.6 Requirements: Scenarios

In order to set up the Trial, the user needs to choose a scenario which will form the basis for the Trial, and which allows the user to get the best results with regards to the defined research questions, objectives, etc. In order to do this in the GT, the user can enter the scenario by typing the text or by uploading a text file (and edit this text if needed) as shown in Figure 7.18.

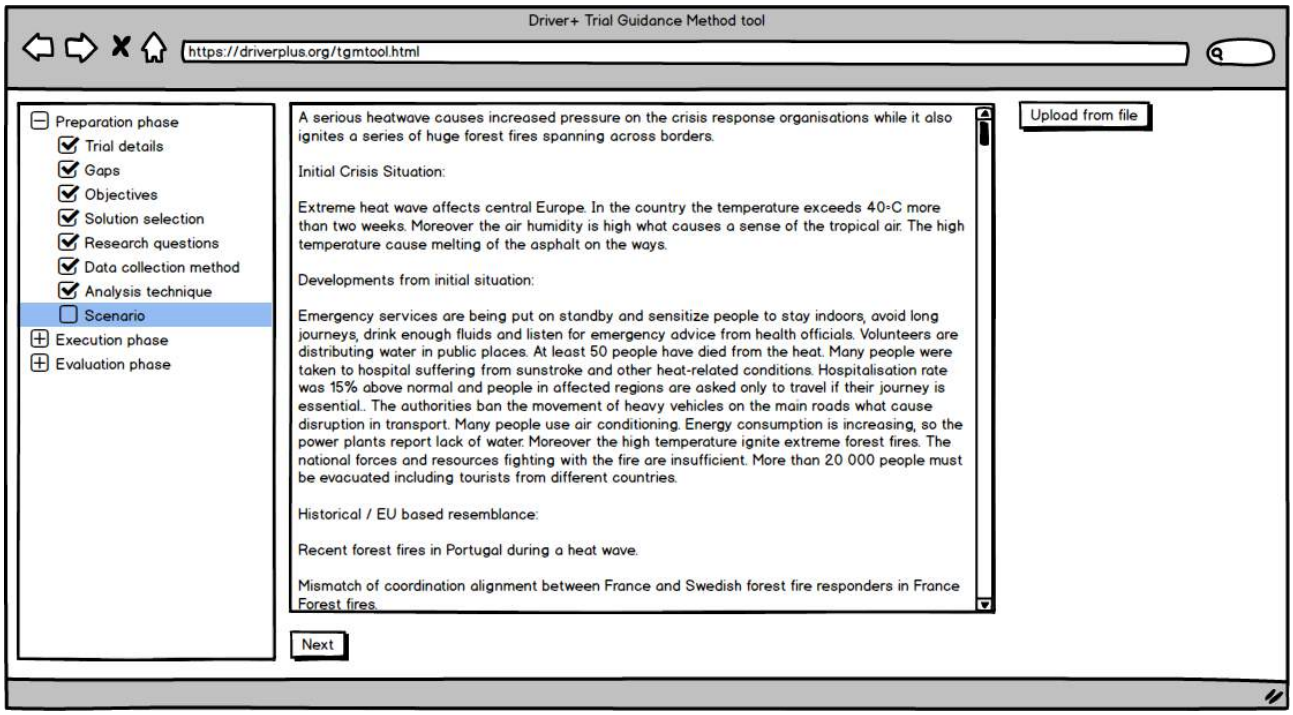

Figure 7.18: Visualisation Guidance Tool specification – scenario input form.

Again the requirements have been defined for Trial preparation with regards to defining the relevant Trial scenario and listed in Table 7.10:

Table 7.10: TGM requirement - Trial preparation (scenario)

No.	Requirement
41	Scenario text can be entered by uploading a text file.
42	Scenario text can be edited.

More information with regard to the Trial execution and evaluation is provided in Annex 6.

For completeness the requirements are cumulated in one list hereafter in Table 7.11.

Table 7.11: Full list of requirements

No.	Requirement
1	The GT is used by Trial Committees in general and is not restricted to the Driver+ project.
2	The GT is web-based.
3	The GT mainly support the preparation phase of the Trials.
4	The GT provides help functionality (explanations, checklists, references). *The starting point is the list of tips & tricks described in section 5 under the headings 'Actions and Required participation'.*
5	The GT contains a repository of examples. *The starting point for the repository is each example given in section 5. Insights from the Driver+ Trials will provide additional examples.*
6	The GT validates the Trial definition. *The validation comprises simple checks at first (i.e. all fields filled in; each gap/objective addressed). Experiences in using the Trial will provide additional checks.*
7	The GT supports different types of users.
8	Access to the GT for authorized users only.
9	Authorized users can add or modify Trials in the GT.
10	Trials can be exported (xml/json format).
11	The GT supports the iterative six-step approach.
12	The output of the GT may be directly imported into section 2 of the Trial Action Plan (TAP).

No.	Requirement
13	The GT extracts information from the Portfolio of Solutions (PoS).
14	The validated DRIVER+ CM gaps are input to the GT.
15	For each Trial, at least one gap must be selected.
16	Allow different users interaction with the Trial. *Users who are involved in preparation, execution or evaluation of the Trial, such as scientists or a scenario writer.*
17	Trial objectives are linked to at least one CM gap and each CM gap is related to a CM function objective.
18	The GT provides a template to facilitate the formulation of the Trial objectives in a manner that is SMART (specific, measurable, assignable and realistic).
19	Each objective is categorized as either 'crisis management objective', 'solution objective' or 'Trial objective'.
20	The GT provides a list of identified Trial objectives in the Trial. *Users can add/remove/modify Trial objectives in the list.*
21	Examples of Trial objectives used in other Trials are provided, supported by a search filter. *Users can copy such examples into his/her Trial definition and modify the Trial objective.*
22	Include metrics with Trial objectives. *User can select from a list, or enter additional metric.*
23	Solutions are related to one or more CM functions.
24	The GT supports the DRIVER+ CM function taxonomy.
25	The GT supports searching the PoS for possible solutions for the objectives formulated, using filter options. *The users can refine/broaden the search by changing the filter options or keywords.*
26	Selected solutions are presented in the GT for review, including all information relevant. *For example (if available) the description of the solution, previous Trial results, experiences from end-users, TRL level.*
27	Solutions can be included / excluded into the Trial by the user.
28	A research question relates to a Trial objective.
29	The GT provides a template for the research question dealing with crisis management task, process, content, crisis management roles and the solution required.
30	Examples of research methods are provided from the DRIVER+ Knowledge Based, including lessons learned.
31	Examples of data analysis techniques and metrics from previous Trials are derived from the DRIVER+ Knowledge Base
32	Examples of evaluation approaches applied in previous Trials.
33	Provide explanation on evaluation approaches, distinguishing between literature and practice (past Trials).
34	Examples for data techniques to measure/observe metrics in a Trial.
35	The GT offers a list of possible methods for data collection.
36	Every metric is linked to at least one assessment method.
37	Examples of research methods with associated data collection plans are provided from the DRIVER+ Knowledge Base.
38	Provide a description of different data collection and analysis techniques.
39	Provide a checklist (for the data collection plan).
40	Relate metrics to the online observer tool which is a component of the reference implementation of the Test-bed. *The tool supports an export function with measurements/observations for the online observer tool.*
41	Scenario text can be entered by uploading a text file.
42	Scenario text can be edited.

8. Way Forward

In this deliverable the foundations of the DRIVER+ Trial Guidance Methodology and the functional requirements of the Guidance Tool are described. It sets out the basis of the TGM and provides the first version of the methodological framework through the description of the steps that Trial owners must follow to carry out a Trial in a systematic yet pragmatic way. This deliverable revolves more around the preparatory phase of Trials. A detailed description of the preparation phase is in fact crucial to ensure a robust Trial design.

This deliverable was written during the preparation phase of Trial 1 that will take place in Poland in M49. The initial TGM, as well as the functionalities of the GT will be evaluated during Trials and improved based on feedback coming from Sub-project 94 (Trials). The evaluation will be carried out in the context of WPs 943.5, 944.5, 945.5 and 946.5. Relevant data to evaluate the methodology will be collected during the execution and evaluation phase of Trials 1-4 and also during the preparation phase of Trials 3 and 4.

Updated versions of the TGM (D922.41: M58, and D922.42: M66) will be based on the structural feedback coming from SP94. Draft versions of the deliverables will also be made available, along with necessary clarifications, training and on the job support, to relevant stakeholders involved in Trials prior to submission. This structural feedback will help in improving the TGM itself, in particular will help in refining the guidelines of the preparation phase and, above all, in providing adequate and detailed support to assess the solutions in a proper way (evaluation phase).

Not only will the evaluation of the first version of the TGM be based on feedback from Sub-project 94, but "internal" (WP922 and WP924) lessons learned will be carefully taken into account to provide an update version of the methodology before Trials 2, 3 and 4. Lessons learned from WP922 are the results of the participatory method used with relevant stakeholders involved in Trials. Since methods are not imposed upon but developed with them, the circular working processes and learning patterns mentioned in section 2 will ensure that D922.41 captures the needs and improvements emerging from internal discussions. Pragmatically, this will take place during and after Trial 1 as well as in the preparation and execution phase of Trial 2.

One the main objectives of the Sub-project 92 meeting which will be held in M50, three weeks after the execution of Trial one, is to reflect upon, *inter alia*, the methodological support *received from* SP92 and *needed from* an SP94 perspective. The key outcomes of the meeting will pave the ground to improve the TGM and the requirements of the GT so that a draft version of D922.41 will be made available before Trial 2 (M54).

The meetings that took place in the preparation and the execution phase of Trial 1, shed light on specific needs of the Trial owners and on the kind of support which is expected. The idea of the Test-bed as a "service" has become apparent due to the amount of informal guidance required, especially in the pre-Trial phase. While within the scope of DRIVER + this is of course necessary and possible, after the end of the project the "service" (working processes and methods) should be made sustainable (see also WP954).

Important lessons learned from the first six-months of the project from a methodological stand-point are:

- Similarities and differences between exercises and Trials need to be discussed with Trial committees at an early stage. The majority of the end-users are mainly familiar with exercises that involve, for instance, testing the preparedness of the organisations or teams, rather than assessing (new) solutions that can drive innovation.
- A pragmatic approach is important to understand and implement the TGM. While, on the one hand, it is important to provide recommendations and criteria on e.g. how to formulate good research questions, on the other, "hands-on" sessions are necessary. These sessions can take the form of face-to-face meetings (e.g. the SP92-SPP94 meeting which took place in M41 in which research questions and sub-research questions for Trial 1 were discussed) or of "mini-Trials", like the demonstration that took place at Workshop 0 in M42. The TGM needs to be more *demonstrated* than *explained* to ensure a common understanding of the steps. Despite, due to time constraints, it was not possible to provide

a comprehensive explanation of all the steps of the TGM during the mini-Trial, working with tangible examples has proven to be effective and it was a source of inspiration for drafting section 5.

- Identifying roles, tasks and processes of the CM dimension is crucial. This involves an in-depth understanding of how CM practitioners would respond to a specific operation as described in a generic scenario without any change or innovation, namely without the solutions that will be assessed during Trials. The description or the visualisation of a detailed scheme of processes is the baseline to understand the context and identify relevant KPIs. Only the practitioners familiar with a given socio-cultural and legal context can provide such information.
- The development of the TGM involves a "virtuous circle" between different teams: the methodological team and GT developers, for instance, consist of people with different background and different expectations on the same output (e.g. the Guidance Tool). Frequent meetings are necessary to align those expectations and visions.

These lessons learned are part of the mutual-learning approach of Sub-project 92 and will shape future versions of the methodology.

Furthermore, to ensure the correct understanding of the methodology and the effective use of the Guidance Tool, WP924 will organise two training modules. The aim is to facilitate the correct implementation of the methods during Trials. The feedback from the participants is crucial to identify the complex and challenging aspects of the TGM. The TGM will be revised also based on these feedbacks so that concepts can be better understood.

The way forward, thus, involves both a short-term and long-term vision. Within the project life cycle, the TGM will evolve and mature *with* the Trials to ensure that a proper assessment of the solutions can take place. In particular, the step-by-step approach will serve the needs of the Trial owners and will be refined and adapted after each Trial. Having set out the basis of the TGM in this deliverable, future version will give more emphasis on the actual implementation of the TGM. In the long-run, it is necessary to think in terms of potential "services" to help setting out Trials in different locations. This points towards the sustainability of the Test-bed (in relation to the Portfolio of Solutions), currently being discussed with Sub-project 95.

References

The full list of references of the SLR is provided in Annex 2

1. **Secchi, P., Ciaschi, R. und Spence, D.** *A Concept for an ESA Lessons Learned System.* Noorwijk : The Netherlands: ESTEC, 1999.

2. **Thomé, A.M.T., Scavarda, L.F. und Scavarda, A.J.** Conducting systematic literature review in operations management. *Production Planning & Control.* 27, 2016, Bd. 5.

3. **Sennett, R.** *The Craftsmen.* New Haven : Yale University Press, 2009.

4. **Alberts, D.S. und Hayes, R.** *Code of Best Practice for Experimentation.* Washington, D.C. : Command and Control Research Program Publications, 2002.

5. **Parmenter, D.** *Key Performance Indicators (KPI): Developing, Implementing, and Using Winning KPIs.* Hoboken : Wiley & Sons, 2010.

DRIVER + deliverables:

D23.21 “Performance and Effectiveness Metrics in Crisis Management Experiments”

D530.1 “Lessons learned Framework Concept”

D530.2 “Lessons learned Framework. September 2017

D610.1 Milestone 2 Report “Achievements, Lessons Learnt and Recommendations, Expertise of practitioners and Trial owners”. February 2016

D840.11 “Societal Impact Assessment Framework”. September 2017

D840.21 “A guide on assessing unintended societal impact of different CM functions – Version 1”. M20

D922.11 “List of Crisis Management gaps”. March 2018

D923.11 “Functional Specification of the Test-bed”. March 2018

D923.21 “First Release of the Test-bed Reference Implementation”. March 2018

D942.11 “Report on Review and Selection Process”. March 2018

Annexes

Annex 1 – DRIVER+ Terminology

In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated[41]. The terminology is applied throughout the documents produced by DRIVER+. Each deliverable includes an annex as provided hereunder, which holds an extract from the comprehensive terminology containing the relevant DRIVER+ terms for this respective document.

Table A1: DRIVER+ Terminology

Terminology	Definition	Source
End-user	Individual person who ultimately benefits from the outcomes of the system. See also 'Practitioner'.	Source: ISO/IEC 25010:2011(en), Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models, 4.4.3.
Exercise	Process to train for, assess, practise and improve performance in an organisation. Note: Exercises can be used for validating policies, plans, procedures, training, equipment, and inter-organisational agreements; clarifying and training personnel in roles and responsibilities; improving inter--organisational coordination and communications; identifying gaps in resources; improving individual performance and identifying opportunities for improvement; and a controlled opportunity to practise improvisation.	Source: ISO22300 (DRAFT 2017) 11.
Experiment	Purposive investigation of a system through selective adjustment of controllable conditions and allocation of resources.	Source: ISO/TR 13195:2015(en).
Gap	Gaps between the existing capabilities of responders and what was actually needed for effective and timely response.	Source: Project Responder 5.
Guidance Methodology	A structured approach from designing a Trial to evaluating the outcomes and identifying lessons learned.	Initial DRIVER+ definition.
Guidance Tool	A software tool that guides Trial design, execution and evaluation using a step-by-step approach, including as much of the necessary information as possible in terms of data or references to the Portfolio of Solutions.	Initial DRIVER+ definition.

[41] Until the Portfolio of Solutions is operational, the terminology is presented in the DRIVER+ Project Handbook and access can be requested by third parties by contacting coordination@projectdriver.eu.

Terminology	Definition	Source
Innovation	1. Implementation of a new or significantly improved product (good or service), or process, new marketing method, or new organisational method in business practices, workplace organisation or external relations. 2. New or changed object realizing or redistributing value.	Source 1: CEN/TS 16555-1:2013, 3.1 *as cited in ISO 37500:2014(en) Guidance on outsourcing, 3.6.* *Source 2: ISO 9000:2015(en) Quality management systems — Fundamentals and vocabulary, 3.6.15.*
Lessons Learned, Lesson Learning	Process of distributing the problem information to the whole project and organisation as well as other related projects and organisations, warning if similar failure modes or mechanism issues exist and taking preventive actions.	ISO 18238:2015(en) Space systems — Closed loop problem solving management, 3.3.
Portfolio of Solutions	A database driven web site that documents the available Crisis Management solutions. The PoS includes information on the experiences with a solution (i.e. results and outcomes of Trials), the needs it addresses, the type of practitioner organisations that have used it, the regulatory conditions that apply, societal impact consideration, a glossary, and the design of the Trials.	Initial DRIVER+ definition.
Scenario	Pre-planned storyline that drives an exercise, as well as the stimuli used to achieve exercise project performance objectives.	Source: ISO 22300:2018(en), Security and resilience — Vocabulary, 3.127.
Test-bed	The software tools, middleware and methodology to systematically conduct Trials and evaluate solutions within an appropriate environment. An "appropriate environment" is a testing environment (life and/or virtual) where the trialling of solutions is carried out using a structured, all-encompassing and mutual learning approach. The Test-bed can enable existing facilities to connect and exchange data, providing a pan-European arena of virtually connected facilities and crisis labs where users, providers, researchers, policy makers and citizens jointly and iteratively can progress on new approaches or solutions to emerging needs.	Initial DRIVER+ definition.
Trial	An activity for systematically finding and testing valuable solutions for current and emerging needs in such a way that practitioners can do this in a pragmatic yet systematic way.	Initial DRIVER+ definition.

Annex 2 – Systematic Literature Review: extended description

In this Annex, a more detailed description of the SLR (presented in section 3) is provided.

SLR Setup

When the basic SLR starts, the following questions must be answered in the tools StArt: Title, Researchers and Description. The description of the goal of this SLR is based on the needs that were identified by:

a) DRIVER+ participants during the development of the Guidance Tool as well as the leaders and participants of the former experiments.
b) The feedback by external "end-users" or practitioners involved in crisis management.
c) Recommendations on the methodology and Test-bed provided during external DRIVER reviews.

Table A2 Set-up information

Title	DRIVER+ methodology systematic literature review
Involved organisations	DLR, JRC, TNO, WWU (as stated in DOW)
Motivation and Description	In order to develop a sound and appropriate methodology for DRIVER+ Trials, a clear overview of existing approaches is needed. These will focus on the topic: **where do practitioners get the possibility to test innovations in realistic scenarios while respecting their socio-technical context.** The underlying DRIVER+ methodology is the Concept Development & Experimentation approach, but it has to be critically reflected with regards to the (a) application domain as well as (b) appropriateness of proposed research methodologies. In crisis management, a command-based decision chain with clear and aligned responsibilities cannot be taken for granted, because the application scenario is defined by complex, uncertain, and dynamic characteristics. Thus, it is at least necessary to have a look at related research approaches for this particular setup. Besides, the practitioner needs show that both qualitative and quantitative evaluation methods are required, so the appropriate approach cannot rely on laboratory-like settings. It needs diversified elements in order to "research and analyse" all elements, as per the interest of the practitioners. This however, does not mean that scientific standards can be ignored. Depending on the researched object appropriate research methods need to be applied.

Planning

The StArt software provides a protocol for the planning phase. This phase contains step 1: *"planning and formulating the problem"*. First, a few things like the (a) objective, (b) the main questions, (c) the keywords and synonyms, (d) sources selection criteria definition, (e) source list, (f) study selection criteria (inclusion and exclusion) and (g) data extraction fields need to be clarified.

The following **(a) objective** was identified: *"Exploration on the SotA on 'Evaluating socio-technical solutions in realistic settings in the context of crisis management from a multi-stakeholder perspective'"*

The next part concerned the **(b) main question or research question (RQ)**: *"How to design and evaluate a space for Trialing socio-technical innovations for crisis management in a realistic and multi-stakeholder setting?"* Additionally, the following SLR criteria were defined:

Table A3 SLR steps

Searched data bases and scope (population)	EBSCO, Google Scholar, ScienceDirect (Only peer reviewed journal articles – therefore, high quality is assured)
Intervention	Observation of different approaches, which evaluate socio-technical solutions in the crisis management domain.
Control	CD&E plus DRIVER- SotA, DRIVER Lessons Learned (LL), specific expertise of DRIVER+ consortium.
Results	1. Answer if there are other "holistic" approaches like CD&E. 2. What are specific elements of existing approaches which even cover only a small set on how to Trial and evaluate solutions. 3. Knowledge Base.
Application context	Crisis management practitioners, researchers and solution providers.

Furthermore, the **(c) keywords and synonyms** were declared. To further identify the relevant keywords for the search, the application context, the functional descriptions as well as the research object were looked at as Table 3 depicts.

Table A4 Basic keywords for search query

Field of interest	Keywords for search query
Application context	crisis management, emergency management, disaster relief, humanitarian operation, disaster management, disaster response
Functional description	simulation, serious game, exercise, game, test, Trial, experiment, training
Research object	innovation, software, algorithm, decision support, tool, solution, process, organisation, partnership

From these keywords a search string was created that used the combination with the Boolean terms “or” as well as “and”:

> ("crisis management" OR "emergency management" OR "disaster relief" OR "humanitarian operation" OR "disaster management" OR "disaster response") **AND** ("simulation" OR "serious game" OR "exercise" OR "game" OR "test" OR "Trial" OR "experiment" OR "training") **AND** ("innovation" OR "software" OR "algorithm" OR "decision support" OR "tool" OR "solution" OR "process" OR "organisation" OR "partnership")

As a next step the **(d) sources selection criteria definition** took place. In order to use a software solution it was important that the data could be exported as a .ris file. In addition, the language had to be English in order to be usable for an EU-project. Furthermore, it was decided to look only at peer reviewed journal publications in order to ensure the quality of the information possess a certain standard. As DRIVER+ is dedicated to innovation, it was defined that only papers from the past decade (2007-2017) were included in the search.

The **(e) source list** contained three items: *“EBSCO”*, *“Google Scholar”* and *“ScienceDirect”* (The idea of using JSTOR as well had to be dropped, as this one was not able to handle the long search query that came up).

In addition to this, the **(f) study selection criteria (inclusion and exclusion)** had to be set. In the following list every (E) is exclusion and the (I) is an inclusion:

- (E) Filter 1 not applicable
- (E) Excluded based on Title, Keywords and Abstract (see comments for details)
- (I) Included based on Title, Keywords and Abstract (see comments for details)

Filter 1 consists of the keywords: "assessment, evaluation, generalizability, method, methodology, procedure, qualitative, reliability and validity".

The last part of the planning phase is the **(g) data extraction from fields**. The first decision was to search based on the *"text"* itself.

Execution

The second phase of the SLR after (2) is called execution. It consists of three parts: (A) studies identification, (B) selection and (C) extraction.

For DRIVER+ the **(A) study identification** was using the following approach: it was decided to use EBSCO, Google Scholar, and ScienceDirect for identifying relevant papers. For EBSCO this meant searching in different libraries. As depicted in Table A5, there were slightly modified search queries for each website. This was due to the fact that each website has its own way of functioning. For scholar.google.de this unfortunately meant, that the keywords used in red (see below in Table A5) might have not been included in the search but it is not possible to say this for sure. For ScienceDirect it was necessary to decide on a range of publication dates. As the latest research results should be looked at, only papers after 2006 were included.

Table A5: Websites and search queries

Website	Query
http://web.b.ebscohost.com/ehost/search/advanced	("crisis management" OR "emergency management" OR "disaster relief" OR "humanitarian operation" OR "disaster management" OR "disaster response") **AND** ("simulation" OR "serious game" OR "exercise" OR "game" OR "test" OR "Trial" OR "experiment" OR "training") **AND** ("innovation" OR "software" OR "algorithm" OR "decision support" OR "tool" OR "solution" OR "process" OR "organisation" OR "partnership")
https://scholar.google.de **https://harzing.com/resources/publish-or-perish**	("crisis management" OR "emergency management" OR "disaster relief" OR "humanitarian operation" OR "disaster management" OR "disaster response") **AND** ("simulation" OR "serious game" OR "exercise" OR "game" OR "test" OR "Trial" OR "experiment" OR "training") **AND** ("innovation" OR "software" OR "algorithm" OR "decision support" OR "tool" OR "solution" OR "process" OR "organisation" OR "partnership")
http://www.sciencedirect.com/science (mode: expert search)	pub-date > 2006 and tak(("crisis management" OR "emergency management" OR "disaster relief" OR "humanitarian operation" OR "disaster management" OR "disaster response") **AND** ("simulation" OR "serious game" OR "exercise" OR "game" OR "test" OR "Trial" OR "experiment" OR "training") **AND** ("innovation" OR "software" OR "algorithm" OR "decision support" OR "tool" OR "solution" OR "process" OR "organisation" OR "partnership"))

As explained in section 3, this search gave all in all 20,420 results for the time span 2007-2017. At first glance it showed, that all results were "somehow" related to the topic. However, this relation was pretty weak for a big number of them. Therefore, the first adjustment was to apply the search only on title, abstract and keywords. The first resulted in 2,934 results.

These numbers are based on some further limitations which were necessary according to the search engine. For EBSCO the setup included "English language" and "Scientific papers (Peer-Reviewed) Journals". For Google Scholar no further information was requested to start a search. For ScienceDirect it was chosen "all sciences", "Title abstract Key (tak)", "Books and journals" as well as "peer-reviewed by default". The distribution of results on the different citations is shown in Figure A1.

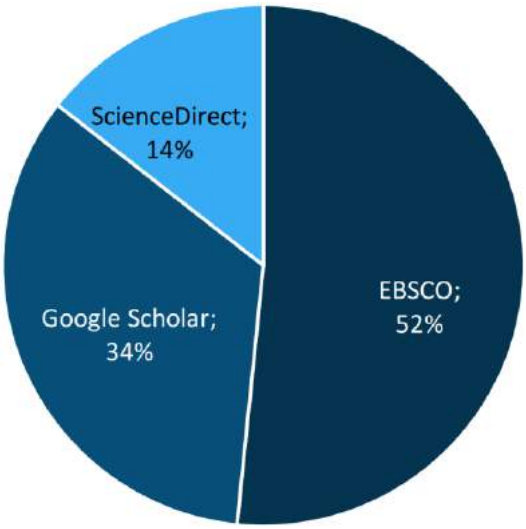

Figure A1: Distribution of first research results

After running the search, little information was listed and generated: Title, author and publication year of every identified paper. These were imported into the StArt-software and listed with the following information: paper ID, title, author, year, status/selection, status/extraction, reading priority and score:

- The ID is simply a consecutive number given to each paper.
- The status/selection can be either "accepted", "rejected" or "duplicated". While duplicated is chosen if a paper has already shown up before the status/selection of "accepted" and "rejected" is chosen by the one conducting the SLR. How this selection was done is described in the following section.
- The parts status/extraction and reading priority were not used for this SLR.

The next part was the **(B) selection**. As explained in section 3, "after adjusting to the search in title, abstract and keywords only, it was important to delete any duplicated papers, as these will not add any value. All in all 319 papers were identifies, that were listed twice and therefor one of their version was deleted. This reduced the number of papers to a total of 2,615. The second selection-step was filtering in StArt. A list of keywords was used for this. It is possible to count words in StArt, therefore all keywords were searched. If this resulted in a score of zero for all keywords the paper was deleted. By using this method and filtering out all duplications the number of peer reviewed papers was reduced to 949. In the next step, all these were rated as "relevant/accepted" or "irrelevant/rejected" by reading the title, keywords and abstract. This resulted in a reduction to 231 relevant papers. To these ones the next steps were applied".

As a last filter step the **(C) extraction** was done in a two-part review. During this process, members of the German Aerospace Center (DLR), the European Commission's Joint Research Center (JRC), the Netherlands Organisation for Applied Scientific Research (TNO), and the University of Muenster (WWU) were responsible for conducting the reviews of the papers and the creation of codebooks as established by the (2) methodology of the SLR. The analysis was carried out using the template presented in section 3. As show below, the explanation of the items differs slightly from the description included in the template to collect lessons learned.

Experiment, exercise, simulation, or Trial objectives: this provides a description and objectives of any Trial-like events conducted as part of the study (e.g. simulation, serious games). Most of the times this information would be found on the methods section of the paper.

Research questions: this field aims to state the purpose or objective of the whole study, answering "what is the paper presenting" or "what is the paper's contribution". This was decided to be filled as such, since 90% of the papers had not included their objective in the form of a question statement. This information was mainly found on the abstract or introduction.

Experiment planning and deviations: this field explains how the presented example of an experiment was planned and the considerations, steps, or phases which were taken in order to conduct such an event. Also, found mainly on the methods section.

Research methods: this field shows the methodology followed by the authors for their research. Found mainly on the abstract or methods section.

Metrics and Key Performance Indicators (KPIs): this field provides any metrics, measures, or significant finding (especially for thematic analysis) which could be considered as a KPI. These are indicators which could be transferable if a case wants to be re-applied. Mainly found on the results section.

Data collection plan: this field answers the question as to "how were data collected" regarding the methodologies it followed. This field can be detailed as to how big was a sample collected for a survey or general as to the phases used for collecting data. Mainly found on the methods section.

Data analysis: this field explains the way data was analysed and the procedures followed to treat these data. Moreover, it provides an overview of the most used software of analysis for specific cases. E.g. SPSS for statistical analysis. Also, mainly found on the methods section.

Ethical procedures: this field provides any details on the protocols or specific procedures for obtaining permission to make use of the data collected. Furthermore, if the research was approved by an official board of ethics from a specific organisation.

Results: shows up significant results or practical implications which are relevant for the design of potential Trials. These section, however, summarizes specific outcomes from the papers. Mainly found on the results or conclusions section.
Methodological LL (lessons learned): this field explains any methodological learnings derived from the experience of conducting the research. It also shows how can the methods be improved or what the next steps would be. Mostly found on the limitations or discussion section.

The creation process for the codebooks was divided into two steps. The first review consisted in splitting the total number of relevant papers among the participant organisations. Each of them would create one template/codebook per paper after the assignment.

In order to ensure that the right information had been included in these documents, the "first-reviewed" codebooks would then be assigned to another reviewer from another organisation to perform a second review on the document (cf. Figure A2). In this process, the second reviewer would go through the assigned documents and fill in any missing information left out during the first review, or correct any redundancies which might not add-up for the purpose of creating a Knowledge Base for the conduction of Trials in the project. Based on the learning experience gathered from the first reviews, it could be ensured that the second review step would fulfil the role of performing a quality check.

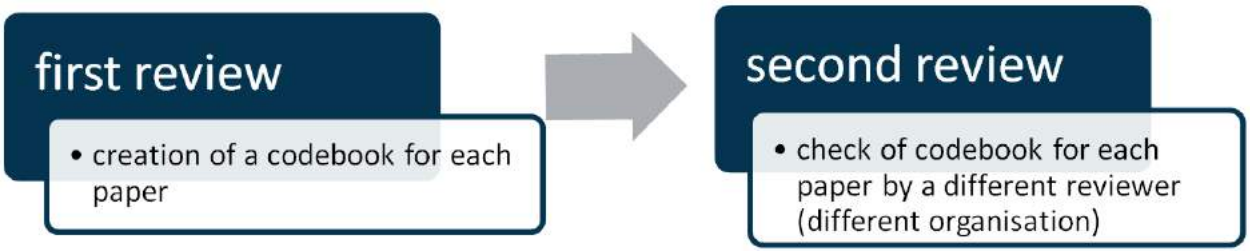

Figure A2: Review-process in the extraction phase

Special cases

In 13 cases the first or second reviewer rated a paper as “not relevant” while the other reviewer rated it as “relevant”. For these special cases, a third review was done to decide on the matter. Only three out of these 13 papers were finally rated “relevant” and included in the following analysis.

All in all 218 peer reviewed articles were analysed by filling in a codebook for each paper. It was decided to look at the whole past decade in order to find relevant, but not outdated information. As shown in Figure 0.3 average almost 23 relevant papers were published each year. This deviates between a min. 12 and a max. 29. Though this is a difference of 17 papers it is hard to say that a trend could be derived from the distribution, which seems to confirm the idea to look at all years of the past decade.

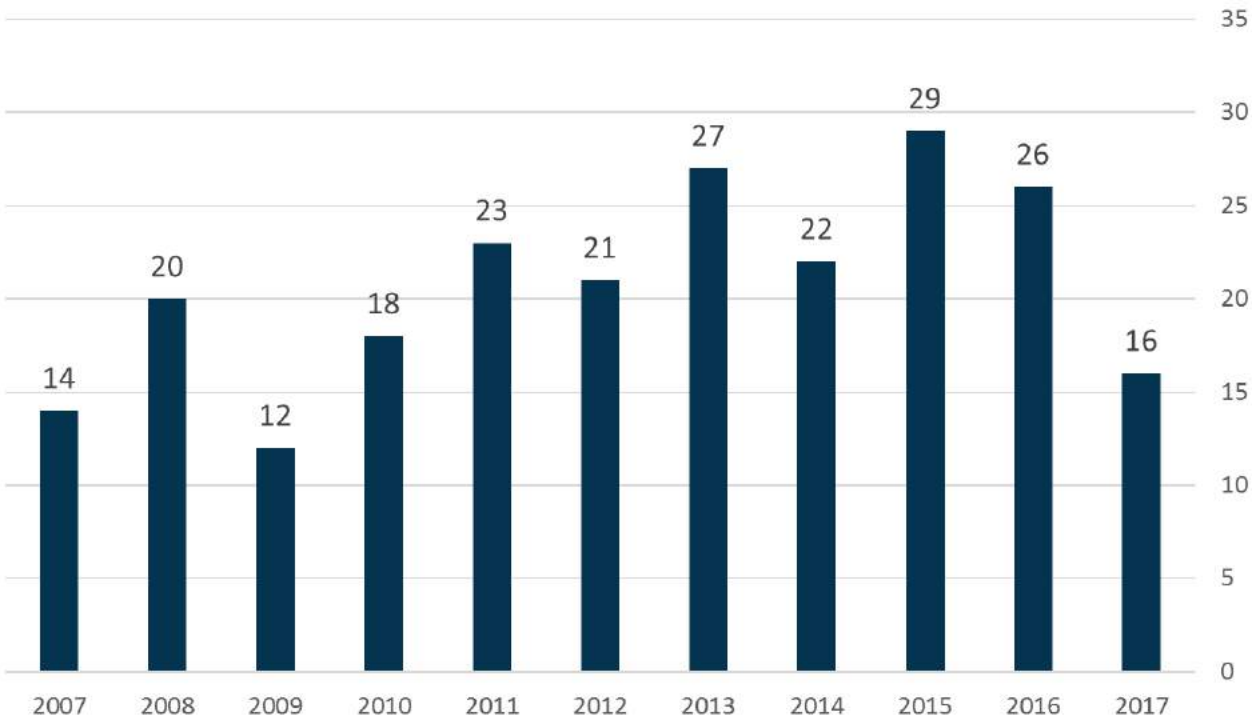

Figure 0.3: Quantity of papers per year

Keywords provided a rough idea of the main area the papers focused on. By plotting all keywords that had been mentioned 3 times and more often in a wordcloud (cf. Figure 0.4) it can clearly be seen that “management” and “emergency” were the most important words within the scope of the SLR. The next most frequent are the words “simulation”, “systems” and “disaster”.

This confirms that the SLR has really given the expected results in the areas of crisis management, but also shows that the health area (health, nursing, medical) is represented quite often. Furthermore, “management” and “emergency” were the most important words within the scope of the SLR. The next most frequent are the words “simulation”, “systems” and “disaster”.

Figure 0.4: Word-cloud based on keywords of relevant papers

List of EBSCO databases

Academic Search Premier
American Antiquarian Society (AAS) Historical Periodicals Collection: Series 3
American Antiquarian Society (AAS) Historical Periodicals Collection: Series 1
American Antiquarian Society (AAS) Historical Periodicals Collection: Series 2
American Antiquarian Society (AAS) Historical Periodicals Collection: Series 4
American Antiquarian Society (AAS) Historical Periodicals Collection: Series 5
American Bibliography of Slavic and East European Studies
ATLA Religion Database with ATLASerials
Business Source Premier
Communication & Mass Media Complete
eBook Collection (EBSCOhost)
EconLit with Full Text
GeoRef
GeoRef In Process
GreenFILE
Humanities International Index
Index Islamicus
Library, Information Science & Technology Abstracts
MEDLINE
MLA Directory of Periodicals
MLA International Bibliography
New Testament Abstracts
Peace Research Abstracts
Philosopher's Index
PsycARTICLES
PsycINFO
PSYNDEX: Literature and Audiovisual Media with PSYNDEX Tests
Regional Business News
RILM Abstracts of Music Literature (1967 to Present only)
SPORTDiscus with Full Text
The Nation Archive (DFG)

The New Republic Archive (DFG)
PsycBOOKS
Arab World Research Source
CINAHL

The list of papers used for the SLR is provided in the table below:

Table A6: List of papers used for SLR

ID	Title	Author	Year
18	Conventional Medical Education and the History of Simulation in Radiology	Chetlen, Alison L. ; Mendiratta-Lala, Mishal ; Probyn, Linda ; Auffermann, William F. ; DeBenedectis, Carolynn M. ; Marko, Jamie ; Pua, Bradley B. ; Sato, Takashi Shawn ; Little, Brent P. ; Dell, Carol M. ; Sarkany, David ; Gettle, Lori Mankowski	2015
55	Simulation forward processes of surgical care	Pucher, Philip H. ; Darzi, Ara ; Aggarwal, Rajesh	2013
65	D-DEMATEL: A new method to identify critical success factors in emergency management	Zhou, Xinyi ; Shi, Yangqiuyan ; Deng, Xinyang ; Deng, Yong	2017
72	A risk assessment tool for improving safety standards and emergency management in Italian onshore wind farms	Astiaso Garcia, Davide ; Bruschi, Daniele	2016
76	Project training evaluation: Reshaping boundary objects and assumptions	Lee-Kelley, Liz ; Blackman, Deborah	2012
79	Evaluation of Medical Management During a Mass Casualty Incident Exercise: An Objective Assessment Tool to Enhance Direct Observation	Ingrassia, Pier Luigi ; Prato, Federico ; Geddo, Alessandro ; Colombo, Davide ; Tengattini, Marco ; Calligaro, Sara ; La Mura, Fabrizio ; Michael Franc, Jeffrey ; Della Corte, Francesco	2010
83	Development, initial reliability and validity testing of an observational tool for assessing technical skills of operating room nurses	Sevdalis, Nick ; Undre, Shabnam ; Henry, Janet ; Sydney, Elaine ; Koutantji, Mary ; Darzi, Ara ; Vincent, Charles A.	2009
98	A service oriented architecture for decision support systems in environmental crisis management	Vescoukis, Vassilios ; Doulamis, Nikolaos ; Karagiorgou, Sofia	2012
123	Striving to be resilient: What concepts, approaches and practices should be incorporated in resilience management guidelines?	Adini, Bruria ; Cohen, Odeya ; Eide, Aslak Wegner ; Nilsson, Susanna ; Aharonson-Daniel, Limor ; Herrera, Ivonne A	2017
131	Expanding the use of simulation in open vascular surgical training	Pandey, Vikas A. ; Wolfe, John H.N.	2012
150	Emergency transportation network design problem: Identification and evaluation of disaster response routes	Nikoo, Nariman ; Babaei, Mohsen ; Mohaymany, Afshin Shariat	2017
159	A virtual reality based fire training simulator integrated with fire dynamics data	Cha, Moohyun ; Han, Soonhung ; Lee, Jaikyung ; Choi, Byungil	2012

ID	Title	Author	Year
160	Prepositioning of supplies in preparation for a hurricane under potential destruction of prepositioned supplies	Galindo, Gina ; Batta, Rajan	2013
164	Decision support system for emergency management: Road tunnels	Alvear, Daniel ; Abreu, Orlando ; Cuesta, Arturo ; Alonso, Virginia	2013
173	A continuous approximation approach for assessment routing in disaster relief	Huang, Michael ; Smilowitz, Karen R. ; Balcik, Burcu	2013
190	Post-earthquake emergency assessment of building damage, safety and usability Part 2: Organisation	Anagnostopoulos, S. ; Moretti, M.	2008
227	Design of fault simulator	Gabbar, Hossam A. ; Sayed, Hanaa E. ; Osunleke, Ajiboye S. ; Masanobu, Hara	2009
234	Crowd simulation for emergency response using BDI agents based on immersive virtual reality	Shendarkar, Ameya ; Vasudevan, Karthik ; Lee, Seungho ; Son, Young-Jun	2008
236	A nature-inspired decentralized trust model to reduce information unreliability in complex disaster relief operations	Kostoulas, Dionysios ; Aldunate, Roberto ; Pena Mora, Feniosky ; Lakhera, Sanyogita	2008
255	Group value and intention to use – A study of multi-agency disaster management information systems for public safety	Lee, JinKyu ; Bharosa, Nitesh ; Yang, Jing ; Janssen, Marijn ; Rao, H.R.	2011
256	Towards a Lightweight Approach for On-site Interaction Evaluation of Safety-critical Mobile Systems	Holl, Konstantin ; Nass, Claudia ; Villela, Karina ; Vieira, Vaninha	2016
263	Flood Emergency Management Using Hydrodynamic Modelling	Liu, Yongzhi ; Zhang, Wenting ; Cui, Xinmin	2012
273	A general computational recognition primed decision model with multi-agent rescue simulation benchmark	Nowroozi, Alireza ; Shiri, Mohammad E. ; Aslanian, Angeh ; Lucas, Caro	2012
275	Modeling and simulation method of the emergency response systems based on OODA	Huang, Yanyan	2015
284	Developing shared situational awareness for emergency management	Seppänen, Hannes ; Mäkelä, Jaana ; Luokkala, Pekka ; Virrantaus, Kirsi	2013
292	A real-time stochastic evacuation model for road tunnels	Capote, Jorge A. ; Alvear, Daniel ; Abreu, Orlando ; Cuesta, Arturo ; Alonso, Virginia	2013
323	Design of formative evacuation plans using agent-based simulation	Zarboutis, Nikos ; Marmaras, Nicolas	2007
339	Research on Efficiency of Collaborative Allocation System of Emergency Material Based on Synergetic Theory	Dou, Liangtan ; Sun, Ying ; She, Lian	2012
350	eStorys: A visual storyboard system supporting back-channel communication for emergencies	Malizia, A. ; Bellucci, A. ; Diaz, P. ; Aedo, I. ; Levialdi, S.	2011
371	Detection of undesirable communication patterns in multi-agent systems	Gutiérrez, Celia ; García-Magariño, Iván ; Fuentes-Fernández, Rubén	2011

ID	Title	Author	Year
393	Scenario-based design: A method for connecting information system design with public health operations and emergency management	Reeder, Blaine ; Turner, Anne M.	2011
414	An expert system for an emergency response management in Networked Safe Service Systems	Liu, X. ; Li, W. ; Tu, Y.L. ; Zhang, W.J.	2011
416	A container multimodal transportation scheduling approach based on immune affinity model for emergency relief	Hu, Zhi-Hua	2011
500	Simulation for team training and assessment: case studies of online training with virtual worlds	Heinrichs, WLR ; Youngblood, P ; Harter, PM ; Dev P	2008
556	Obstetric simulation as a risk control strategy: course design and evaluation	Gardner, R ; Walzer, TB ; Simon, R ; Raemer, DB	2008
808	Managing the inconceivable: participatory assessments of impacts and responses to extreme climate change	Toth, FL ; Hizsnyik, E ;	2008
820	Reconstruction and Exploration of Large-scale Distributed Operations – Multimedia tools for Evaluation of Emergency Management Response	Pilemalm, S ; Andersson, D ; Hallberg, N	2008
847	An assessment of activity-based modeling and simulation for applications in operational studies, disaster preparedness, and homeland security	Henson, K ; Goulias, K ; Letters, Golledge, R	2009
936	Defining Team Performance for Simulation-based Training: Methodology, Metrics, and Opportunities for Emergency Medicine	Shapiro, MJ ; Gardner, R ; Jay, GD ; Lindquist, DG ; Salisbury, ML ; Salas, E	2008
980	Development and evaluation of ontology for intelligent decision support in medical emergency management for mass gatherings	Haghighi, PD ; Burstein, F ; Zaslavsky, A ; Arbon, P	2013
1019	Expert system CRIPS: support of situation assessment and decision making	Dellwing, H ; Schmitz, W	2007
1041	A general methodology for data-based rule building and its application to natural disaster management	Rodríguez, JT ; Vitoriano, B ; Montero, J	2012
1165	Utilizing simulation technology for competency skills assessment and a comparison of traditional methods of training to simulation-based training	Tuttle, RP ; Cohen, MH ; Augustine, AJ ; Novotny, DF ; Delgado, E ; Dongilli, TA ; Lutz, JW ; DeVita, MA	2007
1195	The workpad user interface and methodology: Developing smart and effective mobile applications for emergency operators	Humayoun, SR ; Catarci, T ; deLeoni, Massimiliano ; Marella, A ; Mecella, Massimo ; Bortenschlager, M ; Steinmann, R	2009

ID	Title	Author	Year
1420	Community Assessment for Public Health Emergency Response (CASPER): An Innovative Emergency Management Tool in the United States.	Schnall, Amy ; Nakata, Nicole ; Talbert, Todd ; Bayleyegn, Tesfaye ; Martinez, DeAndrea ; Wolkin, Amy	2017
1421	Short simulation exercises to improve emergency department nurses' self-efficacy for initial disaster management: Controlled before and after study.	Jonson, Carl-Oscar ; Pettersson, Jenny ; Rybing, Jonas ; Nilsson, Helene ; Prytz, Erik	2017
1424	Public Health System Research in Public Health Emergency Preparedness in the United States (2009—2015): Actionable Knowledge Base.	Savoia, Elena ; Lin, Leesa ; Bernard, Dottie ; Klein, Noah ; James, Lyndon P. ; Guicciardi, Stefano	2017
1427	Interactive plant simulation modeling for developing an operator training system in a natural gas pressure-regulating station.	Yongseok Lee ; Changjun Ko ; Hodong Lee ; Kyeongwoo Jeon ; Seolin Shin ; Chonghun Han	2017
1431	Traffic evacuation simulation based on multi-level driving decision model.	Yuan, Shengcheng ; Chun, Soon Ae ; Spinelli, Bruno ; Liu, Yi ; Zhang, Hui ; Adam, Nabil R.	2017
1437	Identifying and explicating knowledge on method transfer: a sectoral system of innovation approach.	Hvannberg, Ebba	2015
1439	A 3-year Health Care Coalition Experience in Advancing Hospital Evacuation Preparedness.	Lowe, John J. ; Hansen, Keith F. ; Sanger, Kristine K. ; Obaid, Jannah M.	2016
1449	A dynamic model for disaster response considering prioritized demand points.	Rivera-Royero, Daniel ; Galindo, Gina ; Yie-Pinedo, Ruben	2016
1457	Influencing Factors on Social Media Adoption in County-level Emergency Management Departments.	Schuwerk, Tara J. ; Davis, Allison	2013
1465	Testing a methodology to improve organisational learning about crisis communication by public organisations.	Palttala, Paulina ; Vos, Marita	2011
1478	Multi-purpose 3-D Real Estate: Understanding the Role of 3-D Technology for Enhancing Resilience	Christensen, Pernille H. ; McIlhatton, David ; Blair, Neale ; Grunninger Bonney, Courtney	2016
1484	A Simulation Tool for Examining the Effect of Communications on Disaster Response in the Oil and Gas Industry.	Singh, Arvind ; Adams, Richelle ; Dookie, Isa ; Kissoon, Shiva	2016
1489	Data Model Development for Fire Related Extreme Events – An Activity Theory and Semiotics Approach	Chen, Rui ; Sharman, Raj ; Rao, H. Raghav ; Upadhyaya, Shambhu J.	2013
1513	Using Twitter in crisis management for organisations bearing different country-of-origin perceptions.	Xu, Jie ; Wu, Yiye	2015
1514	High Fidelity Simulation to Evaluate Emergency Management in Urgent Care Centers.	Tabor, Megan ; Vaughn, Brooke L.	2017

ID	Title	Author	Year
1520	Challenges in coordination: differences in perception of civil and military organisations by comparing international scientific literature and field experiences.	Pramanik, Roshni	2015
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2719	Task force deployment for big events	Drechsel, J. ; Kimms, A.	2008
2738	Space-enabled information environment for crisis management. Scenario-based analysis and evaluation in an operational environment	Ryzenko, Jakub ; Smolarkiewicz, Marcin	2010

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2815	A contingency model of decision-making involving risk of accidental loss	Rosness, Ragnar	2009
2823	Teaching the NIATx Model of Process Improvement as an Evidence-Based Process.	Evans, Alyson C. ; Rieckmann, Traci ; Fitzgerald, Maureen M. ; Gustafson, David H.	2007
2836	Resolving crises through automated bilateral negotiations	Kraus, Sarit ; Hoz-Weiss, Penina ; Wilkenfeld, Jonathan ; Andersen, David R. ; Pate, Amy	2008
2858	Disaster Readiness: A Community - University Partnership.	Adams, Lavonne M. ; Canclini, Sharon B.	2008
2554	Sustainable Measures in Rebuilding After Disasterpaper.	Veronescu, Otilia ; Szitar, Mirela	2012
2592	Advances in Drama Theory for Managing Global Hazards and Disasters. Part I: Theoretical Foundation.	Levy, Jason K. ; Hipel, Keith W. ; Howard, N.	2009

Annex 3 – Lessons Learned Template

Example of lessons learned template:

Table A7: Lessons Learned Template

Experiments 32	**Toolkit for community based psychosocial support, toolkit for sport & physical activity based psychosocial support, toolkit for preparedness of volunteers**
Experiment objectives	Test and validate existing tools for strengthening individual and volunteer resilience. Provide recommendations for improvement of existing concepts and tools based on the experimental results. Address the level of individuals in disaster management, by focusing on improved individual and volunteer resilience. A total of three toolkits were tested in WP932 1. Community based psychosocial support toolkit – training of trainers. This training is built on the Community-based Psychosocial Training Kit and gives participants insight into aspects of the psychosocial impact of disasters and orientates them to psychosocial support activities and facilitating psychosocial workshops. Through a participatory approach, this training will familiarize participants with the Community-based Psychosocial Training Kit and the

Experiments 32	Toolkit for community based psychosocial support, toolkit for sport & physical activity based psychosocial support, toolkit for preparedness of volunteers
	following subjects: Crisis Events and Psychosocial Support; Stress and Coping; Loss and Grief; Community-based Psychosocial Support; Psychological First Aid and Supportive Communication; Children; Supporting staff and Volunteers. It further introduces didactic and pedagogical teaching methods, enabling participants to conduct training of trainers. 2. Sports and physical activities as Psychosocial Support intervention in disasters toolkit – training of trainers This training focuses on using sports and physical activities as a tool for psychosocial support. Combining psychosocial support and sport and physical activities can universally benefit diverse groups across cultures and geography. However it is crucial that activities are conducted in a way that respects local cultures and traditions. A holistic, inclusive approach with attention to socio-cultural appropriateness is at the core of this handbook. A European focus with global outreach makes it applicable in many different settings and geographical contexts. 3. Caring for volunteers toolkit – training of volunteers (not ToT). As psychosocial support has become an integrated activity in many National Societies, we have experienced an increasing number of requests for guidelines and tools on how to help our own volunteers and staff. In other words, how we should put on our own oxygen mask first before helping others, as they say on the airplane. This training provides a thorough introduction to the "Caring for Volunteers, a Psychosocial Support Toolkit," which will help National Societies not only prepare volunteers but also support them during and after disasters, conflicts and other dramatic events. Participants will familiarize themselves with practical tools for preparing for and handling crises, as well as for peer support and communication. In addition, they will gain an understanding of how to monitor and evaluate volunteers' efforts.
Research questions	*Overall research question: Is the cascading model[42] an effective method for transferring psychosocial knowledge and skills to volunteers in crisis management organisations?* *Specific research question 1 (EXPE 32.1): Is the cascading model an effective method for transferring knowledge and skills related to community-based psychosocial support through three tiers of volunteers in crisis management organisations?*

[42] The cascading model of training consists of a maximum of three tiers or levels of training, in which a master trainer teaches in depth knowledge on a specific topic along with facilitation techniques and methodologies on how to deliver trainings to other participants. Participants at the first tier have experience in the topic of the training and they are be able to, after taking part in the training of trainers, transfer the knowledge to a new group of participants in a basic training. This second group of participants can then directly facilitate the activities or interventions they have been trained in during their basic training, to a new group of community members or volunteers.

Experiments 32	Toolkit for community based psychosocial support, toolkit for sport & physical activity based psychosocial support, toolkit for preparedness of volunteers
	Specific research question 2 (EXPE 32.1): Is the cascading model an effective method for transferring knowledge and skills related to sports and psychosocial support through two tiers volunteers in crisis management organisations?
Experiment planning and deviations	Experiment preparation: September 2014 – March 2015 Run experiment: May 2015-February 2016 Interpret evidence: November 2015- April 2016 Conclusions: April-June 2016
Methods	Mixed approach
Key Performance Indicators (KPIs)	n/a
Data collection plan	The data collection methods used in the two experiments included a combination of qualitative (observations, semi-structured interviews and focus group discussions) and quantitative (questionnaires) methods. Two types of questionnaires were used in the experiments: reactionnaires and pre-post-tests. Reactionnaires are used to measure reaction to trainings through a combination of open-ended and closed questions, and pre-post-test are used to measure learning. *Details available D320.1: due to the complexity and variety of methods a full explanation cannot be provided here The same applies to data analysis.*
Data analysis	
Ethical procedures	Informed consent (no ethical approval from the Danish Data Protection Authority Needed).
Results	The key findings from the two experiments are that the cascading model is an effective model for transferring psychosocial knowledge to volunteers and at the same time, the two training solutions are effective in transferring psychosocial knowledge to volunteers from crisis management organisations. Using Kirkpatrick's model for evaluation of trainings, the analysis has focused on reaction, learning and confidence of trained volunteers on the one hand, and their ability to implement what they have learned on the other.
Methodological LL (Lessons Learned)	Most challenging aspect: the process of the recruitment of the volunteers and language challenges. The experiments were conducted in two different cultural contexts, which has produced interesting results but also required extensive resources. The trainings built the capacity of volunteers and benefited of the language and cultural of knowledge of volunteers. However, as the experiment templates were developed in English, despite of the use of professional as well as in-house translation from MDA, resources had to be allocated for the translation of documents.

Annex 4 – Trial Action Plan

Driving Innovation in Crisis Management for European Resilience

D922.21- TRIAL GUIDANCE METHODOLOGY AND GUIDANCE TOOL SPECIFICATIONS (VERSION 1)

SP94 - TRIALS

MARCH 2018 (M47)

Project information

Project Acronym:	DRIVER+
Project Full Title:	Driving Innovation in Crisis Management for European Resilience
Grant Agreement:	607798
Project Duration:	72 months (May 2014 - April 2020)
Project Technical Coordinator:	TNO
Contact:	coordination@projectdriver.eu

Deliverable information

Deliverable Status:	Draft
Deliverable Title:	D922.21- Trial guidance methodology and guidance tool specifications (version 1)
Deliverable Nature:	Report (R)
Dissemination Level:	Restricted (RE)
Due Date:	March 2018 (M47)
Submission Date:	10/05/2018 (please update the field)
Sub-Project (SP):	SP94 - Trials
Work Package (WP):	WPXXX - Name
Deliverable Leader:	JRC
Reviewers:	First name, Last Name, Organisation First name, Last Name, Organisation First name, Last Name, Organisation
File Name:	DRIVER+_94Z.11_ Report on Trial Action Plan – Trial <NUMBER>_<Organization>_V1.0_08122017

[NOTE TO THE AUTHOR]

*The Trial Action Plan is the basis for Deliverables **D94<N>.11 - Report on Trial Action Plan – Trial <NUMBER>** and the completion of its chapters should be assured by the Trial Owner according to the Trial preparation phases explained in chapter* 0.1 Trial Event phase and TAP completion schedule.. *Within DRIVER+ Project, Trial Action Plan template is one of the results of **Task 922.2 Development of the guidance methodology** and an Annex to the **Deliverable D922.21 – Trial guidance methodology and guidance tool specifications (version 1)**.*

The Trial Owner should follow the basic guide for a DRIVER+ Deliverable included in Deliverable Expectation Document, which are quoted below.

> *Blue italicized text enclosed in square brackets **[text]** provides instructions to the document author, or describes the intent, assumptions and context for content included in this document.*
>
> *Red text enclosed in angle brackets* <text> *indicates a field that should be replaced with information specific to a particular project or deliverable.*
>
> *When using this template, it is recommended that you follow these steps:*
>
> - *Replace all text enclosed in angle brackets (e.g., <Project Name>) with the correct values.*
> - *Table captions should be above the table by default. Figures captions remain below the figure.*
> - *To add any new sections to the document, ensure that the appropriate header, body text styles, and section numbering schemes are maintained.*
> - *To update the Table of Contents, List of Figures, and List of Table right-click and select "Update field" and choose the option- "Update entire table"*
> - *Before submission of the first draft of this document, delete this "Notes to the Author" section and all instructions to the author or sample content, which appear throughout the document as blue italicized text enclosed in square brackets.*

Text highlighted in grey marks information specific for Driver+ Trials. This differentiation serves the purpose of contrasting project specific data, acronyms and roles used in Deliverables D94<N>.11 from the universal planning template that will be included to the Deliverable D922.21.

Revision Table

Issue	Date	Comment	Author
V0.1	23/02/2018	Initial version	Emil Wrzosek, Anna Foks-Ryznar (SRC PAS)
V0.2	<DD/MM/YYYY>	[Contribution to Section X.X]	
V0.3	<DD/MM/YYYY>	[Contribution to Sections X.X & X.X]	
V0.4	<DD/MM/YYYY>	[Contribution to Section X.X]	
V0.5	<DD/MM/YYYY>	[Contribution to Sections X.X & X.X]	
V0.6	<DD/MM/YYYY>	[Second draft]	
V0.7	<DD/MM/YYYY>	[Peer review]	
V0.8	<DD/MM/YYYY>	[Peer review]	
V0.9	<DD/MM/YYYY>	[Peer review]	
V0.10	<DD/MM/YYYY>	[Peer review]	
V0.11	<DD/MM/YYYY>	[Quality check]	
V0.1….	<DD/MM/YYYY>	[…]	
V1.0	<DD/MM/YYYY>	[Final approval and submission to the EC]	

The DRIVER+ project

Current and future challenges due to increasingly severe consequences of natural disasters and terrorist threats require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

4. Develop a pan-European Test-bed for Crisis Management capability development:
    - Develop a common guidance methodology and tool (supporting Trials and the gathering of lessons learnt.
    - Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
    - Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
    - Ensure the sustainability of the pan-European Test-bed.
5. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
    - Facilitate the usage of the Portfolio of Solutions.
    - Ensure the sustainability of the Portfolio of Solutions.
6. Facilitate a shared understanding of Crisis Management across Europe:
    - Establish a common background.
    - Cooperate with external partners in joint Trials.
    - Disseminate project results.

In order to achieve these objectives, five sub-projects (SPs) have been established. **SP91** ***Project Management*** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on Crisis Management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment (from the former SP8 and SP9) are part of SP91 as well. **SP92** ***Test-bed*** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93** ***Solutions*** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in SP93. **SP94** ***Trials*** will organize four series of Trials as well as the final demo. **SP95** ***Impact, Engagement and Sustainability***, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardization.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities, whose most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange on lessons learnt and best practices between Crisis Management practitioners as well as technological solution providers.

Executive summary

Trial Action Plan (TAP) is the main Trial planning document, facilitating collaborative planning and supporting combined execution. It covers all areas related to the Trial organisation and will be used to record efforts, circulate decisions and assess progress.

The TAP is a "living document", which means that at the submission date of the deliverable it will contain the current snapshot of the work in progress related to preparations of Trial 1. The version which is presented by this document reflects the preparation work done for the moment of beginning of Phase 3 what is right after Dry Run 1. It means that the document is in continuous up-date in line with new decisions and actions being realized in the course of preparation work by the Trial Committee and other involved stakeholders. This approach allows collecting all important arrangements, conclusions and effects of work in one place available to all DRIVER+ partners what makes TAP also a coordination and information sharing tool.

The document logs all important preparation aspects in order to ensure common and continuous understanding of the work already done and the present status of Trial 1 preparation. It addresses to the main elements of the Trial preparation and conduction like: management, research, methodological and evaluation aspects, involvement of internal and external solution providers and practitioners, organizational and logistical challenges, etc.

The presented version of the TAP includes agendas for all three main events which are Dry Run 1, Dry Run 2 and Trial X. Moreover, it presents:

- Methodological aspects of the Trial preparation including description of the solution selection process and its results for Trial X.
- A concept for the evaluation process including description of gaps selected for the Trial, general and specific research questions the Trial will respond to, initially identified key performance indicators for selected solutions.
- A concept for the trial conduction with finally selected scenario general and detailed description, infrastructural and organizational set up of the Trial, etc.
- Description of selected solutions, their potential for integration and location in trial context.

The TAP as a "living document" will be finalized just before the Trial and its final version will be presented to REA as an Annex to D94X.XX "Report on Trial Evaluation - Trial X".

Table of Content

Note: *Page numbers correspond to the trial action plan as an independent document, and not as an annex in this deliverable*

List of Figures

List of Tables

List of Acronyms

Acronym	Definition
CfA	Call for Application
C/DM	Crisis / Disaster Management
CM	Crisis Management
CMINE	Crisis Management Innovation Network Europe
COP	Common Operational Picture
CoW	DRIVER+ online Collaborated Workspace
D&C	Dissemination and Communication
ECM	External Cooperation Manager
KPI	Key Performance Indicators
PoS	Portfolio of Solutions
PR	Public Relations
SP	Subproject
SPCC	Subproject Coordination Committee
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TAL	Technology Availability List
TAP	Trial Action Plan
W '0'	Workshop "0"

1. Purpose and scope of the document

[The Trial Action Plan template is scalable, it may be adjusted to each Trial, depending on its type and scale. Certain chapters of the TAP may be edited and used as separate documents.
The Trial Action Plan, as a living document, is meant to be continually updated until the end of the phase C of the Trial preparation. Till then, the chapters will have separate maturity status. The TAP completing schedule correlated with Trial Event phases is described in chapter 0.1.]

The purpose of the Trial Action Plan (TAP) is to provide the detailed plan of Trial organisation and to facilitate the monitoring of Trial preparation activities.

The scope of this document covers all areas related to the Trial Event planning. The completion of the TAP chapters serves as an indicator of the Trial preparation progress.

Since the Trial planning and organisation is led by different actors, the TAP's chapters may have different owners. In order to facilitate the collaborative planning and monitoring of TAP completion, the framework of TAP reviews is provided in chapter 0.2.

1.1 Trial event phases and TAP completing schedule

The Trial event phases, which reflect the stages of Trial preparation, include 5 steps:

1. Phase A – The initial phase, which ends with Workshop "0".
2. Phase B – The main preparation phase which ends with Dry Run 1.
3. Phase C – The maturation phase which ends with Dry Run 2.
4. Phase D – The final preparation phase which ends with the Trial itself.
5. Phase E – The recapitulation phase which ends with the Trial evaluation report.

The preparation phases and the activities undertaken during each phase are presented in the workflow below (cf. Figure 1.1). The figure presents the activities necessary to be taken in order to organize the Trial in a structured manner. The relations between the activities are represented by arrows while the different colour codes specify the work done by the trial committee and other relevant stakeholders in frames of particular sub-projects.

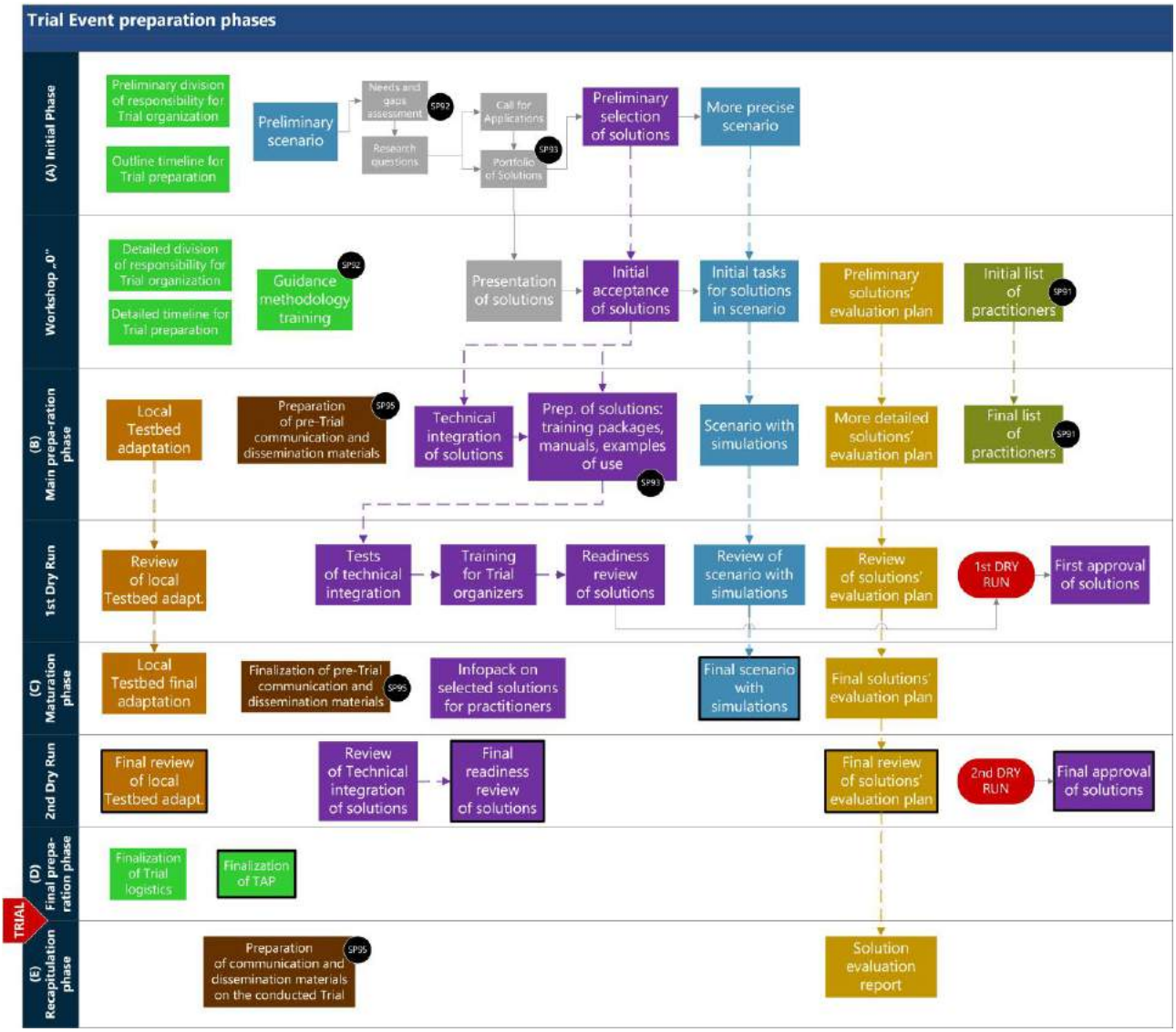

Figure 1.1: The Trial Event phases and their results

The TAP completing schedule provided in Table 1.1 below defines the required dates for the completion of different chapters and identifies the relations between the actions and processes to be undertaken during the Trial preparation. Its aim is to support the TAP completion monitoring in order to assure the Trial preparation within the determined time limits.

Table 1.1: TAP completing schedule[43]

Chapter	Due Date	Description	Needed for
Pre – Trial phase			
1.1	First 2 months of work	General Information on the Trial	Trial baseline, gap selection
Phase A – Initial phase, ended with Workshop 0			
3.4	Before Workshop "0"	Initial risk analysis and contingency planning	Continuous process, revised systematically during each phase and meeting
3.1.1 3.1.2	First month of initial phase	Trial Committee Other key functions	Trial management
6.1.3	Before Call for application	Initial state-of-the-art in scope of practitioners tools utilisation in possible Trial area of interest	
2.1	Before Workshop "0"	Gap analysis	Research Question (initial)
2.2	Before Workshop "0"	Trial objectives (specific)	
4.2	Before Workshop "0"	Research questions	Call for Application (solutions)
2.3	Before Workshop "0"	Local Platform – Technology Availability List	
2.4	Before Workshop "0"	Data collection plan	Initial solution evaluation plan
2.6	Before Workshop "0"	Solution assessment – method and outline	
2.7	Before Workshop "0"	Call for application formulation and results	Invitation for Workshop "0"
Annex 1	Before Workshop "0"	Identification of D&C procedures and needs by completing the D&C audit template	Completed audit questionnaire
Annex 2	Before Workshop "0"	Identification of needs and suitable profiles for External Cooperation by completing the External Cooperation audit template	Completed audit questionnaire
3.3	Workshop "0"	Timeline of preparatory activities	Trial management
8.8	Before Workshop "0"	Solution documentation (presentation, 2-pager, case study)	Workshop "0"

[43] Timing presented here is a recommendation rather than obligation. It should be development further (by the Trial Committee and SP40 leader) to fit each Trial needs. Taking into account the time schedule of DRIVER+ project, and its approach of learning-by-doing, the first two Trials are supposed to deviate from this plan.

Chapter	Due Date	Description	Needed for
Workshop "0"			
2.2	To be frozen during Workshop "0"	Research Questions - final confirmation	Baseline for Chapter 6 Trial Scenario development
5.1	Need to be frozen in first weeks of main phase	Solutions – Technology Availability List - confirmation	Solution assessment Scenario development
5.2	Need to be frozen in first weeks of main phase	Key Performance Indicators of solutions selection	Solution assessment Scenario development
3.3	Need to be frozen in first weeks of main phase	Timeline of preparatory activities – detailing	Trial management
3.1.5	Need to be frozen in first weeks of main phase	Identification of external participants to the Trial	Involvement of external stakeholders
6.1 6.2 6.3	Need to be frozen in first weeks of main phase	Scenario scope and story - detailing, Trial scenario elements. Plans for further development for Chapter 6 – Trial Scenario Building	Scenario development
6.4	Dry Run 1	Selection of triggering events (utilisation of tools in scenario presented as a table of scenario events that triggers a specific solution functionality)	Scenario development, Solution assessment
5.1	Workshop "0"	Solution – Technology Availability List - signed by solution providers.	Declaration includes obligatory results for tool admission AND the details about contact person for the solution.
4.2	Workshop "0"	Local Platform – Technology Availability List - declaration of participation from Test Bed solution providers.	As above
3.1.4	Workshop "0" (at least 3 months before Trial)	Trial participants - accepted list of practitioners to be invited for the event (participants, advisors, observers, other guests)	Invitation process
Phase B – Main preparation phase, ended with Dry Run 1			
6	Dry Run 1	Trial Scenario building. Freezing in a form suitable to carry on a first Dry Run.	Dry Run 1
4	Dry Run 1	Local Platform facilities - adaptation efforts for local Trial Platform. Platform utilisation diagrams and detailed planning. To reach the readiness to successfully conduct first Dry Run.	Dry Run 1

Chapter	Due Date	Description	Needed for
5	Dry Run 1	Solution utilization and assessment. Readiness for Dry Run 1.	Dry Run 1
5.3 5.4	Dry Run 1	Data collection plan and Solutions descriptions - ready to be tested during Dry Run 1	Dry Run 1
n/a	3 months before Trial	Preparation of material for external stakeholders and formal invitation of external stakeholders	Dry Run 1
8.8	One Week before Dry Run 1	Solution and platform instruction, training and dissemination documents review	Dry Run 1
4.3 5.7 8.3	One month before Dry Run 1	Local Platform – Training plan Solutions – Training plan Other trainings	Staff must be trained at the beginning or before Dry Run 1
8	Before Dry Run 1	Other organisational aspects	Dry Run 1
BEFORE DRY RUN 1, every chapter of TAP should be filled accordingly to present knowledge and every uncertainties should be marked to be tested during Dry Run 1. Trial Owners and persons responsible for their chapters and subchapters should study the document together and plan additional corrective actions if needed.			
Dry Run 1 – testing and training, maturation of scenario, final concept for solution utilisation in Trial			
		Training for participants– verification of what kind of training is needed to be organised and planning for it (solutions, test bed, other)	Dry Run 2
		First solution deployment and scenario run	Final list of Technical Requirements for the tools.
		Finalisation of the scenario development	round-table discussion around the scenario ended with final conclusion and freezing scenario plan, validation of personalised Sub-scenarios for each tool
		Report on invitation process status	Conclusion on practitioners participation
		Trial management	Risk analysis, impact assessment, Safety Plan, Contingency Plan for the Trial
		Test solution assessment	Conclusion on solution assessment and KPI measurements, maturing plan for scenario and scenario technology plan, conclusions for simulation efforts, conclusions for each personalised evaluation questionnaire

Chapter	Due Date	Description	Needed for
		Solution readiness	Validation of solution readiness (GO, NO-GO, Conditional GO)
		Dry Run 1	Conclusions on other activities, release of first Trial oriented Deliverable.
Phase C – Maturation phase, ended with Dry Run 2			
		Finalisation of integration processes	
		Sub-scenarios maturation process.	
		Maturation, and further development	Actions leading into freezing of each chapter of TAP
Dry Run 2 – team readiness test, playing the full Trial without external participants			
		Integration review	Final Validation of integration (Go / No-Go - if the tool will be integrated or work as a stand - alone platform)
		Internal dry run with roles and functional solutions utilised as it is planned for Trial	Final GO / NO-GO decision for each technical solution; Final modifications of the key EAP chapters: o "Exercise – scenario" o "Technical teams plan"
		Safety review	
		Final acceptance of exercise evaluation processes	Interpretation of a Dry Run 2 Trial evaluation (of technical solutions) general conclusions - to confirm the evaluation tools
		External stakeholders	
Phase D – Final preparation phase, ended with the Trial itself. Short, 1-2 week period for final arrangements			
		Final logistical arrangements	
		Freezing non-frozen chapters of TAP	Freezing the TAP

1.2 TAP review schedule and monitoring

[This chapter provides the schedule of TAP reviews, which should be conducted on a regular basis by Trial Owner (internal reviews) and the SPCC (external reviews). It is recommended to plan the internal reviews on a monthly basis during the Initial phase of preparation, and subsequently dense them up to a weekly basis in Maturation and Final preparation phases. The external reviews should be conducted at the end of each Trial preparation phase.

During internal rounds of reviews, the Trial Owner accepts or discards changes in the document and delete outdated comments. During the external reviews, SPCC assesses the progress on the document completion and gives the recommendation on further work.

Document versioning:

Before each internal review the Trial Owner should rename the TAP file by increasing the version decimal number (e.g. from v1. 14 to v1.20). Each external review should start with renaming the file by increasing the number of the version (according to the number relevant to the new Trial preparation phase: 0 – Pre trial phase; 1 – Initial phase; 2 – Main preparation phase; 3 – Maturation phase; 4 - Final preparation phase; 5 – Recapitulation phase) and zeroing the decimals (e.g. from 1.26 to 2.00).]

The framework of the TAP reviews includes internal reviews conducted by the Trial Owner on a regular basis and external reviews led by SPCC members at the end of each Trial preparation phase.

Table 1.2: TAP review schedule and monitoring

No	Type of review	Resultant TAP version	Planned date	Actual date	Author
1	internal				
2	…				
	external	V2.00			
	internal				

2. General information on the Trial

Chapter owner	**Name**	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

Location (Test bed)		Address and other necessary information
Date		Start and End dates of Trial, not preparatory activities.
Organiser		The authority responsible for the Trial organisation. It should not be confused with Trial Owner.
Trial type		It should also describe in the scale and type of the planned Trial: e.g. workshop, field, command post, table-top, map study (sand table), simulator based VR, other. If Trial combines characteristics of multiple types, please describe it further.

[This section serves as a first introduction for future readers and should not exceed one page. It should facilitate a general understanding of all aspects of the TAP. Information included in chapter 1 can be included in Informed Consent Forms used for the Trial.

The section may include maps or other appropriate information (only if needed for a better understanding).

It should include information on location, timing, scale of the Trial and other reference information. The table above or the description below might be expanded (if needed) to include other areas of interest (Threat, CM Phase, else).]

2.1 Purpose and scope of the Trial

2.1.1 Trial purpose and goals

[This section should include general purpose and not more than five goals (defined in specific, unambiguous terms).

The output of this step is a formulation in a manner that it is:

- *specific for the crisis management processes, tasks and roles that are envisioned in the Trial,*
- *measurable in that indicators of achievement of the objective can be defined,*
- *assignable in that it is clear whose performance is improved and whose solution is assessed,*
- *realistic in that desired improvement can realistically be achieved, given the setup of the Trial.]*
- *Time-related in that the duration of the (final) Trial is specified*

E.g. The objective of a Trial is to assess 1) whether crisis/disaster management capability gaps are closed, 2) whether C/DM processes, tasks and roles are improved, 3) whether the solution is used and actually does improve the above 4) whether the method and setup of the Trial help learn about whether the above objectives are achieved and to what degree.

- Content of this chapter should be included in the informed consent forms used for the Trials.

- This step cannot be carried out without having an in-depth understanding of the problems and of the context]

2.1.2 Trial Dimensions

[Trial Dimensions refer to the aspects that must be taken into account during the Trial (e.g. the validation of the test-bed from a methodological and technical perspective) For DRIVER+ Trials, this section should address objectives of Trials as (Dimensions of Trial[44]):

- *Trial Dimension: covers the perspective of trial host (typically Trial Owner[45]), and his needs that are not covered by two other dimensions.*
- *CM Dimension: key performance measurement in the context of whole CM system rather than singular solutions / tools / units.*
- *The Solution Dimension: evaluatory event aimed at solution utilisation and assessment in order to learn whether a particular solution has the potential to drive innovation in CM. Expanded further in chapter 5;*

Also, two other important perspectives should be taken into account:

- *Awareness and image influence (event that might influence public perception of any element it concerns- the SP95 perspective);*
- *Validation of Test-bed guidance, methodologies and infrastructure (the Test-bed perspective). Expanded further in chapter 8.5;*

2.1.3 Outline of the Trial scenario/aim (mission / objective / general user story)

[This section should provide basic description of the scenario context, such as general outline of the scenario area of interest, threats selected as interesting by end-users participating in Trial preparation, etc. It should mention nature of the event (e.g. exercise, research, demonstration), the planned level of reality during the Trial (real elements, simulated elements, virtual players). It should be concise and include only high-level information.]

[44] Broader descriptions included in *D922.21 Trial Guidance Methodology and Guidance Tool specification*

[45] but might cover viewpoints of other participating end-users, as trial might be considered as an event that belongs to each of its participants)

3. DRIVER+ methodology application

Chapter owner	Name	
	Function	
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

[This chapter should be completed in Initial Phase of Trial organisation and should be frozen after the Workshop "0" takes place. After this, further work should be conducted in sequent chapters from 3 - 8.

This chapter should be consistent with the iterative step-by-step approach: identify the objectives, formulate research questions, formulate data collection plan, formulate evaluation approaches and metrics, formulate scenario(s), select solutions.

The full explanation of the approach is described in Driver+ ***D922.21 Trial Guidance Methodology and Guidance Tool*** *under the chapters 3 and 4 . The Six Step Approach as presented below forms subchapter* ***4.2: Preparation phase****.]*

Figure 3.1: Six step methodology presented as continous circle of improvement

3.1 Gap analysis

[Gap analysis serves as a "tool" used to determine existing gaps in a given context. It may reveal areas that can be improved. Numerous assessment method could be used to carry out a gap analysis. The methodology described below was chosen for DRIVER+ project and is quoted here as an example only, and we strongly advise the reader to seek out the best working one for himself.

The method that was used in DRIVER+ consisted of following steps:

- *Desktop research conducted to identify and review relevant sources that provide relevant information to the identification and analysis of gaps in the selected interest area.*

- *Validation workshop. Consolidation of received information to be used as input to a one-day validation workshop conducted with available end-users as well as with invited thematic experts and practitioners.*
- *Second revision acquired by sending the workshops results to other external experts.*

The further information about gap selection methods that was used in DRIVER+ project is covered in Deliverable D922.11 "List of CM gaps".

This chapter should draw on the results of gap assessment workshop / meeting.]

3.1.1 Brief description of chosen gap assessment method

3.1.2 List of selected and validated GAPs

Name	Gap description	Interdependencies with other gaps	Gap priority[46]	Comments

[The gaps listed above should be used as a baseline for the call for application, and therefore should stay aligned with it. Also, gaps should reflect the objectives of the Trial mentioned in chapter 2. The objectives should be strictly aligned with the gaps.

Also another information might be put here: process the gap is affecting, already known solutions that can be used, context of the gap (legal, standards, law), expected capability increase.]

3.2 Trial Objectives (specific)

[Identification of the Trial objectives. In this step the most important gaps that have been described in chapter 2.1 should be reformulated as prioritized objectives in a Trial. In addition, it should be determined what effect solutions should have to solve operational problems (e.g. improved decision support, uninterrupted communication even under harsh weather circumstances, etc.).]

3.3 Research questions

[The specific process for formulation of proper research questions is defined in D922.21. The result is a formulation of a research question about the relation between the solution, the C/DM capability to be improved, the performance of C/DM processes, tasks and roles. A question about the relation between these topics that can be answered in the Trial by gathering valid evidence.

This section should consist of an overall research questions which has a clear relation to the Trial objective and to gaps previously selected and confirmed. The main research questions can be divided into sub- research questions which contribute to a specific sub-objective (application area) and indirectly address the main objective.]

[46] To properly prioritise the GAPs, we should consider the results of GAP confirmation meeting / workshops with the end users and the feasibility to realistically confront that gap in available platform, and inside realistic budget. It might be expressed qualitatively as, e.g. primary & of less importance or on a points scale (e.g. 1-5).

3.4 Data collection plan - method and outline

[In this step for each of the research questions that has been formulated in step 2, is determined by which key performance indicators the requested impact can be measured. A data collection plan has to be developed that describes in which way all required kinds of data will be collected (measured), by whom or by which means, during the Trial. This should be done in a clear and consistent way to avoid unambiguousness and to get data of good quality. This plan should enable answering the research questions.

Detailed KPI selection is further explained in chapter 5.2.]

3.5 Analysis Techniques

[In this step is formulated how the data collected during Trials will be analysed. It is described which techniques will be used and how analysis results will be reported (i.e. answers on research questions and conclusions to which extent Trial objectives have been met).]

3.6 Initial scenario for Call for Application

[This section should base upon "Outline of the Trial scenario" subchapter in chapter 1 and expand the initial scenario outline enough to formulate Call for Application. It should be avoided to put too much information here, as this might negatively affect the results of CfA. The definitive, detailed scenario containing events, episodes, timeline will be further explained in ***Chapter 6. Trial scenario building.***

Scenario must be realistic in the sense of the context of the end-users and the environment in which they operate. The scenario should contain all key elements that are related to the gap.]

3.7 Call for application formulation and results

[This chapter should be present only in DRIVER+ internal deliverables. Call for application is a specific process of unbiased selection of solutions for Trial, that is not meant to be a part of the methodology, as we do not want to impose any acquisition method for the tools that are meant to be trialled.]

3.7.1 CfA announcement formulation

[The content of announcement that was published as a CfA.]

3.7.2 Results of CfA

[A general summary of CfA results (time and place of publishing of the announcement, time restrictions, number of applicants, blind selection results, list of solutions selected, reasoning beneath the selection).]

3.7.3 List of selected solutions

Solution name	Solution provider	Relevant gap (s)	Relevant research question (s)

4. Trial planning

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

4.1 Division of responsibilities

[This section should identify key persons responsible for different aspects of the preparation process and the conduct of the Trial.

Typical functions are identified in the table. If a function that would benefit from practical familiarity with local Trial context is assigned to person not acquainted with local specification, it is advised to nominate a support person for him.]

4.1.1 Trial Committee

Role	Name	Scope of responsibility
Trial Owner		- Work-package-level decision making. - Personal responsibility for the overall management and success of the Trial. - Acceptance of gaps, scenario and solutions selection for the Trial. - Coordination of the Trial Committee. - Representation of the Trial on project meetings.
Solution Coordinator		- Leading, controlling, utilisation and assessment of solution integration process . - Assessment of the real maturity of technical component. - Facilitation of the solution selection process. - Supervision of training for the usage of selected solutions.
User coordinator (Platform)		- Selection of, communication with, and moderation between practitioners through Trial Platform and attended workshops. - Collection of the initial list of gaps. - Collection of necessary information from practitioners on request of other partners. - Leading the task of Event Logistics and Platform adaptation. - Supervision of all local logistic arrangements.

Role	Name	Scope of responsibility
Testbed Infrastructure support		- Ensuring overall local test-bed is ready for Trials. - Communication with WP924 Partners. - Leading testbed integrations (including technical testbed solutions). - Leading the technical part of simulation, - Providing interfaces to connect CM solutions to the platform.
Testbed Guidance support		- Ensuring usage of SP92 guidance and methodology in all tasks. - Supporting the Trial-owner in setting up the 'Trial Specific Test-bed' validation plan. - Providing training sessions for the usage of the guidance solution and methodology.

4.1.2 Other key functions

[The table above is meant to address the roles used in DRIVER+ Project as a Trial Committee.

For future users of this Template document, it might be easier to use more conventional division of responsibilities presented below

Complete list of staff that is preparing the Trial and the responsibility matrix for them might be also placed here or put into annexes.]

Function	Name	Scope of responsibility
Main organiser (Trial Owner)		- Coordination of the whole event. - Overall responsibility for the success of the Trial. It is recommended that the Main organiser role is limited to the strategic-level decisions, with all other decisions being delegated.
Event coordinator		- Coordination of all activities during the event, including the Trial, support activities, public events, etc. It is recommended not to merge this role with the Main organiser role.
End users coordinator		- First contact with relevant End users, support for External Coordination Manager in contacting the End users and informing them on the Trial
Scenario coordinator		- Coordination of selection of gaps and research questions for Trial, - Preparation of the scenario and coordination of solution oriented episodes. - Integration with technical component. - conducting the Trial.

Function	Name	Scope of responsibility
Technical coordinator		- Coordination of the technical component. - Preparation and updating of the Technology Availability List. - Evaluation of the real maturity of the technical component available for the Trial.
Training coordinator		- Conducting of training (in use of technical solutions provided for the Trial).
Logistic coordinator		- Coordination of logistical planning. - Ensuring effective flow of information between participants. - Solving all last-second logistical issues. This role may be merged with the Event coordinator role.
Trial supervisor (Director)		- Accepting the Trial scenario. - Controlling flow of the Trial (starting, stopping the Trial, deciding about injects). Usually it should be a person with user experience. This role may be merged with the Scenario coordinator role.
Safety officer		- Overall responsibility for the safe conduct of the Trial. - Has the absolute authority to stop any activity during the Trial. This function must not be combined with any other Trial responsibility.
Solution assessment conductor		- Conducting and coordinating the assessment of utilised solutions.
Methodology validation conductor		- Conducting and coordinating the validation of Test-bed guidance, methodologies and infrastructure.
First Impression evaluator		- Conducting and coordinating of the validation of event reception.
Review leader		- Conducting the Status Reviews and the Trial Readiness Review.
Media Officer		- responsible for Dissemination and Communication activities during Trial preparation and execution. - responsible for maintaining the image of a project and Trial, gaining publicity and disseminating information to media representatives. Maintains the database of media contacts, plans media contacts during Trial.

Function	Name	Scope of responsibility
External Cooperation Manager (ECM)		- (supporting the) selection and invitation of project external solution providers and practitioners - registration of project external solution providers and practitioners - expense reimbursement for project external solution providers and practitioners - collection of feedback from project external solution providers and practitioners

4.1.3 Trial organiser support

[This section should identify all groups supporting different aspects of the Trial, i.e. personnel, that will not participate in the actual Trial. Typical support functions are identified in the table below.]

Support group	Name/Company and contact details	Scope of responsibility
Security team		- Isolating the Trial area from the public access.
Medical team		- Providing medical assistance in case of real accident during the Trial. In certain cases this function may be performed by the medical team participating in the Trial but it requires dedicated communication arrangements for the real emergency situation.
Catering crew		
Cleaning crew		
PR team		Media relations plan, define the press release, social media
VIP host		VIP control

4.1.4 Trial participants

[*This section should identify organisations participating in the actual Trial.*

Limitations of the availability should be identified (e.g. first responders - not available in case of real incident). The technical teams (personnel supporting the use of technical solutions) should not be identified here, unless they operate as individual user groups.

This list should not contain any personal details. It is to identify the organisations that are willing to delegate their personnel to participate in Trial.

The name list with identities of participants should be stored separately with respect to local laws on protection of personal data (see chapter 8.5 Research Ethics and Informed Consent Forms]

Participating group	Confirmation of participation[47]	Number of anticipated participants	Comments (e.g. limitations - conditions of availability)

[47] Status: initially informed / invited / confirmed / to be confirmed later (date) / conditional availability (explain) / other (with suggested action)

4.1.5 Involvement of external stakeholders

4.2 Command structure during the Trial

[During a Trial the command structure and the mechanisms of coordination of activities reflect reality only partially. For this reason it is important to clearly define command arrangements for the Trial. In particular all differences from the real arrangements should be clearly identified, as well as those elements, which are simulated or ignored.]

4.3 Timeline of the preparatory activities

[It is recommended to plan the Trial accordingly to the trial phases, which reflect the stages of Trial preparation:

Phase A – Initial phase, ended with "Workshop 0",

Phase B – Main preparation phase, ended with Dry Run 1,

Phase C – Maturation phase, ended with Dry Run 2,

Phase D – Final preparation phase, ended with the Trial itself,

Phase E – Recapitulation phase, ended with the Trial evaluation report.]

4.3.1 Gantt chart of the Trial preparation process

4.3.2 Weekly timeline of the Trial preparation process

[Preliminary schedule for Trial 2 (as for February 2018) is used here for example purposes only. Every week during which none major event (e.g. Dry Run) is being hold is marked here. It helps to plan the upcoming work realistically. Weeks with events are discarded due to reasoning that even if the event does not take a full week, it is a substantial work disturbance and as so it shouldn't be taken into account.]

2018																		
February		March				April				May					June			
19.02-23.02	26.02-02.03	05.03-09.03	12.03-16.03	19.03-23.03	26.03-30.03	02.04-06.04	09.04-13.04	16.04-20.04	23.04-27.04	30.04-04.05	07.05-11.05	14.05-18.05	21.05-25.05	28.05-01.06	04.06-08.06	11.06-15.06	18.06-22.06	25.06-29.06
-26	W"0"	-25	-24	-23	-22	XXX	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	DR1

2018			
July	August	September	October

2018															
02.07-06.07	09.07-13.07	16.07-20.07	23.07-27.07	30.07-03.08	06.08-10.08	13.08-17.08	20.08-24.08	27.08-31.08	03.09-07.09	10.09-14.09	17.09-21.09	24.09-28.09	01.10-05.10	08.10-12.10	15.10-19.10	22.10-26.10
-10	-9	-8	-7	XXX	XXX	XXX	XXX	XXX	-6	-5	-4	-3	DR2	-2	-1	T

XXX – weeks not to be considered due to unavailability of key personnel

DR1 – 1st Dry Run

DR2 – 2nd Dry Run

W"0" – Workshop „0"

T – Trial planned date

4.3.3 Trial preparation milestones, action points and organisational meetings

[The table below should be filled with the details concerning main organisational meetings, e.g. Workshop "0", Dry Run 1, Dry Run 2, Trial Committee meetings]

Meeting / Milestone	Time and place	Responsible person

4.4 Risk analysis and contingency planning

[In this chapter the key risks and potential countermeasures should be identified. Risk analysis should cover the whole planning process, as well as the Trial itself. Corrective actions should include both prevention measures (actions to minimise the risk) and countermeasures (pre-planned actions to be taken in case of risk occurrence). The recommended scale for the probability of occurrence and severity of consequences is: Low, Medium, High.]

Risk[48]	Likelihood	Severity	Risk Index	Corrective action[49]
Description	1-5	1-5	P x S	

[48] Detailed table for most important Risks (try to group the risk if appropriate), e.g. the matrix method with score range between 1 and 5, and further categorisation (low, med, high, extreme);

[49] Minimising the risk, mitigation actions, insurance with responsible persons;

5. Local Platform facilities

Chapter owner	Name	
	Function	
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

5.1 Local Platform – description

[Briefly describe the facility. Present maps or photos here (if available). List technologies and systems used for training, exercising or trialing.]

5.2 Local platform & Test-bed technology availability list

[Special equipment and infrastructure made available specially for the Trial should be also described here.

This section does not cover technical component provided by solution providers for the Trial.]

[For DRIVER+ Trials: list of Test Bed solutions that will be utilized during Trial.]

No	Equipment / infrastructure	Confirmation of availability [Y/N/TBC]	Limitations (conditions of availability)

The description of each technology available in the Platform during the Trial is provided below.

Technical system	[Each technical component / subsystem of importance for Trial should have its personalised table. If needed, further information might be enclosed as annexes or put in other documents.]
Codename	
Responsible person (name, e-mail, mobile)	
Contact and communication details during preparatory activities	
Contact and communication details during Trial	
Oher logistic information	
Detailed list of activities planned in the Trial	

• Lore ipsum •
Planned preparatory activities (deployment, configuration, tests, etc.)
• •
Requirements related to preparation and use of technical system (power, water resistance etc.)
• •
Risks
•
Other comments
•

5.3 Local platform – training plan

5.4 Platform adaptation and integration

[Platform adaptation and integration to carry out the Trial.

The adaptation / integration actions listed as here should be considered as unusual to platform day-to-day business – requiring additional effort. Doesn't matter if it comes from Project partners, as a subcontracted effort or from any other sources.

***Adaptation:** changes and additions to existing platform that needs to be bought / rented / brought by partners and installed.*

Rearranging existing subsystems into platform for the sake of Trial E.g.: rearranging chairs, building some temporary construction, buying new equipment, listing the work that needs to be outsourced.

***Integration:** process of adding new subsystems into platform (temporal), installing software, connecting tools (e.g. computers).*

It is preferable to provide as much information as possible here in a graphical form (e.g. system integration diagram) rather than as text description.]

5.5 Platform utilisation in the Trial

5.6 Platform evaluation plan

6. Solutions utilization and assessment

Chapter owner	Name	
	Function	
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

[Format of the chapter is dependent on information provided by SP93.]

6.1 Solutions – Technology Availability List

[Information on individual solutions available during the Trial, including non-technology solutions e.g. methodological, organisational, training]

No	Solution name	Initial acceptance Y/N/Conditional (explanation)[50]	First approval Y/N/Conditional (explanation)[51]	Second approval Y/N[52]

6.2 Key Performance Indicators of solutions

[KPI definition, according to D921.21: "Key performance indicators (KPIs) represent "a set of measures focusing on those aspects of organizational performance that are the most critical for the current and future success of the organization" (Parmenter, 2010). The identification of KPIs is crucial as it provides a way to quantify the outcomes of a Trial and assess the performance of the trialled solutions."

The goal is to define metrics (KPI's) that indicate 1) whether objectives are met, 2) enable to determine relations between the objectives as specified in the research question, 3) in a way that data can be gathered in the trial.

It should be put in explicitly clear way - how the KPI's are related to the gaps that need to be closed, or the goal of the Trial.

What KPI's indicate the performance of C/DM processes, tasks and roles?

What KPI's indicate performance of the solution?

What KPI's indicate use of the solution?

What KPI's indicate improvement of C/DM processes as a result of using the solution?

Etc.]

[50] Initial acceptance during Workshop "0"

[51] First approval based on solution performance during Dry Run 1

[52] Second approval based on solution readiness, integrations with scenario and its performance during Dry Run 2

6.3 Data collection plan

[A data collection plan has to be developed that describes in which way all required kinds of data will be collected (measured), by whom or by which means, during the Trial. This should be done in a clear and consistent way to avoid unambiguousness and to get data of good quality. This plan should enable answering the research questions.]

6.4 Solution descriptions

[Description of solutions must include information about their functionalities, level of maturity general way of use, necessary input information/data for using, result of using, format of output data etc.

The solutions of the highest interest for the purpose of scenario preparations should be identified.

Identification of the key gaps and needs addressed by the solutions.

For DRIVER+ it is recommended to insert here just a quick wrap up in]

6.5 Technical teams plan

6.5.1 Utilisation of "SOLUTION_1"

[Participation of the technical personnel representing providers of technology will be needed for several systems planned to be used in the Trial. That personnel will be organised in technical teams. Technical teams may be independent participants of the Trial (acting as user groups). Their role is to provide active assistance as part of user groups and to be ready for troubleshooting without active participation.

Role of each technical team should be described in a separate table. Content of each table should be provided by the appropriate responsible person and verified by the Technical coordinator

Final content of the document must be accepted by the Event coordinator.]

Solution	
Codename	
Responsible person (name, e-mail, mobile)	
Contact and communication details during preparatory activities	
Contact and communication details during Trial	
Oher logistic information	

Detailed list of activities planned in the Trial
• •

Key Performance Indicators		
KPI	way of measurement	person(s) responsible for measurement

Planned preparatory activities (deployment, configuration, tests, etc.)
• •
Needs related to preparation and use of solution (power, water resistance etc.)
• •
Risks
•
Other comments
•

6.5.1.1 Expected solution results:

[This chapter will differ depending on solution type. It might be presented as a list, a table, a set of screenshots or just a list with link to other directory where results are stored.

Exemplary solution output that is generated by it (or its components – tools). It should resemble the outputs (for example: tactical maps with dispersion models on it) that are expected from participants. It should consist of every constitutive element that is used normally in the process. (e.g. raw ortophotomap, raw dispersion model) together with final product (map with model on it). That assist Trial flexibility. If for some reason any element fails, in further steps a pre-prepared substitute can be used, thus not preventing next episodes to be trialled.

It also should allow other partners to easily understood the solution and its contribution to the Trial scenario.]

6.6 Solutions interactions during Trial

6.7 Solutions – Training plan

6.8 Solutions - evaluation plan

7. Trial scenario building

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

[This chapter presents the example of scenario documentation.

Different Trial leaders may create different formats of documentation.]

[The Trial scenario part (user component) should be prepared by the Trial Owner together with the Scenario Coordinator. The technology part (technical component) should be prepared by the Technology Coordinator. ***Work on this chapter should start not earlier than after solutions are at least initially selected.***

The basic check for completeness of the table: performance of all activities described and only those should result in successful completion of the Trial goals.]

7.1 Scenario scope

7.1.1 Scenario justification

[Why this scope of scenario has been chosen?]

7.1.2 Level of realism

[Level of realism of the actions, procedures, immersion level. This subchapter should include the description of the Trial scenario environment (if the scenario takes place in a real or fictive environment.]

7.1.3 State-of-the-art

[How that scenario is being solved by practitioners now, including list of tools and systems that are used in interesting areas of response (e.g. COP tools that are currently being used).]

7.2 Scenario story

[Initial situation and the whole storyline (plot) of the scenario.]

7.3 Trial scenario elements

The subsequent Trial scenario elements are provided in the table below. Each scenario element is described by:

Situation/action: description of situation development and all actions performed by the user teams and the other actors of the Trial. Description should include actors, their location and action performed.

Real time: self-explanatory

Operational time: time counted from the event initiating the Trial, starts from 0:00. This timing represents length of all elements of operation, including those logically linked but not performed during the Trial.

Injects: actions and pieces of information delivered to the Trial actors to change their actions. Injects are initiated by Trial supervisors to control flow of the Trial (e.g. call to emergency number).

Simulated elements: all activities performed to simulate elements of the Trial environment. In particular, simulated elements include wounded and dead persons. Other examples may include arrangements inside the building or written information about contamination delivered to person conducting measurements.

Needed capability: potential opportunities to use new technologies. These opportunities are initially identified by authors of the scenario and they may or may not be addressed by technical component.

[This section may be presented in the Excel document.]

Table 7.1: Trial scenario elements

No	Situation/action (location, actors and activities)	Real time	Operational time	Injects (with inject number)	Simulated elements	Needed capability (technology)

7.4 The scenario – technology plan

[The scenario – technology plan presents the connections between scenario elements that serves as a trigger for utilization of specific solution or solutions functionality. The solutions related to the particular scenario elements are presented in the table below.

[Each line describes use of particular system in the situation defined by the scenario element (situation/action). More than one line can be used for the single scenario line.]

The technical component is described by the following columns:

Situation/action number: refers to the item in table

Solution: solution provided as part of technical component of the Trial.

Function: operational function performed by the system. This column is of particular use when technical system can be used to perform more than one function.

Description of use: self-explanatory.

User training requirements: identification of all skills necessary for users to effectively perform planned task with the technical system. Training must cover all requirements identified in the document.

Role of technical assistance: use of some systems may require active participation of technical teams (providers of technologies). Both active participation of technical teams and assistance for potential troubleshooting should be described.

Table 7.2: Solutions in Trial

Situation /action number	Solution	Function in scenario	Description of use in scenario	User training requirements	Role of technical assistance

This project has received funding from the European Union's 7th Framework Programme for Research, Technological Development and Demonstration under Grant Agreement (GA) N° #607798

7.5 Control of the Trial flow

7.5.1 Start of the Trial

[How the Trial starts (who can start it, how the information spreads, by what means of communication?)

Is there any introductory information provided for participating teams to understand the situation existing at the beginning of the Trial?]

7.5.2 Location of user teams at the beginning of the Trial

[Where each person is when the Trial starts? Who controls that?]

7.5.3 End of the Trial

[Who can end the Trial (including PAUSE / STOP forced by some emergency / safety requirement)?

How is the information about the end of the Trial communicated?]

[Is there any narrative provided immediately after the Trial? Are there any auxiliary activities for participants planned and who manages them?]

7.5.4 Action of the user teams after receiving the end signal

[What action should be taken by the user teams after the end of the Trial?

Where is the meeting point?]

7.5.5 Control of the Trial

[Who and how can control the flow of ongoing Trial? Who can run new inject, who can (has the authority to) force PAUSE (technical PAUSE; Rewind & Re-Do, etc.) or add new elements to the STOP the Trial - who and how (by what means of communication) will disseminate this information.

This section also describes planned reactions of Trial supervisors in case Trial action deviates from the planned direction.

Where the Trial Supervisor (Director) "sits" during the Trial, where the simulation team and observers are?

The description, role, decision making authorities and communication measures of Trial simulation team.]

Deviation from the plan	Corrective action / alternative inject

8. Organisation and logistics

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

[Please keep in mind filling this document that the word Trial might be understood by two means:

- *As an event, from arriving till departing.*
- *Or, more precisely as a part of that event, that aims directly at trialling the solutions.*

*Therefore we suggest to discriminate those by strict use of word: **"Trial Event"** and **"Trial"**.*

Trial Event might be described as: All preparatory activities and other important but auxiliary processes that are related to the Trial and take place directly before or after the Trial.]

8.1 Trial Event actions and timeline

[This section identifies all activities associated with the Trial, excluding the Trial itself.

Some proposed activities have been identified. Activities which are not described in other chapters, should be explained in chapter 7.4 Auxiliary Activities or in annexes.]

Time and location	Activity	Responsible person (name, e-mail, mobile)
	Technical component deployment – configuration, tests	
	Technical component – final validation and the integrated acceptance test	
	Training – the refresher session	
	Preparation of the Trial site	
	Trial Readiness Review	
	Final technical briefing	
	User component deployment	
	The Trial	
	"Hot" evaluation	

8.2 Dry Run 1

[Dry Run is meant to be a rehearsal before the Trial. The goal is to find potential issues and check processes for optimization.

1st Dry Run is conducted to realistically check assumptions and arrangements for the Trial. Therefore it should be conducted with "as-realistic-as-feasible" approach. This means – organiser should try to act as he plans to during upcoming Trial, however re-does and time-brakes are allowed if productive.

It is advised to merge Dry Run with technical component test deployment and integration. However, that might also be held as separate face to face meeting.]

8.2.1 Dry Run 1 review checklist

Review name	Responsible person (name, e-mail, mobile)

8.2.2 Conclusions and Lessons Learnt

[The list of conclusions and most important notes extracted from the review sessions. This subchapter should be filled as a list of short points.

The broader list (with a complete explanation contacting: description (what happened), results (why it is important) and the lesson) may be provided in the documentation of Reviews as an Annex]

8.2.3 Actions and decisions

[The decisions and actions resulting from the Dry Run 1, which are not included in documentation of Reviews.]

Action	Due Date	Responsible person (name, e-mail, mobile)

Decision	Due Date	Responsible person (name, e-mail, mobile)

8.3 Dry Run 2

[2nd Dry Run is conducted as a final Trial rehearsal. Therefore it should be conducted witch "as-realistic-as-possible" approach. This means – all organisers should act exactly as it is planned for the upcoming Trial, re-does and breaks should be avoided. The goal is to finally test all processes, look for unexpected issues and confirm the readiness.]

8.3.1 Dry Run 2 review checklist

Review name	Responsible person (name, e-mail, mobile)

8.3.2 Conclusions and Lessons Learnt

[The list of conclusions and most important notes extracted from the review sessions. This subchapter should be filled as a list of short points.

The broader list (with a complete explanation contacting: description (what happened), results (why it is important) and the lesson) is to be found in documentation of Reviews, in Annex X.]

8.3.3 Decisions and Actions

[The decisions and actions resulting from the Dry Run 1, which are not included in documentation of Reviews.]

Decision	Due Date	Responsible person (name, e-mail, mobile)

Action	Due Date	Responsible person (name, e-mail, mobile)

8.3.4 Training agenda

[Agenda of actions conducted as a apart of Training session that might be planned for Trial participants.]

8.4 Auxiliary activities

[This section describes other aspects of the event, in particular those that are auxiliary to the Trial (i.e. press briefings, evaluation session, organised transportation, social evening). It provides information about all activities not covered in previous TAP chapters.]

8.5 Communication plan

[Description of the communication arrangements between all groups participating in the Trial event and supporting it. The description should include the communication arrangements for the event as a whole and the communication arrangements during the Trial (communication between the user groups, the support groups, the Trial supervisors).]

[The communication plan during a Trial should take into account:

- *the needs of the technical teams;*
- *emergency communication (The means of communication that will be used in case of the real emergency occurring during the Trial. This section should include definition of code word for the real emergency (i.e. "real emergency"));*
- *safety communication (The means of communication that will be used in case of accident or safety issue occurring during the Trial. This section might;*
- *definition of cryptonyms and code words (if needed).]*

9. Other organisational aspects

9.1 Framework conditions

[This section defines all fundamental principles of cooperation of different institutions in the event. If deemed necessary, this section can be signed by representatives of all institutions before beginning of activities. The following principles are offered as a potential baseline.]

9.1.1 *Liability*

Partners will retain guardianship of their respective equipment and the right to authorise or stop conduct of any test activities. Activities that represent risk of destruction of property may be conducted, if sufficiently planned in the scenario. Written statement confirming awareness of risk of destruction might be required.

Organiser will not accept any liability for the loss of life, personal injury or property damage.

Individual insurance coverage can be arranged by partners. Joint insurance coverage could be arranged if partners choose so, but its costs would be divided between partners.

9.1.2 Costs

[E.g.: Each partner participating in Trial activities will cover its own costs, including transportation, local accommodation and provision of meals.

Detailed arrangements will be defined below, with costs covered by organisers explicitly defined.]

9.2 Safety plan

Chapter owner		**Name**	
		Function	Trial Owner
		e-mail	
Date	**Changes**		**Author**
<DD/MM/YYYY>	[Initial draft]		<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]		

[This section should also contain information on safety measures: access control, ID badges, required safety equipment (i.e. helmets, high-visibility vests).

[If deemed appropriate, independent safety audit may be conducted on the basis of the Trial Action Plan. It should be conducted by the person not involved in organisation or execution of the Trial. This person should also not be professionally or personally related to Safety officer. Results of the audit should have a written form and include requests for change of the plan, if necessary. The final frozen version of this chapter should reflect findings of the safety audit.]

9.2.1 Safety principles

[This section defines fundamental principles of cooperation of different institutions in the event. If deemed necessary, this section can be signed by all participants (on personal basis) before the beginning of activities.]

9.2.2 Safety rules

[If appropriate, safety rules may be defined by safety officer. Safety rules define clear boundary conditions of Trial participants' activities. Safety rules may be formulated as requirements for individual activities.

Arrangement for safety communication should be covered by the communication plan.]

9.2.3 Safety authority structure

[If necessary, safety authority structure may be defined. Normally it is required only if potentially risky activities will be conducted in parallel and therefore physical presence of the Safety officer is not possible.

9.3 Other trainings

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

9.4 Research Ethics and Informed Consent Forms

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

[This chapter should describe following issues:

- *Recruitment of participants in research - Informed consent;*
- *Protection of Privacy;*
- *Obtaining ethics approvals (From Data Protection Authority/ Research Ethics Office/ Ethical Committee or similar in the country/ region where the activity is taking place or where the organiser resides should be consulted, given notification etc.)*
  - *Decide if you need approval;*
  - *Identify where to apply for approval;*
  - *Submit the application/ notification;*
  - *Particular to DRIVER+]*

[This chapter will include the content (in full version or shortened into a form of a summary, TBD) from the Ethics tiles from DRIVER+ COW

https://projectdriver.sharepoint.com/sites/DriverPlus/Lists/Ethics%20tiles/Tiles.aspx]

9.5 Trial Guidance Methodology and Guidance Tool evaluation plan

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

[The scope of this section is to record information that supports a collaborative execution of planned activities in scope of Trial Guidance Methodology and Trial Guidance Tool evaluation. The aim of the description is to give an overall overview of processes planned for Trial, in order to avoid the need to digest the whole evaluation oriented documentation.

This section should be concise in content, and should not be longer than half to two pages.

This section does not directly cover the 3-dimension (Trial, crisis management and solution dimensions).

9.5.1 Evaluation execution overview

- *[Performance Indicator table / list (if any KPI are planned to be measured) – including information on who will measure them, when, where and how.*
- *Team – task and roles (name, function, and detailed timetable of tasks for each person / group) – (who?, where?, when?, with what equipment?, why?).*
- *Evaluation execution detailed timetable (should be compared with general Trial and Trial Event timelines to detect discrepancies).*
- *Planned training sessions for evaluators.*
- *List of evaluation documents (including questionnaires, manuals, etc.).*
- *How the data will be collected, stored and processed and by whom?]*

9.6 Other logistic

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

- *[Is there a single information pack prepared and distributed?*
- *Are specific needs of individual participants covered? Will individual participants confirm before the event that they have sufficient information about practical arrangements?*
- *Is there a procedure foreseen for communicating updates of the plan?*
- *Is there a clear division of responsibility for last-moment and on-site decisions? Are contact information for responsible people provided?*

Chapter should consist of information such as: if and by who following documents will be prepared, accepted, reviewed, disseminated in digital form and printed. Event Agenda

Logistic information (travel, accommodation, info-pack, ID badges, technical requirements, other)]

9.7 Public relations plan (including baseline message)

Chapter owner	Name	
	Function	Trial Owner
	e-mail	

Date	Changes	Author
<DD/MM/YYYY>	[Initial draft]	<First name, Last Name, Organisation>
<DD/MM/YYYY>	[Contribution to Section X.X]	

[Is there a baseline message for the public defined (comprehensive and complete information about the event)?
What is a target audience? What is the intended result of PR activities?
What communication channels will be used? How information will be distributed before, during and after the event?
Will there any information be available on-site (for passers-by)?
Information about Trial for locals / local media – exemplary template.]

9.7.1 Dissemination and Communication about the Trial towards the external stakeholders and participants

[The principles of project DRIVER+ D&C can be found in the COW (internal collaborative workspace) in Project Handbook.]

What should mandatorily appear in any material used to conduct the Trial? (Grant Agreement and EC Guidelines)

- **Information on EU funding.** All partners are requested to indicate at all times that the project has received funding from the European Union, using the following:
  - Display the EU emblem (When displayed together with another logo, the EU emblem must have appropriate prominence.)
  - Include the following text: "This DRIVER+ project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under Grant Agreement n° 607798
- **Disclaimer excluding the Research Executive Agency and the European Commission responsibility** In addition to the above, the following disclaimer should be included: "The opinions expressed in this document reflect only the author's view and reflects in no way the European Commission's opinions. The European Commission is not responsible for any use that may be made of the information it contains."
- **Project logo** The project logo should be included on all the presentation and communication materials. It can be found in raster format with transparency (PNG) in the internal collaborative workspace, here. Whenever possible, it is recommended to always place the project logo on the front page of the document and the EU logo at the left side of the footer of the first page in the document.

9.8 Solutions documentation

[Solution instruction, training and dissemination documents that are planned to be published. Every solution is expected to be included into TAP as additional chapters.

As a minimum, reference to all user manuals, PoS entries, presentation slides and a short (1/2 page) and broader 2-page descriptions should be presented. This includes solutions present in PoS and participating as a part of platform (simulation, communication, command tools)

Solution provider is expected to provide at least one document, based on a case study (story of use, realistic or fake), describing how the tool is being used (in a step by step manner)]

9.8.1 Solution #1…

9.9 Authorisation and registrations for Trial

Any kind of official authorisation, registration of Trial as an event or any other parts of the Trial (registration of equipment, approvals to use e.g. Drones)

9.10 List of other planning documents

[Other planning documents can be created as needed. They can be included into TAP as additional chapters.

As a minimum, reference to all planning documents should be presented]

References

1. *Simplified Airblast Calculations.* **Swisdak, M.** Miami, FL : s.n., 16-18 August 1994. Proceedings of the Twenty-Sith DoD Explosives Safety Seminar.

2. **FEMA.** *Developing and Managing Volunteers - Independent Study.* Emmitsburg, MD, USA : FEMA Independent Study Program, February 2006.

3. **Alberts, David S.** *Code of Best Practice for Experimentation.* Washington, D.C. : Command and Control Research Program Publications, 2002.

[How to Create a Reference List in MS Word]

[1. First, manage your sources in Word 2007/2010

- *Click References tab*
- *Click Manage Sources on the Citations menu*
- *Either Copy sources from the Master List to the Current List or create New sources that will automatically be added to both the Master and Current List*
    - *Sources in the Current List will be shown in the dropdown Insert Citation list. Make your selection.*
    - *Enter information for each source.*
- *Once all your sources are entered, close the window.*
- *Select Style on the Citations menu and choose the ISO690 one*

2. Then, create In-Text Citations

- *Click References tab*
- *Click Insert Citation from the Citations & Bibliography menu and select appropriate source from the dropdown list*
- *Make sure you have selected the appropriate style from the Style section of the Citations & Bibliography menu]*

3. Finally, create the Reference list in this section

Once you have the document written and have added the Citations, you can generate Bibliography/References list. Any source listed on the right side of the Master List dialog will be included in the list here. This means that a work does not have to be cited to be included in the References section.
When the Insert Bibliography Gallery opens, there are some pre-configured Bibliography layouts.
Do NOT use these!
Instead of using the Content Control based Bibliography Gallery, click on "insert Bibliography" under the Header "References"

4. In case you forgot to add an In-Text Citation after having created the Reference list

- *Create the In-text citation (see section above)*
- *Click right on the new numbering. Click on the dropdown menu that has appeared and select "Update Citations and Bibliography"]*

Annexes (*of Trial Action Plan*)

Annex 1 – DRIVER+ Terminology

In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated. The terminology is applied throughout the documents produced by DRIVER+. Each deliverable includes an annex as provided hereunder, which holds an extract from the comprehensive terminology containing the relevant DRIVER+ terms for this respective document.

Terminology	Definition	Source
Community of Practice	An (online) platform that facilitates and fosters cooperation and synergies among Crisis Management professionals. A broad variety of stakeholders including practitioners, researchers, industry representatives and policy makers can exchange knowledge and best practices and initiate cooperation on Crisis Management topics.	
Crisis management	Holistic management (3.135) process (3.180) that identifies potential impacts (3.107) that threaten an organization (3.158) and provides a framework for building resilience (3.192), with the capability for an effective response that safeguards the interests of the organization's key interested parties (3.124), reputation, brand and value creating activities (3.1), as well as effectively restoring operational capabilities. Note 1 to entry: Crisis management also involves the management of preparedness (3.172), mitigation (3.146) response, and continuity (3.49) or recovery (3.187) in the event of an incident (3.111), as well as management of the overall programme through training (3.265), rehearsals and reviews (3.197) to ensure the preparedness, response and continuity y plans stay current and up-to-date.	Source: ISO22300 (DRAFT 2017) 8
Evaluation	Process of estimating the effectiveness (3.1.3.03), efficiency (3.1.3.04), utility and relevance of a service (3.1.1.59) or facility	Source: ISO 5127:2017(en) Information and documentation — Foundation and vocabulary, 3.1.3.02
Gap	Gaps between the existing capabilities of responders and what was actually needed for effective and timely response	Project Responder 5
Guidance Methodology	A structured approach from designing a Trial to evaluating the outcomes and identifying lessons learned	
Guidance Tool	A software tool that guides Trial design, execution and evaluation in a step-by-step way including as	

Terminology	Definition	Source
	much of the necessary information as possible in form of data or references to the Portfolio of Solutions	
Lesson Learned	[lessons learning: process of distributing the problem information to the whole project and organization as well as other related projects and organizations, warning if similar failure modes or mechanism issues exist and taking preventive actions]	Source: [ISO 18238:2015(en) Space systems — Closed loop problem solving management, 3.3]
Mitigation	Measures taken to prevent, limit and reduce impact of the negative consequences (2.1.9) of incidents, emergencies and disasters; [limitation of any negative consequence (3.46) of a particular incident (3.111) - DRAFT 2017]	Source: ISO22300 (2015) 4 [DRAFT 2017; 18]
Observer	Exercise participant who watches selected segments as they unfold while remaining separate from role player activities [DRAFT 22300: 2017-- observer participant (3.163) who witnesses the exercise (3.83) while remaining separate from exercise activities Note 1 to entry: Observers may be part of the evaluation (3.81) process (3.180).	Source: ISO 22300:2012(en) Societal security — Terminology, 2.4.5 [addition in DRAFT 2017]
Organisation	Person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives Note 1 to entry: The concept of organization includes, but is not limited to, sole trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private. [Note 2 to entry: For organizations with more than one operating unit, a single operating unit can be defined as an organization.	Source: ISO22300 (2015) 5 [Note 2: DRAFT 2017, p 19)
Portfolio of Solutions (PoS)	A database driven web site that documents the available Crisis Management solutions. The PoS includes information on the experiences with a solution (i.e. results and outcomes of Trials), the needs it addresses, the type of practitioner organisations that have used it, the regulatory conditions that apply, societal impact consideration, a glossary, and the design of the Trials.	
Practitioners	Individual person who ultimately benefits from the outcomes of the system	Source: ISO/IEC 25010:2011(en) Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) —

Terminology	Definition	Source
		System and software quality models, 4.4.3
Risk	Effect of uncertainty on objectives.	Source: ISO 31000
Risk Analysis	Process to comprehend the nature of risk and to determine the level of risk.	Source: ISO 31000
Scenario	Pre-planned storyline that drives an exercise; the stimuli used to achieve exercise objectives [pre-planned storyline that drives an exercise (3.83), as well as the stimuli used to achieve exercise project performance (3.167) objectives (3.153)]	Source: ISO22300 (2015) 9 [DRAFT 2017, p 27]
Trial	An activity for systematically finding and testing valuable solutions for current and emerging needs in such a way that practitioners can do this in a pragmatic yet systematic way.	
Trial Event (or Event)	All activities necessary to perform a Trial to comply with the DRIVER+ Trial Guidance Methodology, this includes Trial design, preparation and planning of execution.	Definition is not included to the DRIVER+ terminology

Annex 2 – Informed Consent Forms

Documentation can be found in:

https://projectdriver.sharepoint.com/sites/DriverPlus/Lists/Ethics%20tiles/Tiles.aspx

https://projectdriver.sharepoint.com/sites/DriverPlus/SitePages/Overall%20recommendations%20for%20the%20Protection%20of%20Privacy.aspx

https://projectdriver.sharepoint.com/sites/DriverPlus/SitePages/Steps%20to%20take%20for%20obtaining%20ethics%20approvals.aspx

https://projectdriver.sharepoint.com/sites/DriverPlus/SitePages/Recruitment%20of%20participants%20in%20research%20-%20Informed%20consent.aspx

Annex 3 – Dissemination & Communication Audit Questionnaire

Objectives of the audit template

A series of Trial planning meetings are being organised during early 2018 with the partners hosting the four DRIVER+ Trials.

The core objective of the Dissemination & Communications Questionnaire is to:

- Identify and record the agreed dissemination activities that will be carried out to support of the DRIVER+ project

The Dissemination Questionnaire has been designed to serve as an aide memoire for the meeting and also as a record of what dissemination opportunities can be exploited before, during and after the Trials themselves. Some elements of the Questionnaire will be completed before the meeting and others will come out of the discussion and subsequent conversations with partners' internal communications and media departments.

A detailed action plan with timings and responsibilities will then be produced and circulated to the relevant parties.

Expected outcomes

The Dissemination & Communications Questionnaire will be used to:

- Identify the core messages and unique selling points (USP) about each of the Trials
- Carry out a SWOT Analysis for each Trial
- List primary scientific and specialist publications and journals
- List key regional and national media
- Emphasise social media role and opportunities
- Serve as a reminder to organisers to arrange for imagery capture, including stills photography, video and screenshots if appropriate
- Confirm key points of contact in the partners' Media Departments
- Confirm any internal sign off procedures

Dissemination and Communication audit template

Questionnaire completed by: Name Organisation	
Date of Questionnaire	
Name/no. of the Trial:	
Date of the Trial:	
Organisation hosting the Trial:	
Location of the Trial:	
Name/contact of the Trial leader:	
Organisation(s) involved in the Trial:	

Questionnaire completed by: Name Organisation	
Main point of contact for any external stakeholder and media enquiries • Name: • Role: • Organisation: • Email: • Telephone:	
Information about the Trial	
Brief summary of the Trial	
Key objectives of the Trial	
Expected outcomes of the Trial	
How will the success of the Trial be measured?	
Gap(s) being filled by the trialled solutions	
Which partners will attend the Trial?:	
Will any observers be attending the Trial?:	
Which organisations do the observers represent?:	
Has any dissemination already taken place (internal or external)? *Please give details of press releases or articles and where they have been published, incl. online*	
What are the core message(s) we can communicate?	
What is the hook or angle on which we should focus in any release or article?	
When will stills and video imagery be available?	

Questionnaire completed by: Name Organisation	
Has an informed consent form been already prepared so that participants agree to be recorded/photographed?	
Are any pre-prepared screenshots or images available before the Trial? If so, list what is/will be available and from whom.	
What are the names of the main specialist publications that you read: online and print?	
What are the names of the main scientific publications: online and print?	
Are national or regional publications likely to use a press release: online and print?	
What are the main national newspapers / media outlets / publications?	
What are the main regional newspapers / media outlets / publications?	
Name and URL of any internal publication:	
Who is the contact person within your organisation responsible for the internal publication? • Name: • Role: • Email: • Telephone:	
What is the Trial host organisation's Twitter account name?	
What are the partner organisation's Twitter account names?	
Who is responsible for any Twitter feeds? • Name: • Role: • Email: • Telephone:	

Questionnaire completed by: Name Organisation	
Can we tweet during the actual Trial itself?	
What is your organisation's LinkedIn account name?	
Who is responsible for maintaining your LinkedIn account? • Name: • Role: • Email: • Telephone:	
Approval to use a news piece on the DRIVER+ website?	
Who needs to authorise final copy for news piece? • Name: • Role: • Email: • Telephone:	
Quote(s) for inclusion in article	
Senior officer/person providing quote: • Name: • Role: • Email: • Telephone:	

Type of dissemination and communication support envisaged:			
Pre- Trial: (indicate as appropriate):			
Press release:	Social media:	Website:	Other:
Details:			
During Trial (indicate as appropriate):			
Video:	Live updates:	Social media:	Other:

Questionnaire completed by: Name Organisation	
Details:	
Post- Trial (indicate as appropriate):	
Press release:	Publishable report:
Newsletter article:	Report to Community:
Social media:	External report or article:
Production video/other multimedia:	Other implications, e.g. EC CoU:
Details:	
Building the CoPCM	
Could the Trial help in recruiting members for the DRIVER+ Community?	
Could the CoPCM itself contribute towards improving future Trials?	
If yes, please explain how.	

Annex 4 – External Cooperation Audit Questionnaire

Objectives of the audit template

The purpose of this template is to facilitate the involvement of external stakeholders in DRIVER+ activities and events, mainly focusing on the four Trials scheduled. The template is to be completed by the partner organising an activity involving external stakeholders, in order to allow a proper identification of the needs and requirement with regards to their involvement in the event in question.

The completed template shall be provided to the External Cooperation Manager (ECM) at the latest 6 months prior to the Trial, for the organisation of invitations and administration with regards to the involvement of external stakeholders.

Expected outcomes

The completed template will serve as a starting point for involving external stakeholders in the DRIVER+ Trials or other activities. It will provide an outline of the kind of stakeholders needed and their expected type and level of involvement. This information will enable WP912 to start with the identification of potential external stakeholders to be involved and the follow-up according to the respective procedures for external cooperation.

External cooperation audit template

Questionnaire completed by: Name Organisation	
Date of Questionnaire:	
Name/no. of the Trial:	
Date of the Trial:	
Organisation hosting the Trial:	
Location of the Trial:	
Name/contact of the Trial leader:	
Organisation(s) involved in the Trial:	
Main point of contact for any external stakeholder enquiries (Respective members of the Trial Committee): • Name: • Role: • Organisation: • Email: • Telephone:	
Information about the trial	
Brief summary of the Trial:	
Key objectives of the Trial:	

Questionnaire completed by: Name Organisation	
Expected outcomes of the Trial:	
Gap(s) being addressed by the trialled solutions:	
Which solution providers from DRIVER+ consortium will attend the Trial?:	
Which practitioner organisations from DRIVER+ consortium will attend the Trial?:	
Has an NDA already been prepared to allow unlimited flow of project information?	
Type of external cooperation support envisaged:	
Practitioners: What kind of discipline from which country is needed etc.?	
Solution providers: What types of solutions are needed?	
Experts: What expertise is needed at this point?	

<End of Trial Action Plan>

Annex 5 – UML

In this paragraph the UML of the GT is described, followed by the actual diagram. The UML language works with different artefacts. One would be the box, that can be depicted in a reduced form (green box) or a form with all its components, that are then included in a green line.

To depict the diagram three different colours were chosen: while blue and grey boxes are just elements of the overall (green) box, every purple box is dedicated to one or more human beings.

The UML depicted consists of 4 parts:

1.) Overall information (Figure 9.6.1).
2.) Preparation phase (Figure 9.6.2).
3.) Execution phase (Figure 9.6.3).
4.) Evaluation phase (Figure 9.6.4).

In the following each item will be elaborated further.

1.) Overall information:

The idea here is that a user first needs a **landing page** that welcomes him/her. If the user wants to create a Trial a **registration and log-in** are necessary, in order to safe elements. Furthermore, some **explanations on the TGM** and the functionality **to create a new Trial** are needed.

For the landing page something welcoming and clear structured as well as understandable is needed. It should contain information on the project DRIVER+, its aims and goals and especially inform about the aim of the Trials and the website itself.

If a user wants to create a Trial some sort of registration (and later log-in) is necessary to enable saving data for later (a Trial is not completely planned in a few minutes). It should be possible to create a user as well as a Trial location, with the needed info.

As creating a Trial is directly linked to the TGM, some information and explanation on this is necessary as well. The Guidance Tool shall help people to create a new Trial, so this is a needed functionality. A Trial consists of the Trial committee, where people have certain roles; the associated Trial location that offers the needed hardware (maybe also software) and associated practitioner organisations that could might be chosen from a list. As the solutions providers come in later in the process they are not mentioned here at this point, though they are of course a very important part of the Trial.

2.) Preparation phase:

The preparation phase consists of the three parts: **Trial context and specification of gaps**, **Trial design – six step approach** and **development of Trial material**.

For the Trial context and specification of gaps the following things are needed: The Trial context is given by the Trial location and the stakeholders (practitioner organisations, maybe politicians as well). So information about past Trials at this location is useful to find out, if the locations offer everything needed.

The key of the whole process is however the CM gap, that should be closed by trialling innovative solutions. Therefor the DRIVER+ CM gaps should be presented here. Of course, the user will have his/her own gap in mind when thinking of creating a Trial, but by seeing that others might have a similar gap, can create synergy. So the other gap-owners could be invited to the Trial and add a lot of value. By this the gap itself can be even more specified.

The heart of the TGM is the six-step approach for Trial design. The six steps are: Identify the Trial objective, formulate research questions, formulate data collection plan, formulate scenarios and select solutions. The Guidance Tool will help with all these steps. However, it is important to link this with DRIVER+ Knowledge Base, that includes the codebooks from the Systematic Literature Review and from the Lessons Learned. This

Knowledge Base is linked to the different steps as it helps with knowledge from past DRIVER experiments as well as Trial like events from the past decade.

a.) Identify Trial objective.

The objective is the main aim of this step. It shall be explained in a SMART way (and SMART shall be explained to the user) and is related to the three dimensions (CM, solution and Trial – which also need to be explained to the user). To identify the objective one must think about the CM task, CM process and CM roles that are related to the gap(s) that shall be addressed. In the end a list of prioritized objectives will be created.

b.) Formulate research questions.

The RQ is the main aim of this step. This shall also be formulated SMART (the explanation to this shall be linked here again). During the project some generic information on formulating a RQ was developed and shall be given here as guidance. Furthermore a list of questions was developed that a RG should be able to answer. These shall help the user in formulating his/her own RQ(s). In the end a set of RQs for the Trial will be created.

c.) Formulate data collection plan (and KPIs).

It is of utmost importance to formulate a data collection plan for the Trial. Only if this is given, the added value a solution may bring can be shown. The people involved here are the Trial owner, the end-user coordinator and the methodological support. They need to identify and formulate the needed KPIs. So of course some generic info on KPIs are necessary. Furthermore, a baseline is needed. The baseline is the way in which a procedure is carried out in a given organisation. This needs to be created thoroughly – only then the difference between the now and the later (with solutions) can be depicted and from this difference the KPIs can be derived. This information is currently being discussed with T1 stakeholders, therefore it is not depicted in the UML yet.

d.) formulate evaluation approach and metrics.

The same people that started formulating the data collection plan will work on the evaluation approach and metrics. This will answer the question “how the collected data will be analysed”. So information on techniques for data analysis as well as ways to report data analysis is needed here.

e.) formulate scenario.

All people involved in the two previous steps as well as the Test-bed methodology coordinator are important for this task. The aim is to create a realistic scenario or scenes. Realistic has different dimensions in this case: Realistic in the sense that the practitioners feel that their daily business, routine and reality is depicted but also realistic in means of enabling data collection, meeting the Trial objectives and answering the research question. So the scenario or specific scenes need to be tailored to this in a way the Trial location supports.

f.) solution selection process.

There are two ways of finding solutions for the Trial. Either take some out of the DRIVER+ PoS or create a Call for Application (cfA). The whole CfA process is described in D942.11 It comes with a double blind review by practitioners and leads to a pre-selection of solutions. The CfA process is likely to need guidance w.r.t. the process and organisation. The pre-selected solutions are then invited to a hearing (Workshop 0) to present their solution to the Trial committee. This will lead to the final solution selection. It is very important to take different ethical concerns into account as the innovative solutions might need NDAs etc. So guidance on this ethical dimension is needed.

The last part of the preparation phase is the development of Trial material. These include all documents for the execution, like an agenda, instruction, consent forms, questionnaires etc. Here guidance will be needed as well as help with ethical concerns. Furthermore the documents for the evaluation have to be created (Trial reporting template, codebook and lessons learnt template for the Trial). Here it has to be ensured that everything needed for the data collection and a smooth run of the Trial is created.

3.) Execution phase:

All in all the execution phase can be divided in the two parts: **Dry Runs** and **Trial Run**. There are 2 Dry Runs with a final adjustment in between. These are dedicated to preparing the Trial Run itself, which will be used for trialling and evaluating innovative solutions in realistic scenarios.

For all Dry Runs as well as the final adjustment the associated Trial location, the Test-Bed as well as the solutions are fixed elements that need to work together. This shall be enabled by the Trial committee, solution provider and the role player. Helpful here is the data collection plan and the realistic scenario/scenes (which shall be linked here).

The main aim of Dry Run 1 is a connectivity check. All solutions that need to connect to the Test-Bed or to other solutions have to be integrated. In this way also the collection of data has to be tested w.r.t. completeness and the data collection plan. The needed amount of training on solutions shall be prepared. Furthermore the scenario needs to be tested w.r.t. their ability to trigger the needed CM processes, tasks and roles. The Dry Run 1 staff is in charge for this. The output should be a list of things that still need adjustment.

This before mentioned list is the input to the final adjustment phase. This is the timeframe between Dry Run 1 and 2. In this period the connectivity, data collection and use of solutions by users shall be enabled, if they have failed before.

As everything is up and running the Dry Run 2 is the final rehearsal of the Trial. So the Dry Run 2 staff and the roles for the scenario, solutions and data collection (observers) have to be present in a way, that all needed positions can be tried before the Trial. The goal is to make sure that the whole constellation is functioning. If any major concerns appear in Dry Run 2, the Trial itself needs to be postponed.

The Trial itself is the important goal everything in the execution phase worked for. So the persons that need to be present are the Trial committee, the solution providers and all roles that are needed for the scenario/data collection. The Trial location needs to be prepared as well as the technical set-up. So the mixture of solutions in a realistic scenario will create the needed raw data according to the data collection plan.

4.) Evaluation phase:

Four main elements can be seen in the evaluation phase: The **data collection check** enabled the **data analysis** that then is used **for answering the research questions**, which is the base **for disseminating results**.

The raw data from the Trial is the input for the data collection check. These are verified concerning errors and vagueness. After that they are structured.

This is feed into the analysis, which will be reported in the Trial reporting template. The form of the template shall give guidance and make the analysis easier. The Trial owner and the evaluation support representative are important for this task.

With the help of the analysed data the answer(s) to the RQ(s) shall be found. Here again the relation to the three dimension is important so this needs to be linked here again.

The final step of the evaluation phase is the (internal and external) dissemination. The internal report will be written and the Knowledge Base will be updated to enable further Trials. Furthermore the PoS will be updated with the results of the trialled solutions. The external report will give a main conclusion and recommendations and hopefully report, that the CM gap is closed for the Trial owner.

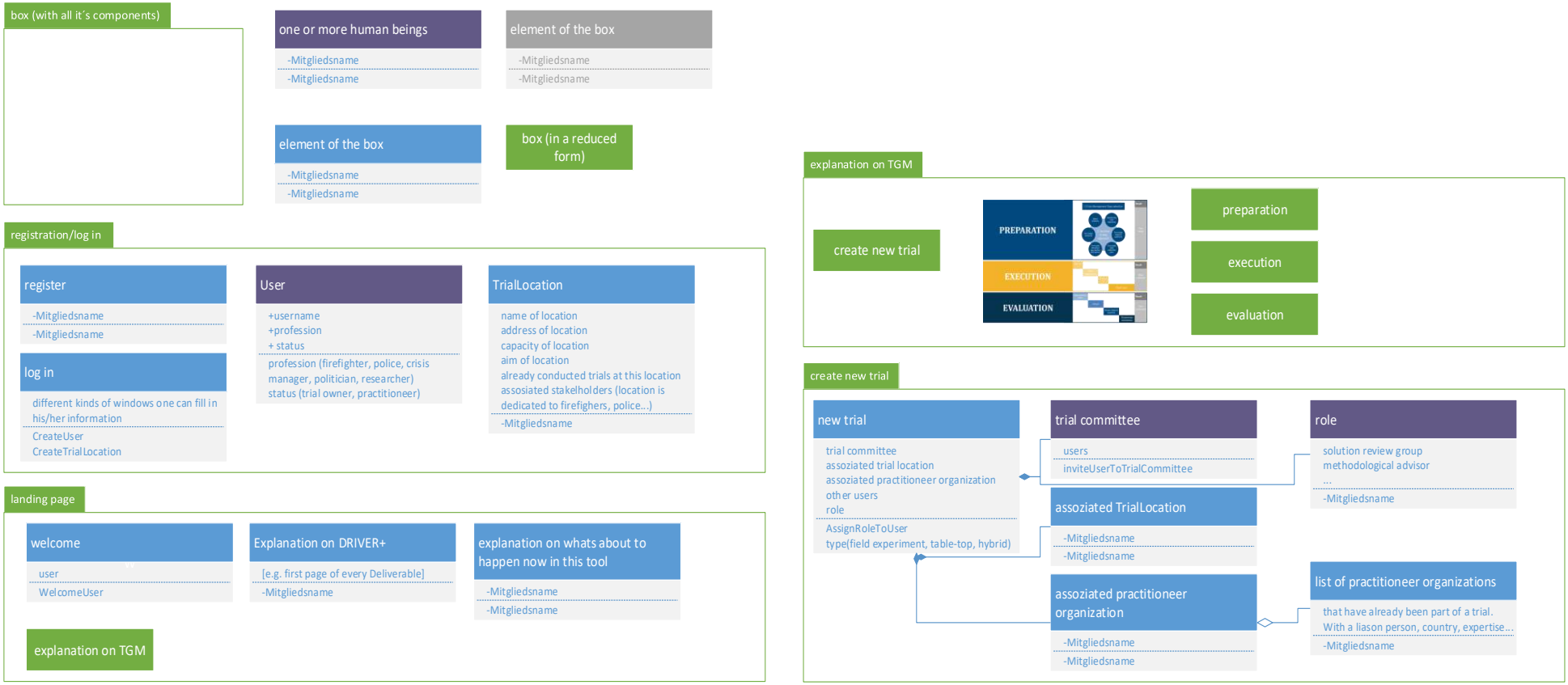

Figure 9.6.1: GT UML overall information

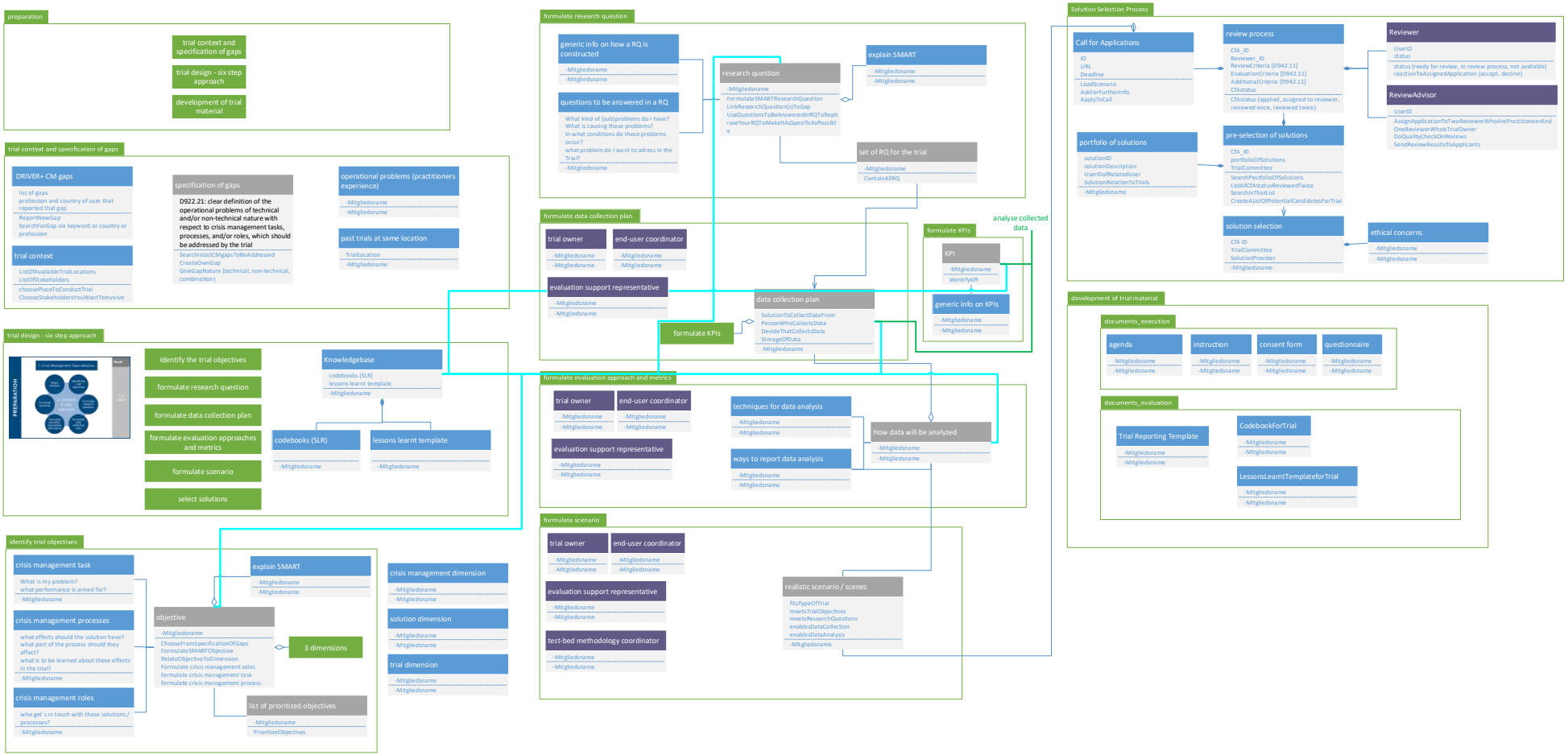

Figure 9.6.2: GT UML preparation phase

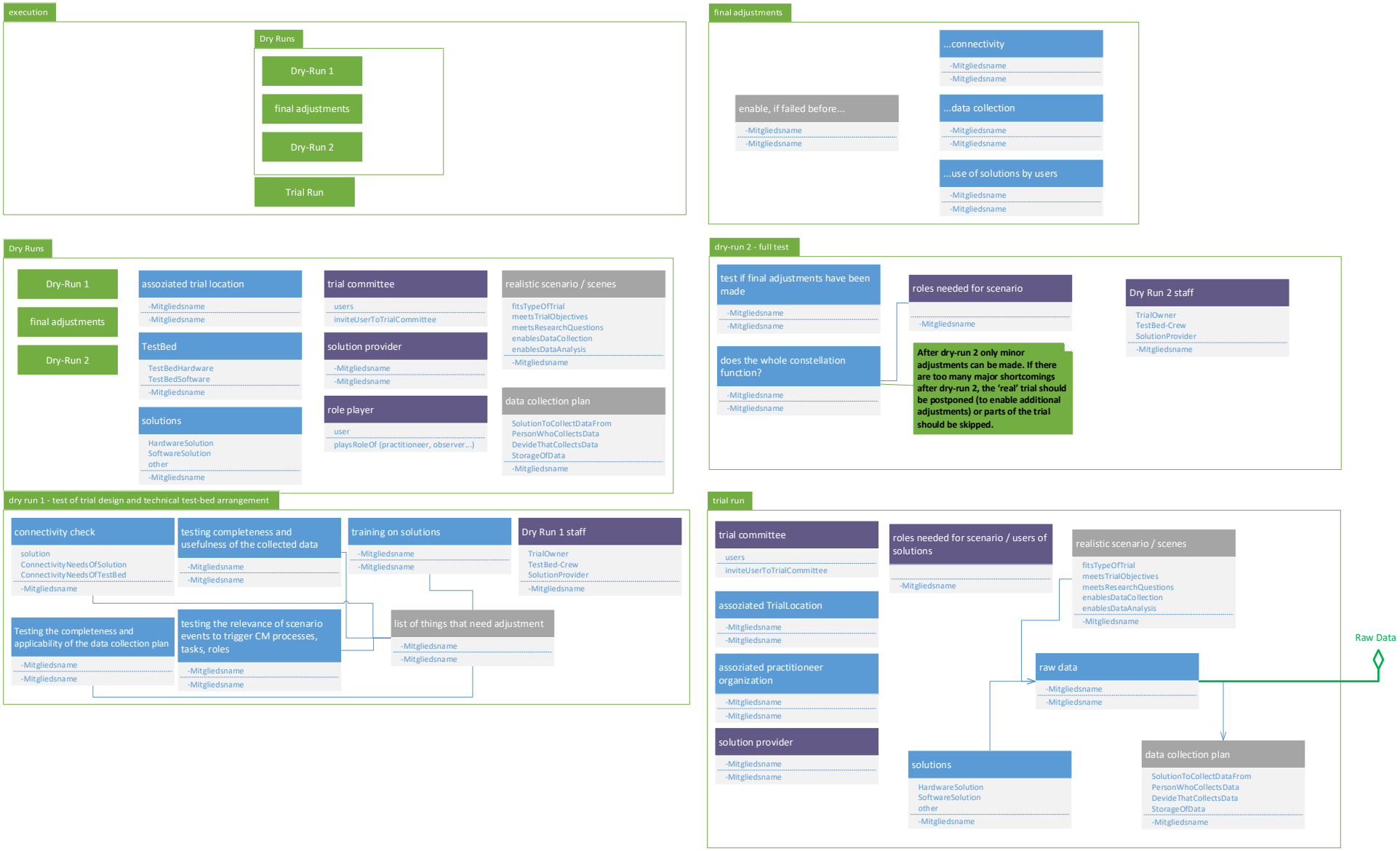

Figure 9.6.3: GT UML execution phase

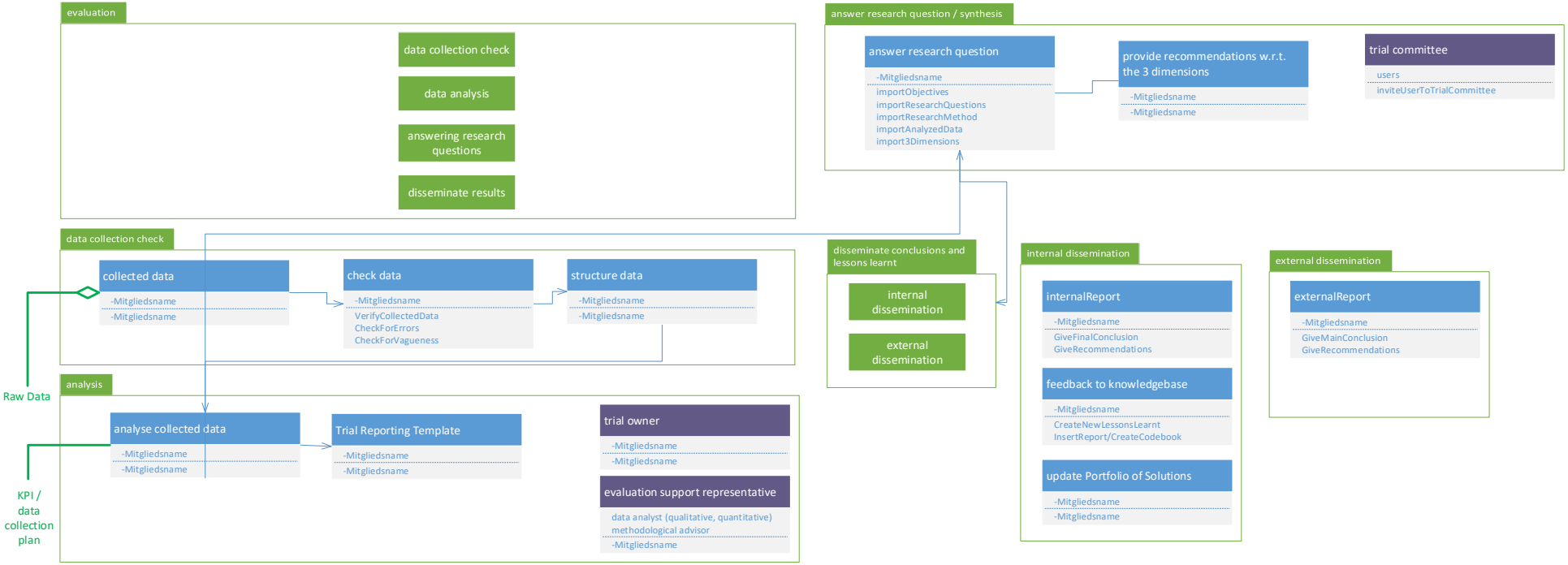

Figure 9.6.4: GT UML evaluation phase