AHEAD

Toward sustainable foresight capabilities for increased civil security

D6.1 –Report assessing the foresight methods used for the 3rd foresight exercise

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1 Executive Summary

This report evaluates the foresight method used in the 3rd exercise of the AHEAD project, which aims to strengthen the ability of Law Enforcement Agencies (LEAs) to anticipate and respond to emerging criminal threats. This deliverable is part of a process of continuous improvement of methodological approaches of foresight and adapting the capabilities of law enforcement agencies.

Objectives and context

The main objective of this 3rd exercise was to test and improve the AHEAD methodology by incorporating the lessons learnt from the first two exercises. In particular, the following developments were explored:

- The addition of a Red Team / Blue Team role-playing game, enabling participants to adopt a proactive approach by "putting themselves in the shoes" of criminals to better anticipate their strategies.
- Improved game tools and support, with a redesign of the cards and board to make the scenarios more immersive and encourage creativity.
- Optimised structuring of the sessions, in particular by giving more rhythm to the presentation and combining certain stages to improve the effectiveness of the exchanges.
- Adaptation of the capability analysis framework, simplifying the POSTEDFIT model towards a more intuitive approach, making it easier to identify LEAs' needs.

Main results

The integration of role-playing was a major progress, enabling a better exploration of criminal opportunities and possible countermeasures. Participants expressed a better understanding of the threats and an increased ability to anticipate criminal innovations.

In addition, the physical format of the game was still preferred over the digital version, despite the advantages of the latter, as it encouraged interaction and creativity. The sessions were restructured to optimise participants' time, by limiting the re-contextualisation phases and directly integrating reflection on the strategic and tactical implications of the scenarios.

Recommendations and outlook

Recommendations that can be drawn from the 3rd exercise are to:

- Further refine the preparation of the exercises, by specifying the objectives more clearly and selecting participants who follow the entire process.
- Experiment with configurations adapted to the needs of the LEAs, in particular by including more technical experts or organising targeted sessions on strategic or tactical issues.

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- Enhance the adaptability of the methodology, by exploring new hybrid formats combining physical and digital tools to maximise the commitment and productivity of the sessions.

Conclusion

The 3rd exercise confirmed the general methodology of AHEAD and, in particular, the use of research work in the stages of scenario development and comparison with what already exists. In addition, it validated several key methodological advances, making the AHEAD framework more robust, flexible, and relevant for safety agencies. These improvements are intended to be incorporated into future iterations in order to maximise the impact of crime and risk prediction and enhance the ability of LEAs to anticipate and counter emerging threats.

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List of Acronyms

Abbreviation / Acronym	Description
AHEAD	Advanced Horizon Exploration and Analysis for Decision-making
LEA	Law Enforcement Agency
STEEPL	Social, Technological, Environmental, Economic, Political, Legal
POSTEDFIT	People, Organisation, Support, Training, Equipment, Doctrine, Facilities, Information, Technology
HRT	Human Resources and Training
OSF	Operational Support and Facilities
SOD	Strategic Organisation and Doctrine
ITM	Information and Technology Management
TRPG	Tabletop Role-Playing Game
ERPG	Electronic Role-Playing Game
BMC	Business Model Canvas
JRC	Joint Research Centre
EUROPOL	European Union Agency for Law Enforcement Cooperation
MARIT-D	Maritime Drug Trafficking Project
MaaS	Mobility as a Service
OBOC	Organisation, Behaviour, Operations, Competences

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2 Introduction

The AHEAD framework represents a comprehensive approach to help law enforcement agencies (LEAs) predict and prepare for future crime trends. The alpha version, described in the D4.1 was developed with particular attention to existing challenges in foresight, including data complexity, analytical limitations, and the need for context-sensitive models. The framework emphasises practical implementation while maintaining theoretical robustness.

2.1 Framework Overview

The framework, depicted in Figure 1, operates through three interconnected stages, designed to be both **comprehensive** and **modular**. This modularity is essential as different LEAs across Europe have varying levels of existing foresight capabilities. Some countries, such as Sweden and the Netherlands, have already implemented capability frameworks, while others are starting from different baseline positions.

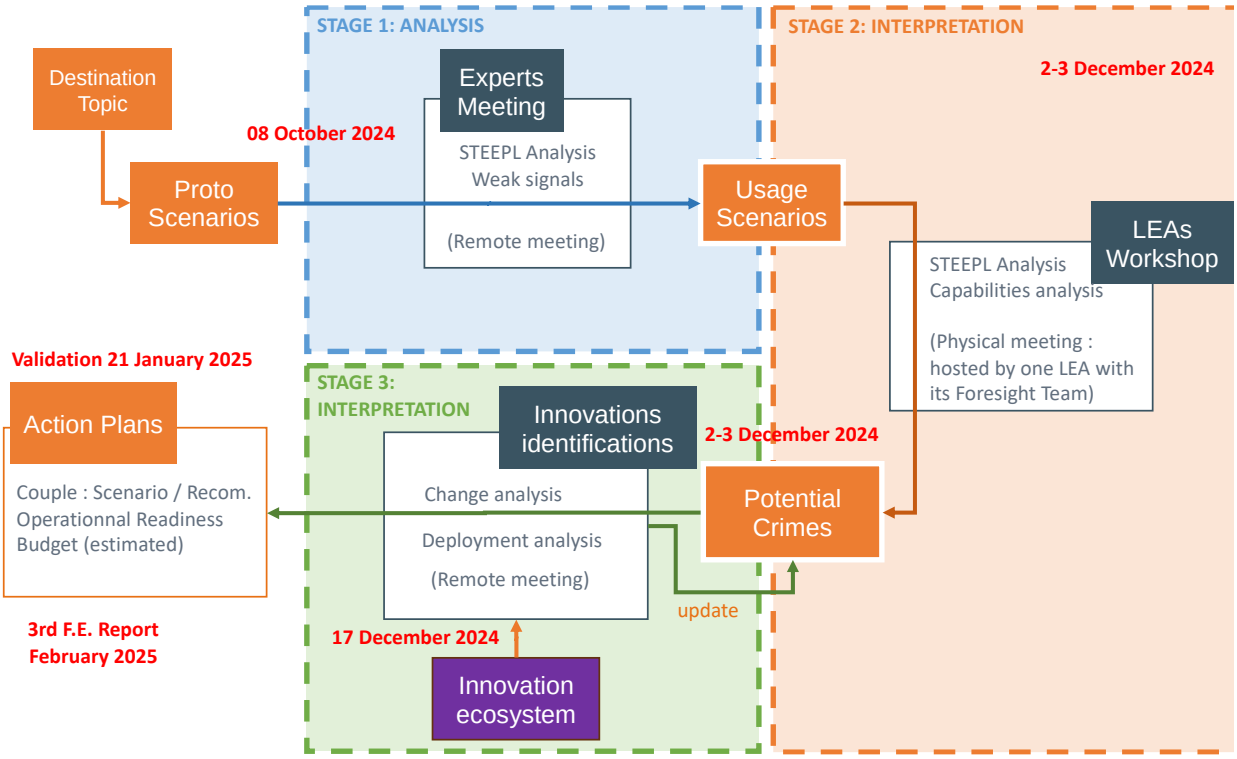

Figure 1: AHEAD framework stages with 3rd FE agenda

The first stage, analysis, begins with scenario exploration based on comprehensive data collection and focuses on scenario generation and validation through expert assessment. It incorporates STEEPL analysis (Social, Technological, Environmental, Economic, Political, Legal)

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to ensure comprehensive coverage of all relevant factors affecting future trends. This systematic approach allows for the identification of emerging patterns and potential challenges.

The second stage, "Interpretation," involves interactive workshops utilising serious gaming methodologies. This stage integrates the POSTEDFIT framework (People, Organisation, Support, Training, Equipment, Doctrine, Facilities, Information, Technology) to systematically evaluate capability requirements. Through structured activities and guided discussions, participants explore potential future scenarios and their implications for law enforcement operations.

The final stage, "Prospection, develops actionable recommendations through careful stakeholder analysis, impact assessment, and capability planning. This stage synthesises insights from the previous phases to create concrete action plans aligned with organisational capabilities and resources. The process ensures that theoretical insights are translated into practical implementation strategies.

2.2 Structure of the report

This document focuses on the methodology and its evolution after the first three foresight exercises conducted under AHEAD. It begins by presenting the feedback from the first two exercises (WP4 and WP5), both from the work package leaders who developed the methodology and from the LEAs who tested it.

It then presents the methodological changes that have been devised to carry out this 3rd exercise in cooperation with the French Gendarmerie COMCYBER-MI.

Finally, it presents the feedback received from the participants and the proposed changes for the next exercise.

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3 Use of the serious game trough the two first exercises

3.1 Serious game methodology

3.1.1 Game Design and Components

The serious game component represents an approach to scenario exploration, utilizing a specially designed board that incorporates multiple interactive elements. The physical components include a custom game board with designated areas for different activities (cf. Figure 2), complemented by various tokens and cards featuring user activities, emerging technologies, criminal motivations, and contextual factors.

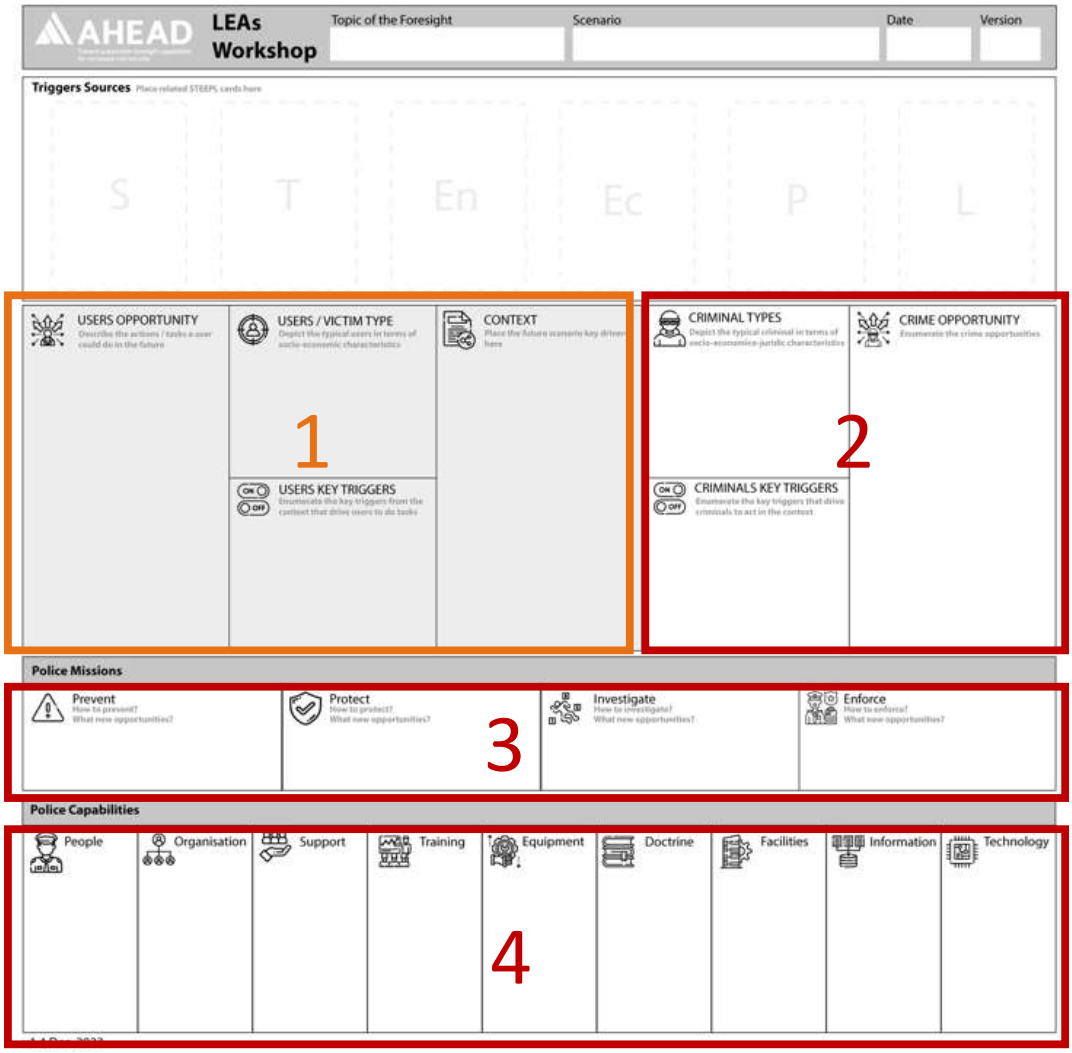

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Figure 2: Initial game board used for the two first foresight exercises (Daumas F. et al). This board uses 4 areas: area 1 for scenario summarising, area 2 for Crime opportunities, area 3 for missions impacted and area 4 for needed capacities.

The design ensures comprehensive coverage of all relevant aspects while maintaining engagement and focus.

3.1.2 Gameplay Process

The game progresses have been thought through in order to guide participants from initial scenario exploration to concrete capability assessment in a structured sequence. This begins with thorough scenario presentation and context setting, followed by systematic identification of criminal opportunities. Participants then assess the impact on LEA missions and evaluate capability requirements. This progression ensures thorough examination of all relevant aspects while maintaining clear focus on practical outcomes.

During the first foresight exercise, we gave the participants as much freedom as possible. The initial idea was to make the LEAs workshop a space for sharing ideas and providing feedback. However, during this exercise, we noticed that although there were shared examples, they often came from the same people. Either the participant belonged to a LEA that was well endowed in terms of budget and human resources and therefore had the means to multiply full-scale tests; or the participant was expansive by nature and monopolised the discussion. In both cases, the result was a reduced vision and a loss of opportunities for ideas on the part of the other participants.

During the 2nd exercise, we tried to remediate this issue. To this end, at the suggestion of Ghent University, we limited everyone's speaking time thanks to a more detailed sequence that was defined by Upperion. Under this new sequencing, the participants had, first, to use the cards on their own; then, in a second stage, to present the cards to the other participants without giving them the opportunity to debate them; finally, in a 3rd stage, the debate was opened to all participants giving them the possibility to react. This new approach, which fostered a better sharing of viewpoints,was validated during the 2nd exercise by the participants themeselves, who were all able to express themselves.

3.2 Lessons learnt from the two first exercises: Facilitation and Implementation

3.2.1 Participants

The two first exercises struggled at finding experts, and the methodology meeting we held in Ghent after the validation of this 3rd foresight exercise showed that it was a recurring issue faced by other projects and agencies independently of the methodology.

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In addition, the case was made in AHEAD to have the same people contributing to the foresight exercise from its first stage till the last.. Indeed, it appeared really important to have the same group of participants from the scenario elaboration stage to the LEA workshop, that is why we worked closely with WP3 on this point. During this 3rd exercise, we noted that as the participants in the LEA workshop were the same people who had drawn up the scenarios, the LEA workshop became simpler as it was no longer necessary to re-explain the scenarios or to have to debate new arguments put forward by new participants against the scenarios.

3.2.2 Facilitators / Animators

The success of the game relies heavily on its facilitation. Properly trained animators who can guide participants through scenario exploration while managing group dynamics are required. Facilitators strategically deploy challenge cards to maintain engagement and ensure comprehensive coverage of framework elements. They also play a crucial role in documenting outcomes and insights, ensuring that valuable observations are captured for future analysis and implementation.

3.2.3 Feedbacks from the attendees

This structured gaming approach has proven particularly effective in enabling LEAs to envision future criminal opportunities while simultaneously assessing their organisational readiness. The methodology manages to combine creative exploration with practical consideration of operational constraints, providing useful insights to make more informed choices regarding future planning and capability development.

Survey results conducted after the first foresight exercise dealing with “online presence” showed that 75% of participants found practical applications useful.71% indicated that the workshop content was relevant and insightful and 63% positively assessed the foresight methodology.

In addition to this initial feedback, participants also made a number of suggestions for improvements:

- more detailed pre-workshop materials
- more specific scenario details
- smaller working groups
- more guidance
- more inspiring assets and out-of-the-box thinking
- enhanced operational focus in capability discussions

The AHEAD framework demonstrates strong potential for enhancing LEA foresight capabilities. Its modular design allows for adaptation to different organizational contexts while staying methodologically rigorous. The combination of structured analysis, practical gaming elements, and concrete action planning provides a comprehensive approach to future crime prediction and preparation.

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4 Switching from v1.0 to v2.0 of the game

4.1 Thinking out of the box as a criminal: Introducing the role-playing stage

During the first two foresight exercises, it repeatedly emerged that police officers had difficulty adopting the mindset of criminals.

Police officers in the field appeared to us to be in the best position to get a sense of what is happening at an operational level. The discussions between participants confirmed this initial assumption. However, their naturally law-abiding attitude and their respect to the doctrine make it challenging for them to shift into the mindset of a criminal.

To overcome this problem, several solutions were of interest (but without the same degree of feasibility). They included::

- Recruit ex-convicts to explain how a criminal could use new opportunities to create new crimes;
- Recruit more futuristic experts and technologists to give an opinion on new crime opportunities;
- Create a new sequence using role-playing.

The first possibility has the advantage of having already been tried and tested historically, notably in France in the 19th century with the famous case of Vidocq. Vidocq's career is particularly remarkable for the way he turned his criminal experience into an asset for the police. His status as an ex-convict and his intimate knowledge of the criminal underworld gave him several decisive advantages:

This possibility was discarded due to the difficulty to recruit a repentant from one country to another. We discard this possibility.

The second possibility is more acceptable but brings us back to the problem of identifying and evaluating experts. Exchanges with various European organisations (JRC, Europol) that are used to foresight exercises show that this is an issue difficult to address.

Our thinking led us to consider role-playing as the solution, presenting the benefits of the two previous points while avoiding their respective drawbacks.

Role-playing in creativity workshops offers numerous advantages, as evidenced by various studies across different contexts. One of the primary benefits is the enhancement of creative thinking and problem-solving skills. Role-playing allows participants to step into creative spaces by using spatial and temporal frames, which liberates the imagination and encourages the creation of order from chaos[1].This method is particularly effective in educational settings, where it has been shown to improve students' creativity, critical thinking, and communication skills by engaging them in real-life scenarios [2]. Additionally, role-playing fosters group creativity by promoting interaction and creative synergies among participants, as seen in mathematical modelling activities [3]. In civic planning, role-playing games have been found to generate new ideas and enhance social learning,

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thereby fostering civic creativity [4]. Furthermore, role-playing can transform workshops into playful spaces that prioritise participant needs over rigid outcomes, thus enhancing engagement and creativity [5]. Despite initial resistance due to embarrassment, when adapted appropriately, role-playing can become a fun and effective teaching tool, as demonstrated in medical education [6]. The use of role-playing in collaborative design also facilitates dialogue and reflection, making it a valuable tool for interdisciplinary collaboration [7]. Moreover, role-playing games, such as tabletop role-playing games, have been associated with higher scores in divergent thinking tests, indicating their potential in promoting creativity [8]. Overall, role-playing in creativity workshops not only nurtures individual and group creativity but also enhances social skills and motivation, making it a versatile and powerful tool across various domains.

4.1.1 The Red Team

The discussions with the COM CYBER MI – Gendarmerie,showed that the use of the Red Team framework enables participants to 'act as if' they were the criminals. In its prospective use, this framework requires the mobilisation of several participants and experts who will be divided into the Red Team, the 'bad guys' whose aim is to identify security breaches, and the Blue Team, the 'good guys' responsible for implementing countermeasures.

More generally, Red teaming is a strategic methodology employed across various domains to identify vulnerabilities, test defences, and anticipate potential threats by adopting an adversarial perspective. In the biological sciences, red teaming is utilised to analyse and forecast biological threats to national security, allowing participants to simulate adversarial scenarios and assess potential risks [9]. In the financial sector, red teaming is applied to manage financial crime risks, offering a proactive approach to compliance by simulating external threats and testing the robustness of financial crime defences. This method helps banks identify and mitigate risks associated with money laundering, sanctions, and strategic policy scenarios [10]. Furthermore, the Red teaming methodology exemplifies a systematic and scalable approach to red teaming, allowing for empirical research and testing of human decision-making in security contexts, such as aviation security, by simulating adversarial roles and evaluating the impact of new information on decision-making processes [11]. Overall, red teaming serves as a versatile tool across various fields, enabling organisations to think like adversaries and strengthen their defences against potential threats [12].

Similarly, the methodology involves the activity of a Blue Team which, in response to potential Red Team threats, will devise ad hoc countermeasures. The red team approach also facilitates the delivery of a methodology for the whole civil security domain,

4.1.1.1 Adapting the Red Team Methodology to AHEAD

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Before AHEAD project participation, Upperion had already successfully adapted the Red Team method to another context using a card game and decision assisted program (EOS-IA software). During the preparation of the 3rd foresight exercise, we tested it with the French Gendarmerie that also uses the Red Team approach in their own foresight exercises.

The Red Team: Modelling the generic conditions of crimes

The main components of a crime are generally divided into two essential elements: actus reus and mens rea. Actus reus, or the external element, refers to the conduct, event, or state of affairs that constitutes the physical component of a crime. This includes any voluntary act, omission, or state of affairs that results in harm or is prohibited by law [13] [14]. For instance, in the crime of theft, the actus reus involves the appropriation of property belonging to another person [15]. The actus reus must be proven to be voluntary and causally linked to the harm or result, often evaluated through the 'but for' test, which assesses whether the harm would have occurred but for the defendant's actions [16]. On the other hand, mens rea, or the mental element, involves the defendant's state of mind at the time of the crime, encompassing intention, recklessness, or negligence. It is the guilty mind that accompanies the actus reus, indicating a culpable state of mind such as intent to cause harm or awareness of unjustified risk [13]. For example, in theft, mens rea includes dishonesty and the intention to permanently deprive the owner of the property [15]. Both elements must coincide for a crime to be established, meaning the actus reus and mens rea must occur simultaneously [13]. Additionally, the legal system often defines crimes through statutes, and the absence of a law typically negates the existence of a crime [17]. Understanding these components is crucial for the legal determination of criminal liability and the appropriate application of sanctions [18].

On this basis we propose a simplified and generic model of crime as depicted on Figure 3

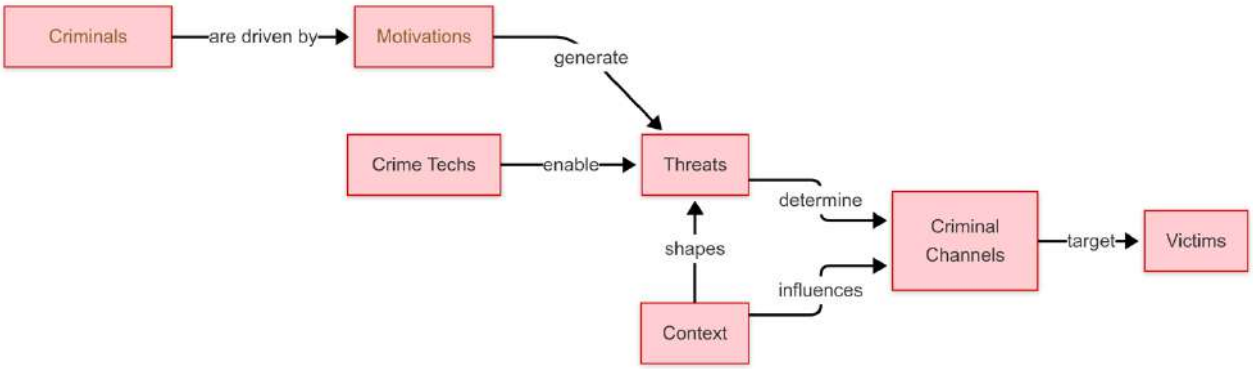

Figure 3: Simplified diagram of Crime components and their relationship

It is composed by criminal types, their motivations, the threats they create, the technologies they use to perpetrate their crimes, the channels they use to reach their victims, the context of the crime, and the targeted victims. They can be easily regrouped as actus reus or mens rea as follows:

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Classification	Component	Description
Actus Reus (The Physical Elements)	Crime Tech	Technology used for the crime: This represents the physical tools and methods used to carry out the criminal act
	Criminal Channels	Channels used by criminal to reach their victim: The physical means of approaching or accessing the victim
	Criminals	Criminal type: The actual classification of the criminal act that was committed
Mens Rea (The Mental Elements)	Motivation	Motivations: The intent, reasons, and psychological drivers behind committing the crime
	Threats	The threat: The intended harm or consequence the perpetrator plans to inflict, showing their state of mind
	Victims / Targets	The victim targeted: The deliberate selection of specific victims demonstrates premeditation and intent
Mixed Category	Context	Context of the crime: This can include both physical circumstances (time, place, environment) and mental elements (social conditions, relationships, psychological factors that influenced the situation)

Table 1: Red Team role-playing components

Table 1 shows the main components created to depict the generic crime parts. Let's analyse each element:

- Actus Reus (The Physical Elements):

The technology (Crime Tech) used for the crime falls under actus reus because it represents the tangible tools and methods employed to execute the criminal act. For example, if someone uses a computer to commit fraud, the actual use of the computer and the actions taken with it constitute part of the actus reus.

The channels (Criminal Channels) used to reach the victim also qualify as actus reus since they represent the physical means through which the crime is carried out. Whether it's through email, phone calls, or direct contact, these are all physical actions taken by the perpetrator.

The criminal (Criminals) type typically falls under actus reus as it describes the actual conduct that constitutes the crime. For instance, theft involves the physical taking of property, assault involves the physical act of causing harm or threatening immediate harm.

- Mens Rea (The Mental Elements):

Motivations are clearly mens rea as they represent the psychological driving forces behind the crime. Whether it's financial gain, revenge, or other reasons, these mental states help establish the perpetrator's culpability.

The threat falls under mens rea because it demonstrates the perpetrator's intention to cause harm. The mental formation of the threat and the decision to make it reveal the perpetrator's state of mind.

The victim targeted is primarily a mens rea element because it shows the perpetrator's deliberate selection process and intent. The mental process of choosing specific victims demonstrates premeditation and purpose.

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- Special Consideration - Context of the Crime:

The context of the crime is unique because it can encompass both actus reus and mens rea elements. The physical circumstances (time, place, environmental conditions) fall under actus reus, while the psychological circumstances (social conditions, relationships, mental state at the time) fall under mens rea. For example, if someone commits a crime during a riot, the physical presence at the riot scene is actus reus, while the influence of mob mentality might be relevant to mens rea. This context element can be accounted for in the scenario that is played.

In parallel, the various components can also be put together in a canvas-type template, as shown in Figure 4. The usefulness of such a diagram has been demonstrated in creativity sessions and historically by Osterwalder for the Business Model Canvas (BMC) [19].

The idea of introducing a canvas into our process was experimental and particularly motivated by the fact that during a game session with more than 6 participants, it can be difficult during collective brainstorming to position all the ideas on the single gameboard. This is why we decided to keep the option, on an experimental basis, to display the board on the wall.

Figure 4 shows the final canvas, redesigned at the end of the 3rd Foresight exercise. This canvas was further tested at a EuCB-MARIT-D jointly organised foresight workshop on drug maritime trafficking, to which AHEAD was invited to showcase its methodology (21 January 2025,Faro, Portugal).

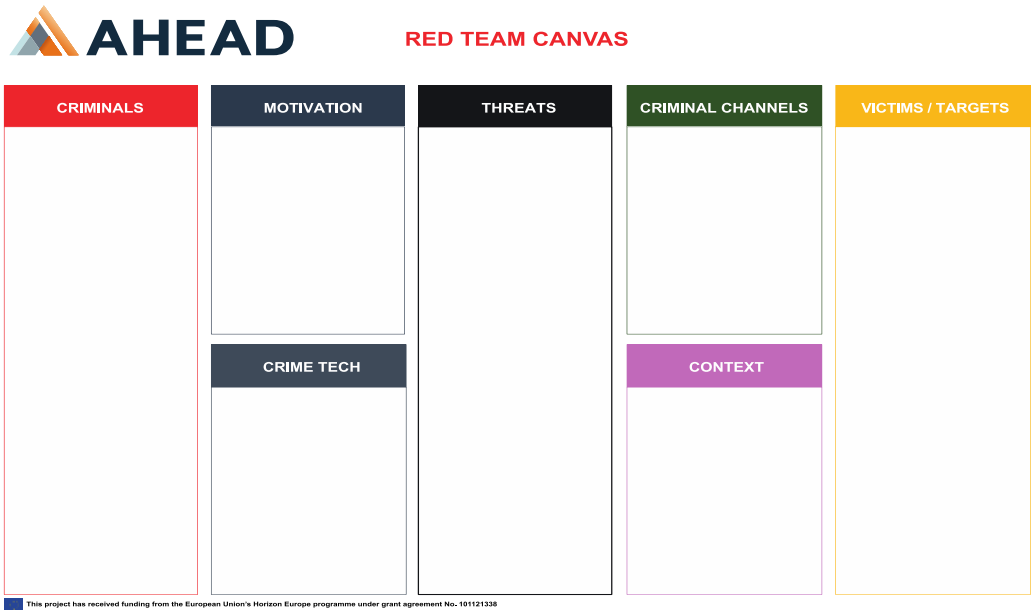

Figure 4: Facsimile of the RED TEAM canvas as presented during MARIT-D session

4.1.1.2 Adapting the Blue Team

The Blue Team: Modelling the countermeasure components

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A similar work was carried out for the blue team. Firstly, we looked at the necessary and sufficient components to define a countermeasure. In the same way as for the Red Team, it appeared to us that the proposal for a countermeasure was first and foremost linked to a mission. It addresses a potential criminal threat and may aim to protect potential victims. To be effective, countermeasures must be based on a method (itself influenced by the partners and existing constraints such as the perception of society's stakeholders). It is only possible if the LEA has the necessary capacities (human resources and training, operational support, doctrine, emerging technologies). This countermeasure must be deployable—for example, via specific channels—and may require working with partners.

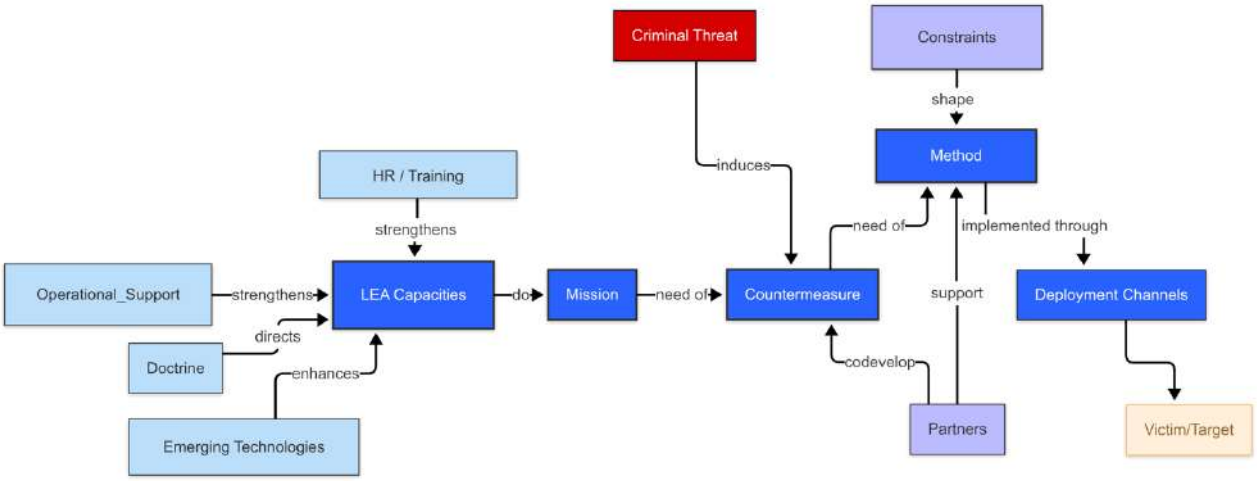

Figure 5: Simplified diagram of Countermeasure components and their relationship

Also in this case, the main components can be put together in a canvas-type template, as shown in Figure 6.

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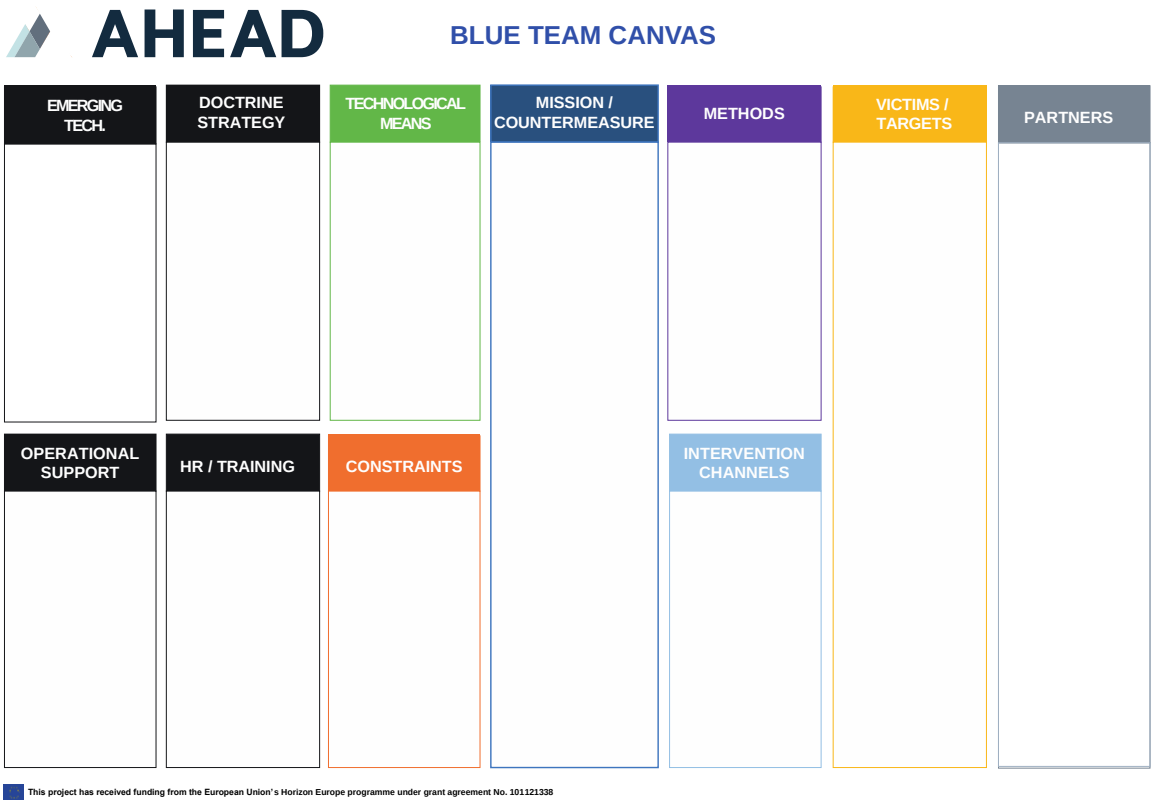

Figure 6: Facsimile of the RED TEAM canvas as presented during MARIT-D session

4.1.2 Role playing the Red and Blue Teams inside AHEAD gameplay

Once identified the key components of the RED TEAM and BLUE TEAM, they were incorporated into the game system. As a reminder, the primary aim of this adaptation was to prompt LEAs'thinking 'out of the box' in order to anticipate the criminals' next ideas and counter them—in other words, it's a process that ultimately consists of "Hacking the Hackers.".

Determining the components of criminal processes and the generation of countermeasures was the first stage of the morphological analysis carried out. The aim of this analysis was to produce a library of possibilities for each component. Based on the work of astrophysicist Fritz Zwicky [20], this method is ideal for understanding and solving complex problems. Initially used by its inventor as part of the discovery of dark matter in the Universe, it is also used to generate foresight scenarios. In our case, we based ourselves on Fraunhofer and ETH Zurich's work exploring possible business models for Mobility as a Service (MaaS) platforms. In their work, the researchers [20] created a library of possibilities for each component of the MaaS business model canvas. These possibilities (so-called 'Zwicky Boxes'), presented in Table 2, can then be assembled at will and, depending on the likelihood of the composition, lead to new opportunities.

In the same way, for each of the Red Team (cf. Table 2) and Blue Team (cf. Table 3) components, we have proposed a library of possibilities, each materialised by a game card.

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It is not necessary to be exhaustive, because in our case we aim to inspire participants, to stimulate their creativity, not to frame them. The exercise can be seen as one that is carried out in schools with children using gap-filling texts. The structure of the process is imposed, but the gaps can be filled in at will. Each story then becomes unique.

In our case, the Red Team story unfolds as follows:

The participants draw a CRIMINAL card at random. They will have to embody (role-play) this type of criminal in the exercise. The cards for the other components are dealt to each participant until all the cards are drawn. Then, in a given time, the participants must use the cards they have in hand to tell how the type of criminal they are playing seized the opportunity provided by the cards to invent a new crime. Knowing that they cannot have all the possible cards in their hand (as they are shared with the other participants), the players must 'fill in the gaps' to build a viable story.

They then place the possibilities they have selected on the Red Team canvas. Then the group can discuss all the possible crimes depicted by each participant. They can decide to regroup, link, keep or discard stories. At the end, they have to vote to keep two stories maximum. The kept stories are then passed to the Blue Team stage.

The logic is the same for the Blue Team, which is played in sequence by the same group (an alternative, depending on the number of attendees, could be to play as two competing teams). However, in this case, the starting point is the MISSION card that the participant must accomplish in the context of the Red Team story to explore. Unlike the Red Team game, the Blue Team stage does not contain cards for all the blocks on the canvas, and in particular for the capacities boxes; in this particular case, the participant will only receive the Emerging Technologies cards. We felt that this category was the most unfamiliar to the participant. Indeed, they should be familiar with the strategy, HR and training capabilities, and operational support available in their agency.

During the 3rd Foresight Exercise's LEA workshop session (2-3 December, 2024, Lille, France) where the vast majority of participants voted in favour of this role-playing stage (see Complementary feedbacks**), confirming this was helpful to think out of the box. This fact was also amplified by the new design of the cards, which is more inspiring due to the use of illustrations.**

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CRIMINAL	Sole criminal	Small or medium group	Organized Crime	Enterprises	Terrorist / ideological organisations	Decentralized Networks													
MOTIVATION	Financial Gains	Power and Control	Revenge / Dissatisfaction	Addiction	Peer Pressure / Gangs	Thrill / Excitement	Anonimity	Lack of Awareness	Regulatory lag	Psychological issues	Ideological Motives	Survival							
CRIME TECH	Generative-AI	Computing Power	Smart Devices	Datafication	Artificial Intelligence (AI) and Machine Learning	Extended Reality	Digital Trust	3D Printing (including 3D Bioprinting)	Genomics	New Energy Solutions	Robotic Process Automation (RPA)	Edge Computing	Quantum Computing	Virtual Reality and Augmented Reality	Blockchain	Internet of Things (IoT)	5G	All kind of unmanned vehicles	Cyberphysiological devices
THREATS	Cybercrime	Organised Crime	Terrorism	Urban Crime	Illegal Trafficking	Financial Fraud	Domestic Violence	Property Crime	Radicalisation	Environmental Crime									
CRIMINAL CHANNELS	Mass Gatherings	Transit Hubs	Commercial Hotspots	Virtual Communities	Digital Markets	Personal Communication	E-commerce	Private Spaces	Professional Settings	Social Networks	Institutional	Age-Specific	Need-Based						
CONTEXT	Dense Urban Environment	Rural Area	Public Space	Private Premises	Cyberspace	Mass Events	Border Zones	Critical Infrastructure	Public Transport	Sensitive Establishments									
VICTIMS / TARGETS	Individuals	Businesses	Public Services	Voluntary Sector															

Table 2: RED Team proposed morphological boxes for each crime component.

MISSION	Prevent	Protect	Investigate	Enforce															
TECHNOLOGICAL MEANS	AI & Machine Learning	Drones & Robotics	Advanced Biometrics	Internet of Things	Blockchain & Traceability	Augmented Reality	Big Data & Analytics	Encrypted Communications	Smart Sensors	Cloud Computing									
CONSTRAINTS	Limited Budget	Legal Framework	Public Opinion	Time Pressure	Human Resources	Interoperability	Confidentiality	Required Training	Environmental Impact	Social Acceptance									
EMERGING TECH.	Generative-AI	Computing Power	Smart Devices	Datafication	Artificial Intelligence (AI) and Machine Learning	Extended Reality	Digital Trust	3D Printing (including 3D Bioprinting)	Genomics	New Energy Solutions	Robotic Process Automation (RPA)	Edge Computing	Quantum Computing	Virtual Reality and Augmented Reality	Blockchain	Internet of Things (IoT)	5G	All kind of unmanned vehicles	Cyberphysiological devices
METHODS	Physical Patrols	Digital Surveillance	Preventive Communication	Rapid Response	Training & Awareness	Community Cooperation	Intelligence	Access Control	Visible Deterrence	Forensic Analysis									
INTERVENTION CHANNELS	Awareness Phase	Contact Phase	Intervention Phase	Follow-up Phase															
PARTNERS	Institutional	Security Forces	Justice	Health & Social	Education & Training	Economic Actors	Associations	Technical Experts	Media	International									
VICTIMS / TARGET	Individuals	Businesses	Public Services	Voluntary Sector															

Table 3: Blue Team proposed morphological boxes for each crime component.

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4.2 Improving the game assets

One of the requests made by participants in the first two exercises was for more inspiration during the game, particularly through graphic representations of the elements/concepts expressed by the cards.

This request was mainly expressed for the STEEPL role-playing cards - the RED/BLUE Team role-playing cards had not yet been introduced.

We also took the opportunity to transform the game board using illustrations, as shown in Figure 7.

We suppress the cards' placeholders that were not so practical and expanded the size of the areas for sticky notes.

Figure 7: Game board v2.0 used for the 3rd Foresight exercise. Areas signification: 1 for scenario summarising, area 2 for Crime opportunities, area 3 for missions impacted and area 4 for needed capacities.

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As can be seen from the figure, zone 4 has also been modified. During the first foresight exercise, we proposed the use of the POSTEFIT framework (from the military sector). This framework proposes to analyse the capabilities to be analysed under 9 headings. The Swedish police use a proprietary framework comprising 6 components divided into 4 categories. As we explained in deliverable D4.1, the AHEAD methodology is fairly flexible and allows part of the method to be replaced by a tool that already exists at the LEA. However, during the 2nd foresight exercise, the participants unanimously explained that the POSTEDFIT framework included too many components and that in a first foresight intention there were too many parameters to consider.

Taking this into account, we could not integrate the framework proposed by the Swedish police, as it includes seven more. With a view to simplifying these components, we considered that it might be simpler to propose not all the components, but only the broad categories of need. In order to remain understandable (due to the absence of subcategories), we have also modified the titles proposed by the Swedish framework.

The new framework is therefore based around 4 main categories:

- Human resources and training (HRT)
- Operational support and facilities (OSF)
- Strategic Organisation and Doctrine (SOD)
- Information and Technology Management (ITM)

During the 3rd exercise, this proposal proved easier for participants to process.

Similarly, the cards have been revised in terms of general graphics, but above all they all include an illustration relating to the subject covered by the cards.

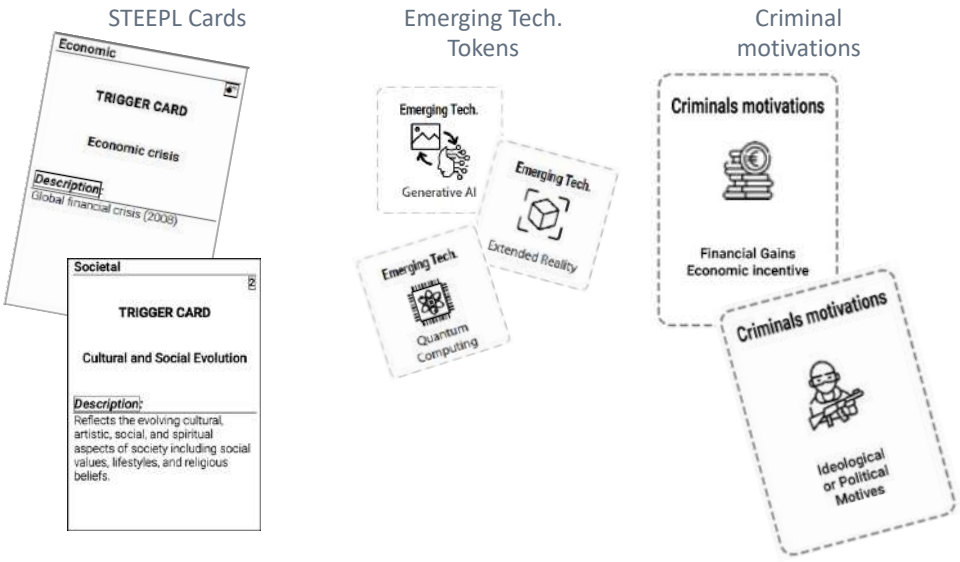

Figure 8: Initial version of the cards. From left to right : STEEPL cards, Technology tokens, Criminal motivations cards

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From the initial version to the new version: the emerging technologies' tokens and the criminal motivations have been included into the Red/Blue Team role-playing part of the game as cards. These new cards have coloured contours to help the animator to sort them and the players to see in which area of the canvas they go.

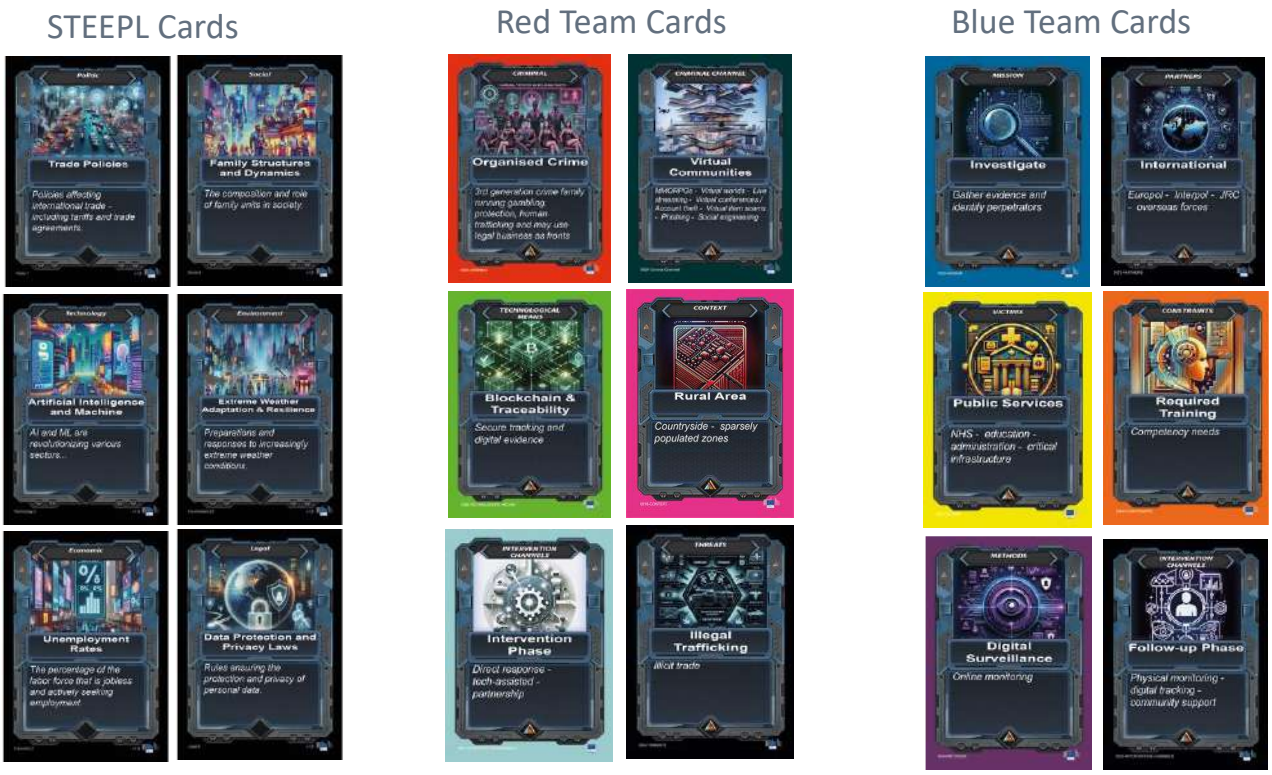

Figure 9: New version of the cards. From left to right : new version of STEEPL cards, then versions for RED and BLUE teams cards (card illustrations created by Upperion for AHEAD project)

4.3 Reinforcing the sequencing of animation

One of the lessons learnt from the 2nd foresight exercise was the need of more guidance during the LEA workshop.

To some extent, this point has been addressed by the addition of the Red/Blue Team role-playing sequence. However, we reorganised the sessions and tried to reduce the number of days during this 3rd exercise to see if a more dynamic timeline would help address our concern.

Based on the fact that the scenarios had been drawn up by the same people as those taking part in the LEA workshop and taking into account the results obtained during the satellite[1] exercise with the Finnish police, we tried to combine the LEA workshop (stage 2 of our methodology, see

[1] By « satellite exercise," we mean foresight exercises that are not mandatory in the working plan of AHEAD but asked by LEAs.

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figure 1) and the exploration meeting (stage 3 of our methodology, see figure 1) into a single one-day workshop.

As a reminder (see deliverable D4.1), stage 3 is devoted, on one hand, to assessing whether the recommendations are acceptable to the various stakeholders (citizens, businesses, administrations, and associations) using the Multiple Stakeholder Value Proposition map and, on the other hand, to assessing the impact of the change within the LEA (OBOC matrix). The diagram below shows the chronology.

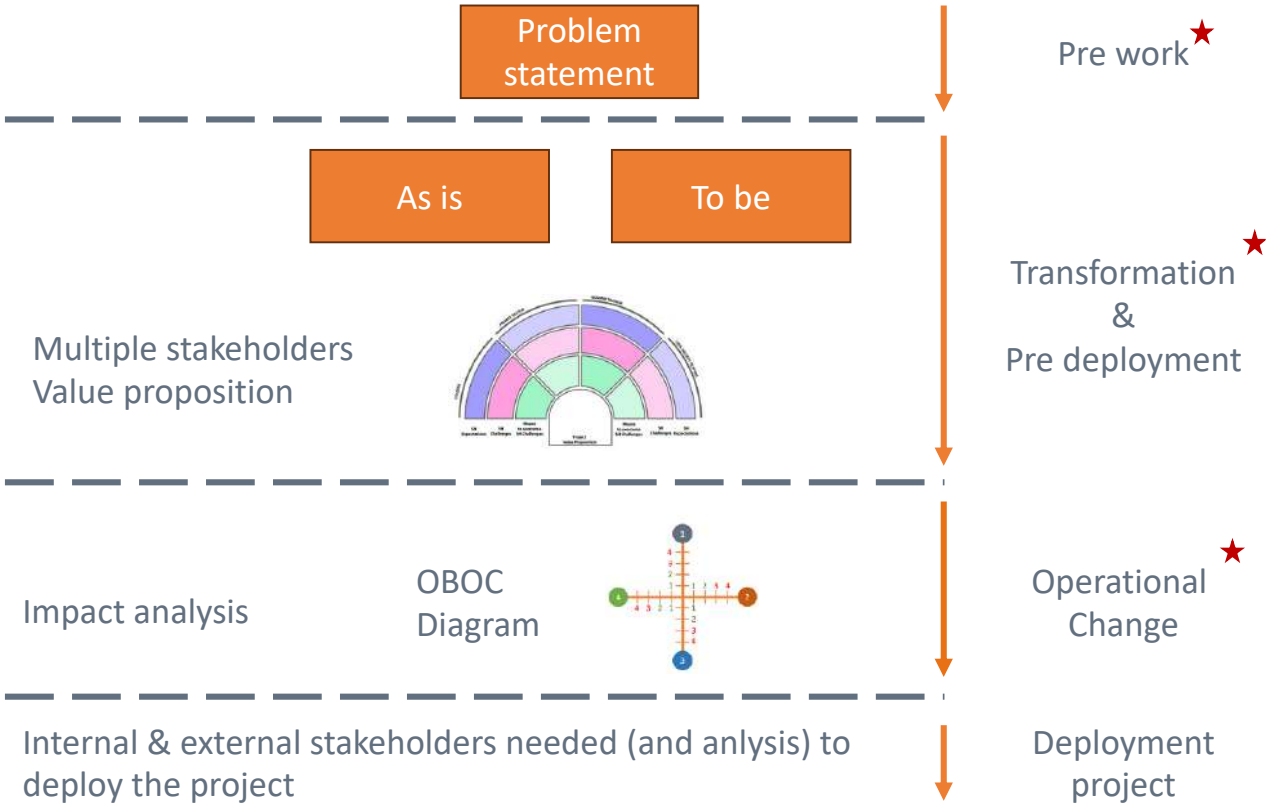

Figure 10: Stage 3 process. After studying the scenario (context) and specifying the threat (problem statement), the AHEAD methodology explores the acceptability of the recommendations and their impact in terms of change for the organisation. The red stars indicate the steps included in the AHEAD methodology.

As mentioned, a new and differently timed sequence has been tested. As shown on the table X, a first step is to present the game, the assets and the main goal of each steps

Animator Roles : Context keeper, Time keeper, Take Notes	**Prepare** : - All cards are pre-packed for 6 players

Table 4: Animators' Roles and mission

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For this exercise, we collaborated with the French Gendarmerie from COM CYBER MI to collect data from bibliography, to prepare the workshop and to ensure that animators could be real challenging partners for LEAs that attended the LEA Workshop. It was decided to not share this knowledge with the attendees prior to the workshop.

Day 1				
13 :45	**SEQUENCE 1 :**			
	20 min	**PRECISING CONTEXT**		Animator distributes STEEPL Cards (shuffled
		5 min	Players keep cards they think involved into the scenario	
		5 min	Players present their choice to others	DON'T READ THE CARD TEXT ! Players have to give 2 importants conclusions from the cards they kept.
		5 min	Debate among players to validate choice and precise the scenarios to keep	-> sticky notes on the board
	40 min	**CRIMINAL POINT OF VIEW (ROLE PLAYING)**		Animator distribute cards : Motivations, Crime Tech, Crime channels, Threat..)
		10 min (1st round : imposed role - Victimology & Modus Operandi	Each player try to assemble cards regarding his role (may leave blank or complete with blank cards)	Animator use wall paper to collect infos from players
			Players determine which victims can be targeted	
			Players determine the means to deploy for criminal to realise crime	
		20 min (2nd round : collective)	Players debate and may complete the cards for other roles	
		10 min Synthesis	Consensus from players	-> sticky notes on the board
14 :45	PAUSE (15 min) – Animator prepares the synthesis to open sequence 2			

Table 5: Schedule for the first half-day of the first day

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DAY 1				
15 :00	**SEQUENCE 2**			
	50 min	**IMPACTS & NEEDS**		
		10 min	Each player think about the impacts of these new criminality forms on the missions	
		40 min Synthesis	Presentation and synthesis for each mission (10 min by mission in a single round)	-> sticky notes on the board
16 :00	PAUSE (25 min)			
16 :25	**SEQUENCE 3**			
	45 min	**SOLUTIONS AND ROADMAPS**		
		10 min (1st round : imposed role)	Each player try to assemble cards regarding his mission (may leave blank or complete with sticky notes) – Santa Claus letter	Animator's role : challenge the ideas from the attendees
		5 min Victimology	Players determine which victims can be targeted	
		15 min Modus Operandi	Players determine the means to deploy a solution	
		10 min (2nd round : collective)	Players may complete the cards for other roles	
		5 min Synthesis	Consensus from players & VOTE	-> sticky notes on the game board
17 :10	Pause (10 min)			
17 :20	**40 min**	**CROSS-POLLINATED VIEWS**		
		15 min	Animator 1 presents	
		15 min	Animator 2 presents	
		10 min	Synthesis & VOTE	
18 :00	CLOSING			

Table 6: Schedule for the second half-day of the first day

The results of these two first sequence led to strategic recommendations. The second day, aimed more at finding more tactical recommendations to be implemented by local LEA.

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DAY 2				
8 :45	**SEQUENCE 1 : ACCEPTABILITY OF SOLUTIONS**			
	50 min	**SOLUTION 1**		
		25 min	Stakeholders Acceptance analysis	Common work on hemicycle sheet
		10 min Synthesis	Work on the individual appreciation of the OBOC matrix	Individual work
		10 min Synthesis	Debate on the OBOC matrix results (finding the common / differences)	-> sticky notes to collect remarks
		5 min	Synthesis	
9 :35	PAUSE (10 min)			
9 :45	**SEQUENCE 2 : ACCEPTABILITY OF SOLUTIONS**			
	50 min	**SOLUTION 2**		
		25 min	Stakeholders Acceptance analysis	Common work on hemicycle
		10 min Synthesis	Work on the individual appreciation of the OBOC matrix	Individual work
		10 min Synthesis	Debate on the OBOC matrix results (finding the common / differences)	-> sticky notes to collect remarks
		5 min	Synthesis	
10 :35	PAUSE (10 min)			
10 :45	**SEQUENCE 3 :**			
	60 min	**POOLING**		
		20 min	Solutions restitution 5 min each (4 solutions) : Strength & Weakness	
		5 min vote	Groups vote for preferred solution giving 3 words as arguments	1 solution prioritaire
		35 min	Round the Table	
11 :45	**30 min**	**FEEDBACK**		
		15 min	Feedback on the process	Starfish diagram
		15 min	Feedback on the use of this method by each country	
12 :15	CLOSING			

Table 7: Schedule for the first half-day of the second day

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5 Lessons learnt

5.1 Keeping a physical tabletop format vs an electronic one

The AHEAD serious game can be categorised into the Tabletop Role Playing Games (TRPG) categories – defined by the famous ancestor, Dungeons & Dragons[2].The collaborative and social nature of TRPGs fosters a unique environment where players can explore alternative realities and express their creativity through character embodiment (as we used in the Red Team role-playing) and narrative construction (in our case, the conjunction of initial scenario and animator capability), which is less common in ERPGs [23][24]. In contrast, ERPGs often offer a more visually immersive experience, where creativity is generally limited to choices within predefined game mechanics and narratives. While ERPGs offer advantages such as accessibility and in-game assistance, they do not offer the same level of social connectivity and engagement as TRPGs, which rely on imperfect information and the physical presence of players around a table [25]. This aspect of TRPGs is less pronounced in ERPGs, where the emphasis is often on individual achievement. Overall, while both TRPGs and ERPGs can stimulate creative thinking, TRPGs offer a more collaborative and socially interactive platform that encourages participants to engage in creative problem solving and storytelling, making them particularly effective at fostering creativity and personal development [26], [27].

During the different foresight exercises we also noticed that keeping a physical cards game presents a lot of benefits:

- Cognitive Benefits[28]:

Cards provide tangible representations of complex concepts, making abstract future scenarios more concrete and manageable ;

Physical manipulation of cards engages multiple senses, enhancing memory retention and learning which is more difficult with other media ;

Card sorting and grouping activities help participants identify patterns and relationships between trends/signals ;

- Collaborative Advantages [29]:

Cards create a shared visual language among participants from different backgrounds ;

The game format reduces power dynamics and encourages equal participation ;

Physical cards facilitate group discussions and consensus-building ;

- Methodological Strengths[30]:

Cards can systematically represent different variables (motivations, stakeholders, etc.)

[2] . Tabletop role-playing games (TRPGs) and electronic role-playing games (ERPGs) differ considerably in the way they encourage participants' creative thinking, mainly because of the nature of the interaction and the role of the human moderator. TRPGs, such as Dungeons and Dragons, are characterised by their reliance on a human game master who acts as a facilitator, challenging the players. This configuration encourages a high degree of creativity, as game masters and players engage in narrative improvisation and character development, often using creativity tools to enhance the narrative and gameplay experience [21][22].

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The game structure helps ensure comprehensive coverage of relevant factors

Card combinations can generate unexpected scenarios, promoting creative thinking

The AHEAD methodology has provided evidence that this type of gamification increases engagement and creative output in strategic exercise

However, and this has been discussed with the members of the consortium, there is nothing to prevent LEAs from implementing the methodology in a computerised way and use AI. However, the aim of AHEAD is to develop and validate a methodology in a physical format.

5.2 Focus more on the Initial question and the "sponsor" for the exercise

One of the novelties observed during this phase of the project comes from the comparison of the exercises initially planned in the programme and the satellite exercises carried out either with the EU-funded security research project (MARIT-D) or with an LEA from the consortium (as was the case with the Finnish police).

Conversely, the AHEAD foresight exercises, involving different LEAs from different countries, tend to produce strategic-level recommendations. As each country is more or less advanced in the development of countermeasures, what is tactically new for one LEA is not necessarily so for another, but obtaining a response at the strategic level is also easier because it is more general.

During the 'satellite' exercise with the Finnish police, the same participants attended throughout the exercise, and a specific tactical question was asked by the decision-maker (i.e. chief of police). In this case, the outcome was more effectively a tactical response.

In another 'satellite' exercise, with the EU-funded MARIT-D project, each of the three game tables focused on a specific element of the drug trafficking value chain, or on the entire chain. The responses were tactical, and likewise, attendees were the same from start to finish.

5.3 Complementary feedbacks

At the end of the 3rd Foresight exercise, the attendees were solicited to give their feedback using the Starfish Canvas exercise. In this exercise, they had to indicate their opinion on what we should do More, Less, Start doing, Keep doing, Stop doing.

As a result, 86.49% of the feedback was to keep going or enhance the methodology versus 13.51% of the feedback that addressed stopping or doing less. This first result shows that the practitioners that attended this meeting are in favour of this methodology and wish to have more.

Concerning the assets of the game, cards are plebiscited. On the question of the use of a game board, the answer is not clear (50%-50%); some LEAs think it is a good tool to write the synthesis of the findings; some do not. This point needs to be improved by clarifying the link between the

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stages of the process and those of the game board. Explanations on this subject will be included in the handbook if the game board is kept.

Looking more in detail at the few negative feedbacks demonstrates that some of the findings of the exercise are too technically detailed. Discussion with attendees on this point demonstrates that it is difficult for LEAs to have a good impact analysis on their capacities if they do not have a detailed solution. This point has drawn our attention, and we will study how to facilitate this impact analysis without detailing a solution. It will allow us to stay at a recommendation level.

On the side of improvements to the game, participants asked to have more time allocated to each part of the game and to be helped in completing the game with a chronological display of the stages (each stage completed, a token could be moved to the next stage). Our attempt to reduce time was too optimistic and will be reconsidered for the next workshop.

In addition, some participants also suggested that there should be more technical information, either by having technical experts present or by having the moderator provide specific technical information (in a briefing note, for example). This last point was already discussed before the workshop: the previous exercises showed that not all attendees had read the scenarios (half a page each), and for that reason, we couldn't expect them to be able to read a file of several pages before the workshop.

N.B.: *At the MARIT-D workshop, technical experts were involved at each table. They were able to explain the technology to the group without, however, opening up new horizons (when the subject went beyond their area of expertise, for example, or by a lack of disruptive capacity). The issue of experts' involvement in the workshop therefore remains. On the one hand, their contribution to popularisation is positive, but on the other, they are sometimes confined to their own discipline and find it difficult to see beyond their own beliefs.*

It is interesting to note that two participants would like to see an entirely digital and remote adaptation of the methodology that would incorporate AI, indicating that the card game is outdated[3]. It should be remembered that the aim of AHEAD is not to develop software (this was not in the proposal) but to create a new methodology, which will continue to evolve throughout the duration of the project. Considering our iteration period, it is not feasible to redevelop a new version of AHEAD software every 5 months. On the other hand, these iterations are simpler and feasible with paper.

Once the methodology has been tried and tested—at the end of the program—everyone will be free to implement it in the format that suits them. However, the 'paper' version developed to test the methodology has a number of advantages, in addition to those already set out in paragraph 5.1. It requires less energy than software, it can be recycled, and its cost ensures that it can be widely distributed—one of the wishes of the attendees that we are starting—thus ensuring fairness between the member countries of the European Union.

Having said that, Upperion would be perfectly capable of developing software at the request of partners who so wish, once the methodology has been fully tested and validated.

[3] In the interests of transparency, this feedback has been treated as negative, even though it is not in itself negative, since the substance is not in question but only the form.

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6 Conclusions

The 3rd foresight exercise conducted as part of the AHEAD project helped to refine the methods used to anticipate criminal trends and assess the capabilities of security agencies (LEAs). The integration of a role-playing component via the Red Team / Blue Team approach proved essential in overcoming participants' cognitive biases and encouraging "out of the box" thinking. By enabling law enforcement officers to adopt an offensive posture when analysing threats, this approach enriched the criminal scenarios exploration and the strategic responses framing.

The main changes to the methodology concern:

- Improving the format of the serious game: The switch to version 2.0 of the game has enhanced the immersion and creativity of the participants by redesigning the cards, simplifying the game board, and better structuring the animation sequences.
- More precise framing of sessions: The adoption of a more dynamic and better-guided facilitation sequence improved the engagement of participants, enabling better exploitation of the insights gathered.
- The evolution of capability analysis tools: The simplification of the POSTEDFIT framework to a 4-category model facilitated decision-making while maintaining a systematic approach to needs analysis.
- Maintaining the physical format of the game: Despite the potential value of a digital version, the tabletop approach proved more effective in stimulating interaction, creativity and commitment among participants.
- Analysis of the feedback also highlighted the need to better define the strategic objectives upstream and to ensure the consistency of the expert groups throughout the process. In addition, the question of integrating technical experts remains an issue for future exercises.

In a nutshell, the challenges for the following cycles are :

- the composition of the team of participants must be continuous throughout the process.
- specify the objective: tactical (very specific question or issue for the cycle) / strategic (initial scenarios more focused on major societal changes)
- adapt the 'methodological product' to different uses by ISPs depending on the type of organisation (large teams with resources/experts vs. small teams without resources/experts).

In conclusion, the AHEAD methodology continues to demonstrate its relevance and adaptability to the needs of European Law Enforcement Agencies. The implementation of these developments in future exercises will help to further refine the forward-looking capabilities of LEAs, enabling them to effectively anticipate and counter emerging criminal threats.

Forthcoming exercises will also involve civil security, enabling the methodology to open up to new domains and different challenges. We are anticipating this and have begun to introduce the "Domino Effect" concept into Risk (previously known as Crime in our game version). Indeed, an action (crime or natural disaster) can trigger new events. We think it would be interesting to introduce this notion in the next version of the game.

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