Future Game Concept Exploration

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ABSTRACT

This paper concerns the development and testing of a novel analytical wargame used for the exploration of military game development in the next 15-20 years. Based on theories of creativity, narrative immersion and game development, the FGCE (Future Game Concept Exploration) game was developed and subsequently tested in a live setting with both military and gaming experts. Results indicate that the FGCE game, with its competitive setup and intra-game challenges, is a useful method for promoting synergy between disparate experts. Work must be done on proper usage of reframing techniques used to allow participants to further immerse themselves into a more futuristic setting.

General Terms

Design, Experimentation, Theory

Keywords

Wargaming, Game Design, Synergy, Competition, Creativity, Reframing, Future Technology, Capabilities

1. INTRODUCTION

With the rise of the network society and the wide proliferation of related technologies, the landscape of war has been in a state of upheaval [1]. The classical idea of the red army versus the blue army has become more or less obsolete with these new modes of warfare arising as not since the interbellum has there been a similar state of technological upheaval [1]. As the tools and tactics of warfare have always been intricately connected to the evolution of (military) technology, rapid technological growth calls for methods of assessing the need for the military to adapt to these changes in order to maintain a competitive advantage over their opponents.

Originating among the Prussian General Staff during the early 19th century, the simulation of military field operations has been used extensively over the course of history not only to reconstruct previous battles for instructional use, but also to plan for the various contingencies that could appear on the battlefield in future skirmishes [2]. Dubbed Kriegspiel or war games, these strategic simulations have developed over time, enabling both civilian play and advanced military simulations [3]. With the increasing complexity of both warfare and the accompanying military system, cold war type and model-based simulations wargames have become more intricate and expensive, sometimes leading to costly failures [4].

With changing times come changing requirements and, in the same manner that the military must adapt to technological changes, so must wargaming. The potential for wargaming to allow exploration of future scenarios is large, as showcased by previous attempts at reframing hypothetical technological questions into a gaming format [5]. This potential, however, is for the most part untapped, as wargaming still clings to its strategic roots [6]. Wargaming can be used as an analytical tool not only for strategy, but also for generating insight into the capabilities required for modern warfare. As technology develops, military personnel must understand the usage and application of such technologies: a closer relationship with (civilian) technicians is necessary to explore these changes. Moreover, while technological progress can be mapped out partially, its application and the effects it has on future warfare are harder to predict, even by experts in that respective field. Thus, a more free-form variant of wargaming is needed to analyse more hypothetical futuristic scenarios that emphasizes novel ideas for the application of technology over simply using available assets to the greatest extent.

2. RESEARCH QUESTION

This paper focuses on the development and validation of such an analytical wargame for the Dutch Ministry of Defence: the Future Concept Exploration (FCE) game, a functional wargaming format and general template that serves as a tool for the exploration and analysis of future scenarios by military personnel and civilian technicians, with the aim of determining the capabilities required to deal strategically with these scenarios. The application that was used as the baseline for the game's development lies within the

domain of gaming technology, which led to the current version of FCE: the Future Game Concept Exploration (FGCE) game.

The projected outcome of the FGCE is two-fold: not only will be explored how technologies can be applied to solve various future situations, entirely novel capabilities will be generated with each session, in turn leading to an idea of the nature of game technologies and concepts that must be developed in the coming years.

The FGCE game aims to be an improvement upon TNO's earlier experiments with future capability assessment and planning through the use of a more game-focused setup, amongst others in [36]. From these earlier game sessions, several points arose that the FGCE attempts to tackle:

- **Future forward thinking** Firstly, players are generally found to have difficulties abandoning their current mind-set in order to generate novel insights. Moreover, reframing of their ideas of the world as-is was seen as challenging, with the projected goal of enabling future-forward thinking proving difficult.
- **Synergy** Secondly, due to the nature of the earlier game sessions , mainly military personnel and only a very few civilian experts have been part of the exercise itself. It was observed that such teams generally lacked the synergy that one hoped to achieve by combining military and civilian experts.
- **Challenging** Thirdly, the implementation of planned interventions (Challenges) as moments that test the value of the capabilities generated was lacking in either difficulty or relevance to the situation at hand. Wargames, by definition[1], incorporate an adversarial component that allows to actually test the plans or concepts devised. Adversarial play will reveal deficiencies of the plans or concepts and consequently will send the players back to the drawing board to come up with improved solutions. Yet, the kind of seminar wargaming lacks a true adversarial component. To still challenge the players' solutions, a so-called 'Challenge board' was introduced to challenge the solutions by introducing settings or events where the solutions were likely to fail. It turned out, however, in practice, that the fast paced nature of the game sessions left the Challenge board unable to adequately react within the short time frame provided.

To address the above issues in a single game, the question central to this thesis is:

RQ: How can the current future capabilities assessment format be improved through wargaming?

This broad question will be answered through several sub-questions that each focus on a crucial element concerning the development of the FGCE.

SQ 1. ***Future forward thinking*** *How can the game setup and mechanics enforce reframing of a player's point of view in order to achieve a state of future-forward thinking?*

SQ 2. ***Synergy*** *How can game mechanics promote innovative and synergistic capability generation between military officers and expert civilians?*

SQ 3. ***Challenging*** *How can game session leaders be assisted to react adequately to live game sessions in order to challenge its participants creatively and reframe their points of view through interventions/Challenges?*

3. RELATED WORK

3.1 Analytical wargaming

Traditionally, wargames are strategic endeavours that focus on direct conflict between opposing forces through manoeuvring of troops in an attempt to simulate war-like conditions without requiring actual troop movement [7][8][9]. The FGCE game lacks many of the simulation elements present in classical wargaming, being more akin to seminar wargaming, and seeks to allow for more experimental exploration of future scenarios and attempts to determine the required capabilities to tackle these scenarios.

Although non-gaming environments could be and have been used to achieve a similar goal, wargaming has been discussed extensively as a method to evoke the aforementioned synergy and immersion, with leading military experts praising its widespread usage [10][4][3]. They do note, however, that often wargames are ineffective mainly due to flawed design and implementation, stating that the entertainment game industry can serve as an example [4][6]. Following fundamental examples of entertainment game design with regards to user-experience design and gameplay-centric development [11][12], FGCE aims at low mechanical complexity combined with high clarity of purpose, such as by utilizing a simple resource system that ties victory points and the available money for game concepts together, both introducing scarcity and simultaneously forcing participants to rethink their initial game concepts in order to win.

A danger that arises when following entertainment games too closely in the creation of wargames lies with the so-called 'gamer-mode' that occurs when players place the explicit game goal, e.g. winning, above the implicit learning goal [32][33], leading to optimization instead of a realistic addressing of the situation. It

[1] 'Adversarial by nature, wargaming is a representation of military activities, using rules, data, and procedures, not involving actual military forces, and in which the flow of events is affected by, and in turn affects, decisions made during the course of those events by players acting for all actors, factions, factors and frictions relevant to those military activities.'[37]

was found that this is detrimental to the learning experience [32], yet can possibly be counteracted by designing the game specifically to not reward optimization and by embedding the game in a realistic context. The latter, the concept of immersion in its many forms, is a central idea to modern entertain game design and is implemented in the FGCE, the importance of which will be discussed below.

Useable as a tool for exploration of both military and non-military scenarios, yet with a strong implicit goal of predicting and assessing technological needs, the FGCE game is an example of an analytical wargame. In stark contrast to more traditional scenario-based adversarial wargaming [10], analytical wargames occupy a vastly different space as well as function, meaning they must similarly be approached as an entirely new beast [13]. Besides requiring a complete rethinking of older wargaming conventions [14], new design principles and guidelines must be established to allow for their effective implementation and usage.

A relatively unexplored type of wargame, prior attempts at analytical wargaming have focused on hypothetical technology deployment [5] using pre-determined 'Ideas of Systems' as assets for solving future scenarios. Moving away from military asset deployment, the FGCE game focuses on player generation of similar 'Ideas of System', in the form of viable future game concepts and their associated technologies, by fostering a stimulating gaming environment that emphasizes participant *synergy* through teamwork and competition, promotes *future-forward thinking* through narrative immersion and *challenges* their current mind-set for both greater creative concept generation and adherence to the volatile events of futuristic scenarios.

3.1 Synergy

With the end-goal of producing novel game concepts from both a military as well as a technological point of view, utilizing the combined mental capacity of all its participants stands at the forefront of the FGCE game's design (Subquestion 2).

Enabling players in their creative thought process is a two-step process: firstly, an initial concept must be generated in a short brainstorm session, followed by a more focused phase of delimiting and factoring in scenario-specific requirements. Ranging from industrial design [15] to business management literature [16] quick succession 'riffing' of ideas, or brainstorming, is hailed as not only positive, but crucial to the design process [17]. Moreover, in traditional game design, the initial creative stage is a lengthy process including but not limited to brainstorming, conceptualizing and early prototyping. The FGCE game seeks to tackle both early brainstorming and the concepting phase in a short time span, switching between inspiration sessions, creating and finalizing game concepts, and presenting and discussing them in order to keep participants engaged.

Interviews with several lead designers of large game studios [17] revealed that two aspects are named as crucial to the creative thinking involved in the creative stage: influence of a participant's background, and divergent thinking styles and thought processes. The FGCE game must thus be designed to include various different experts cooperating, as well as allow for individual thought processes. Participants of the FGCE game are split up into teams, with each team consisting of multiple experts from different fields in order to emphasize individual contribution.

3.2 Challenges & Framing

Furthermore, not only individual or group skills, knowledge and latent abilities contribute to this creative process. It has been found that socio-psychological factors can have large effects on creative behaviour, with framing devices being able to trigger or suppress creative output [18][19]. One such framing device that the FGCE utilizes that ties into both creativity as well as future-forward thinking is that of Challenges (Subquestion 3). Each Project has several associated Challenges, which are questions and topics that shift the focus of a game concept completely. The direction of this shift is determined by the Game Master, who must choose one of the Challenges that could potentially change participants' current point of view most. By shifting the focus or limiting the scope of participants' current game concept, old thinking can be replaced by novel ideas [18], as restriction breeds creativity [20].

Although many rough measures exist for creative output such as divergent thinking tests and qualitative rating of creativity [21], FGCE focuses less on measuring the quality and functionality of the game concepts and more on their relevance for the specific scenario. The FGCE game seeks to utilize socio-psychological framing devices to bolster creativity, not only by forming synergistically strong teams, but also through providing both a meta-narrative framework that acts as a catalyst for competition as well as offering realistic, near-future scenarios aimed at immersing the players in the setting and time period. In practice, this means that the overarching narrative structure of the game is important and the FGCE game thus includes a roleplaying element: each team is a military contractor vying for funding against other parties. The scenarios take the form of short videos that are shown before each of the game's rounds, which are in turn divided into themes such as Cyber, Deterrence and Mental Health, to trigger not only a heightened state of creativity, but also focus on evoking a futuristic mind-set.

3.2 Future-forward Thinking

Moving beyond player synergy, the FGCE game seeks to transport its participants to a situation wherein they view the presented projects with fresh eyes. Futuristic scenarios and problems are presented in an effort to evoke future-forward thinking by immersing the FGCE game's participants in its narrative (Subquestion 1).

In communication theory, immersion (or transportation) is a mechanism used to decrease counter arguing with persuasive messages, which is done by offering an engaging narrative [22]. Narrative immersion or transportation is thus paramount to the capability of participants to reframe their points of reference by placing them in a less critical state [23]. Moreover, immersion allows players to reinterpret unrealistic scenarios as more feasible [24], indicating its usage as a tool for aiding with embedding a futuristic narrative. Furthermore, roleplaying games are often linked to suspension of disbelief and emphasize interactive storytelling over realistic narrative [25][26]. Although the FGCE game is not a roleplaying game (RPG) in the traditional sense, its setup and inspiration sessions are framed as storytelling devices similar to those used in RPGs for world building [26]. The overarching meta-narrative of teams being military contractors ties in with both the military setting and competitiveness of teams, the latter which can contribute to intra-team cooperation.

Evocative use of storytelling or narrative is moreover seen as another means of achieving engagement in wargames [27][28]. Although enjoyment is not at the forefront of wargaming or serious/applied gaming in general, it does serve an important purpose: immersing the player into the game world and further motivating them to keep playing. The concept of 'flow-like absorption' has been a widely discussed phenomenon in psychology [29] and media studies [30], and has been attributed with higher engagement with the source material. This heightened state of engagement which is often mentioned synonymously with gaming is connected with greater enjoyment and less distraction from outside influences. Narrative transportation theory posits that narrative immersion contributes to this positive state of flow [31], further strengthening its positive effects on engagements. The FGCE game utilizes video, imagery and setting to attempt to achieve a similar flow state wherein participants are constantly engaged with the scenarios presented. Prior research done by TNO [34] on this embedding of gameplay within a specific and realistic context showcases the idea of the Big Game, which is a framing device wherein the actual (Small) game is embedded through briefings, 'inspiration sessions' and reflection moments in order to allow for learning beyond the gaming experience itself [34]. The FGCE game is designed according to these principles, with embedding and reflection built into its structure. Moreover, without the embedded components of the Big Game present in the FGCE (e.g. context, inspiration, reflection), the game itself loses a large part of its intended value.

4. Future Game Concept Exploration

4.1 FGCE Game Design

In the FGCE game, players split up into Teams, a military officer with a technological expert, and together take on the role of a military contractor vying for a contract by the Dutch Ministry of Defence. The roleplaying scenario emphasizes intra-team cooperation and moreover promotes inter-team competition in an effort to create both synergy within teams and improve engagement through the win condition and competition.

Each Round has its own theme, ranging from Cyber Recruitment to Troop Morale and Mental Health, and starts with a short inspiration session that includes an introduction, a video on a realistic future scenario such as Post-Putin Russia or the Netherlands on high terrorist alert, and example game concepts or technologies relevant to the theme. This inspiration session serves as a framing mechanism to evoke future-forward thinking by immersing participants in a realistic future scenario. Furthermore these sessions attempt to give participants the basis needed to generate novel game concepts and not only rehash what has already been done.

Subsequently, a problem is presented by the Game Master (GM) in the form of a Project, for which the Teams with the best solutions are awarded Funding Points. These Projects are scenarios focusing on a relevant military topic, and include questions framed to focus discussion and idea generation. The example Project in figure 1 showcases the Deterrence Project with its Target Group (Officers and Military envoys/diplomats) and Requirements (Focus on non-nuclear deterrent, Diplomatic or non-violent solution). Both Requirements and the images used seek to frame participants in a particular direction with regards to game concept generation in order to have at least comparable game concepts from each Team.

Figure 1. Example Project

Gaining Funding Points can be done in two ways: generate the best game concept, or saving up coins by generating cheap(er) game concepts that could hypothetically be more feasible to produce for a set budget. This creates scarcity similar to real world technological/game concept development and prevents

participants from producing concepts that are impossible to develop even in the future.

The Jury, a role taken on by the Game Master, is essentially the military command that each team of contractors must convince to fund their projects. The Jury determines the quality of the solutions based on whether the developed solution meets the Requirements and Target Group of the Project, shows Ingenuity and whether it is Feasible or not.

To present a Game Concept to the Jury, Teams must spend between one and three coins to 'develop' their concept from their total of 10 coins. The cost of each solution ranges from one to three, is determined by the Jury and depends on its scope and the Technologies used.

The solutions themselves are novel Game Concepts combined with zero or more available Technologies. Figure 2 shows examples of the Biofeedback and Motion Control Technologies and their descriptions. Technologies are both a tool to foster creativity and evoke a futuristic mind-set, with emphasis placed on less widely available technologies and those that will be highly relevant in the (near) future. Challenges that reframe points of view are issued during the ideation phase to prevent Teams from getting caught up in old ways of thinking. These Challenges concern greater societal shifts and international influence on the topics as presented in the Projects. The Challenges were designed beforehand, anticipating on possible 'old' thinking. For each project, two different Challenges were available and the game master would select the one that was deemed most suitable to the solutions the players devised.

4.2 Game Setup

At the start of each round, teams received a Game Concept Sheet where they could make notes and fill in the necessary information about their game including a short description and the Technologies used. Furthermore, 14 Technology Cards (see Appendix D) were placed in on the table in alphabetical order. At the end of each round, the Game Concept Sheets were collected and the Technology Cards were placed in their original position. The inspiration session took the form of a Powerpoint. A short introduction was followed by a short video (3 - 5 mins) of a future scenario loosely connected to the Project of that round. Subsequently, two examples were given of games or technology currently used in the corresponding field, after which the Project was introduced to the group and the ideation phase began. After ten minutes, the Game Master reveals the Challenge for that round. Five minutes later, the GM approaches each table to determine the cost of their game concept before each group presents their concepts to the group. They are then given Funding Points based on their adherence to the Project's criteria and the preparation for the next round starts. In between rounds, a small discussion took place emphasizing the FGCE game systems and Challenges.

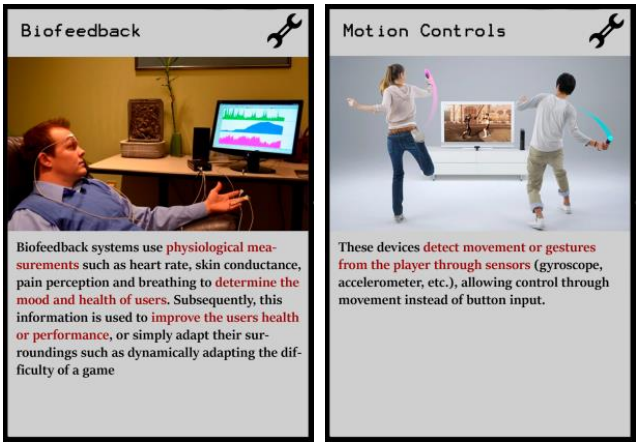

Figure 2. Example Technologies

5. METHOD

5.1 Synergy & Challenges

In order to ascertain the validity of the FGCE game with regards to its promotion of synergy as well as the effective usage of mid-game Challenges, a list of questions was constructed to get an indication of the participant's experience of the related game mechanics and their perceived effects (see Appendix A). Both a post-game reflection with all participants as well as an in-depth post-mortem discussion with approximately half of the game's participants were planned. Furthermore, the Game Master made notes of participants' behaviour and a second observer was present to monitor the FGCE game's progress. Each game concept was recorded by the participants and subsequently collected by the Game Master for later analysis. Data was collected during an initial dry run and a final test.

5.2 Future-forward Thinking

In an attempt to assess the value of the FGCE game in evoking a future-forward thinking mind-set, each game concept was independently rated by two gaming experts between 1 (lowest) and 5 (highest) on their *novelty*, *technological feasibility* and *psychological feasibility*. Technological feasibility was defined as whether the game concept could be realistically produced given current estimates of technological development, whereas psychological feasibility denotes an estimate to what extent the game concept is likely to achieve its desired (psychological) effects. Novelty indicated whether the game concept was original or otherwise novel in its implementation of older concepts and thus not simply a rehashing of already existing games and technology applications. Subsequently, Cohen's κ was calculated in order to determine the measure of agreements between the two independent raters, and thus determine the overall value of their ratings.

5.3 Testing

An initial dry run to test the general setup and the underlying concepts of the FGCE game was held with four students and a supervisor from TNO. This early game session utilized a separate third party (other than the Game Master) rating the costs of game concepts, as well as a more intricate resource system that allowed the spending of Funding Points as coins. Afterwards, a group discussion took place in an effort to finalize the game cycle for the final test run. Three rounds were played, with each round lasting around 40 minutes, with a short reflection of 15 minutes at the end, for a total of 3 hours including setup and introduction.

The group for the final test run consisted of a senior former military officer, a recently graduated marine, three technological experts with extensive knowledge of the military and three gamers. The participants were divided into groups of two or three, with each team including at least one person with extensive military knowledge and a gamer. After a short introduction, the participants played a total of five rounds of the FGCE game, followed by a reflection and group discussion. The setup for each round was identical to the dry run. Each round lasted between 30 and 45 minutes, with a reflection of 45 minutes, for a total of 4 hours excluding breaks and lunch.

Figure 3. Two participants in discussion

Afterwards, a group discussion was held structured around relevant questions from the aforementioned list relating to the FGCE game's validity.

Figure 4. Room setup of final test run

6. RESULTS: MEASURES

To answer the question how the current future capabilities assessment format can be improved through wargaming, the reflection and interim discussions of the final test run were aimed at providing as many clear indicators as to the FGCE game's effectiveness. All participants indicated that they enjoyed the game experienced, with only a single participant noting the game's length as detrimental. The variety of each project was indicated as a positive aspect. Its format was clear, as well as what was expected of the participants. The Game Concept sheets that teams filled in for each of their proposed solutions was experienced to be restrictive with regards to creativity due to lacking space for drawing and expressions other than writing. The Jury system was deemed too black and white, with calls for a more nuanced system that allowed for clearer differentiators between teams.

6.1 Synergy

The generation of new game concepts stood at the forefront of the game session, and one of the FGCE game's main efforts to promote this was through synergistic collaboration between military officers and technological experts. The synergy of the different experts within each team was hailed as highly positive during the final test run, with the multidisciplinary team compositions seen as contributing to out-of-the-box thinking and the reframing of individual member's points of view.

Each team generated five game concepts, for a total of 15 (see Appendix F for the complete list). To determine the synergetic value, as well as the degree of future-forward thinking within the corresponding teams, two independent raters judged the produced game concepts on a scale from one to five in three categories. The outcomes of these ratings were respectively 3.95 (Technological Feasibility), 3.70 (Novelty) and 3.35 (Psychological Feasibility).

Cohen's weighted kappa was calculated to determine the level of agreement between the two raters. A moderate agreement was found with k = .530 (95% CI, .367 to .694), p < .0005.

A Pearson product-moment correlation was run to determine possible relationships between the three rating categories. A strong, positive correlation was found between Technological Feasibility and Psychological Feasibility (r = .383, n = 40, p = .015), whereas a strong negative correlation was found between Novelty and Psychological Feasibility (r = -.314, n = 40, p = .049), which were both statistically significant.

Finally, three new Technologies were added by the teams that were not included in the original 14: LVC (Live, Virtual and Constructive), Advanced Photoshop and Digital Psychologist. It should be noted that LVC is nomenclature for specific types of simulation, Advanced Photoshop is a software application and thus not a technological platform and the Digital Psychologist is an example of A.I.

6.2 Future-forward Thinking

The FGCE game's inspiration sessions were aimed at fulfilling the sub-goal of bringing participants into a future-forward thinking mind-set not only through its Challenges, but through the entire game setup. The videos of future scenarios presented specifically to enable this future-forward thinking at the start of each inspiration session did not match up completely with the projects, which caused the need for extra explanation of each new project. While the videos were indeed found useful in setting the tone and atmosphere of the current round, participants indicated that perhaps the presented future scenarios were still overly connected to our current frames of reference. The usage of more futuristic settings and imagery in both the future scenario videos as well as the available Technologies was proposed as a possible solution. The Technologies could be expanded upon and include a wider variety of gaming 'technologies' such as board- and cardgames. Moreover, the Technologies were found be overly focused on interface technologies. Usage of more far-fetched, futuristic technologies such as advanced robotics was proposed. Evocative imagery and science fiction concepts were deemed more important for the future narrative than realistic implementations.

Others indicated that the framing devices used (e.g. the available Technologies, scenario videos and example game concepts) were too plentiful and forced participants into a specific mindset. During the game it was unclear whether or not the available Technologies had to be used or that non-technical game concepts such as roleplaying and boardgames were 'allowed'. It was proposed to add these analogue means of gaming to the list of gaming Technologies.

6.3 Challenges

Projects as well as Challenges were not seen as straightforward and their ambiguous nature allowed for individual interpretation when designing the game concepts. In turn this ambiguity enabled larger discussions on the presented topics. However, Challenges were sometimes seen as no more than added requirements for the project instead of events that changed the status quo of their thought and design processes significantly. In two rounds, Cyber and Deterrence respectively, the Challenges were deemed effective in achieving the designated goal of future-forward thinking and required participants to rethink their concepts rigorously. The Cyber project centred around the question: *"How can we improve military recruitment of cyber security personnel through gaming?"*, with the accompanying Challenge was focused on NATO-wide recruitment of cyber personnel: "*How can the game concept allow for selecting only the best internationally?*" Participants found the Cyber challenge relevant due to its international focus and the interconnected nature inherent to cyber and the (future) world was deemed evocative. Similarly, the Deterrence project *"How can gaming improve military deterrence training?"* in combination with the Challenge "*How can the game concept be adapted to function when the enemy is not represented by a fixed entity such as a state or (known) ruling body?"* made participants re-evaluate their expectations with regards to a conflict of a stately nature that might occur between Nato and Russia (old thinking), by framing them into thinking about a situation in 2030 that might be post-Putin where it might not be unlikely that Russia and/or Nato might have been disintegrated, hence a non-stately conflict with multiple actors would emerge (future forward thinking).

7. RESULTS: NOVEL GAME CONCEPTS

Below, we'll describe the proposed game innovations based on the first two sessions with the FGCE. In that, we'll distinguish between concepts that mainly used novel technologies (section 7.1) and those concepts that did not necessarily used new technology, but introduced new ways of military gaming (section 7.2).

7.1 Use of novel technology

7.1.1 AI replacing man

The expectation of having much better Artificial Intelligence (AI) in 2030 triggered many ideas about automating parts of play that would today be provided by humans. For instance, in the mental health project, a team anticipated a fully functional digital psychologist, obviously named ELIZA[2]. ELIZA would not only diagnose, it would also treat psychological disorders. Humans

[2] ELIZA was written at the MIT Artificial Intelligence Laboratory by Joseph Weizenbaum between 1964 and 1966. ELIZA operated by processing users' responses to *scripts*, the most famous of which was **DOCTOR**, a simulation of a Rogerian psychotherapist.

would only provide second line support, thus, when ELIZA would diagnose, for instance, suicidal tendencies amongst personnel, it would trigger a human psychiatrist and refer the soldier. Here the technological and psychological feasibility was deemed moderate to low, as we have been anticipating ELIZA for ages now and she hasn't yet grown to any maturity.
Several game concepts included AI based modules that would replace human enemies, peers or instructors. Such concepts would enhance efficiency of training as these would allow for training without utilizing own troops or an enemy, or alternatively, these would enable individuals to train in a simulated team setting. Such AI based concepts are not new, hence their novelty is low, yet their technological feasibility is moderate. In the military science field, a lot of work has been done on modelling enemy effects, yet the full *whole of governance* toolkit has yet to be explored. So we doubt whether a reasonable level of predictive validity for operations beyond the kinetic can be achieved by 2030. Then, interacting with digitized peers, amongst other things, is heavily dependent on automated natural language processing, and, the progress in this domain steady but slow. Finally, the research field of intelligent tutoring is trying to replacing the instructor for about 40 years now and the progress is not too impressive.

7.1.2 Innovations in interfacing technology

The availability of many new types of interfacing technology triggered ideas on the use of such technology in enhanced interaction with peers and family and for enhanced, more immersive representation.
Enhanced Interaction with family was chosen in particularly to support troop morale. For almost all teams, the underlying idea was that more intimate connections between troops and their families at home would boost troop morale. Several teams came up with ideas to use advanced virtual reality technology to allow personnel to interact more intimately with their families at home during deployment. E.g. *Touchy Skypy* was invented to enable personnel to play and cuddle with their kids and obviously, other members of the family could be cuddled as well. Novelty of such solutions was rated high, yet psychological feasibility moderate to low as the effects of enhanced intimacy could both be positive as well as negative. Enhanced connection with home might drag the soldier into trying to solve all daily family problems which might lead to frustrations on both sides.
Enhanced representations were suggested, using hologram technology for e.g. planning games to 'augment' the present landscape with those elements present in conflict. Such representations could be used in education, training and mission preparations. The concepts are not new and technological feasibility is considered moderate to high as we expect the hologram technology to get more mature between now and 2030.

7.1.3 Using the internet of things

A creative example of the use of the internet of things was the hackers recruitment game where potential recruits were confined in a camp where nothing functioned; no light, no Wi-Fi, no showers etc. By hacking into the internet of things at the camp- in a highly competitive setting, they could get all facilities to work**.** As a cyber recruitment game, we enjoyed the game- concept and the use of technology. So the novelty was rated high to moderate and the technological and psychological feasibility as high to moderate.

7.2 Novel Game concepts

7.2.1 Whole of society wargaming

The deterrence project triggered teams to think far beyond purely military capabilities. They introduced a large toolbox of non kinetic capabilities (diplomatic, psy-ops, info- ops, economic-ops etc etc) for adversarial deterrence play and they planned on rewarding players heavily when they would come up with capabilities that made sense and were not previously anticipated within the toolbox. Especially smart alliances with public partners were cheered upon.
In deterrence play, one should not push your enemies too far, once an enemy would revert to kinetic action, you would have lost the game. This kind of whole of society gaming, although creative, is not totally new as we see it in Matrix gaming, hence novelty is moderate and psychological feasibility was deemed moderate as the predictive validity would be totally dependent of the expertise and the capabilities of the players to actually play their role properly, adhering to emotions and beliefs.

7.2.2 Rich representations of different landscapes

Another trend that was seen was that e.g. games for strategic planning would go beyond representing the traditional physical landscape. Traditional wargames predominantly use a representation of physical terrain, with a focus on landscape features, such as rivers, roads, bridges, urbanization etc. Novel game concepts for strategic planning used heavily layered representations of different aspects of society relevant to conflict. It would contain layers for e.g. the human- and information landscape, but also, if relevant specifics about other landscapes such as the economic landscape (for instance depicting money flows).
A layer for the human landscape would depict what is known about the power and sectarian distribution, show the hotspots of groups with for instance a shared political or religious background, and which strongholds are held by which group. Those layers are not necessarily map -based, but may consist of symbolic representations and parameters. Parameters, e.g. those that depict tension between groups and the extent to which groups feel allied to own troops. A problem with such representations is that these are for more dynamic than those of the physical landscape and as such both harder to create and to maintain. This

could create risks of having a false sense of security based on outdated info. So novelty is high, yet psychological feasibility is estimated moderate.

7.2.3 Role exchange

In the civil military cooperation project we saw an interesting concept of role- exchange. The team anticipated a situation with Europe that would be far worse in terms of polarisation between groups than that of today with a constant deployment of military to counter large scale terrorism. Normally, civil authorities would be responsible for countering those threats, however, the team considered military techniques and procures far more appropriate at such high threat level and they came up with training games where military were in the lead and trained civil response units for e.g. three block war in simulated environments. Role change is not new, but we found the idea interesting in this context.

8. DISCUSSION

8.1 Synergy Although the overall makeup of each group in the final test run included both a gamer and a military expert, the overlap between TNO employees as having both game design as well as military expertise offered a smooth FGCE game session which thus might not accurately reflect its application 'in the field'. The difference between military officer and military expert here seemed quite significant, with most military experts not showing signs of restriction to military dogma and regulations with regards to Game Concept generation, with content deemed more crucial to the solution than its form, e.g. the concept itself. Due to the difficulties with arranging for more military personnel to join the test run, this could possibly be attributed to individual differences instead of occupation. As TNO employees tend to have more experience in game design than military officers can be expected to have, future FGCE sessions might require more design and creativity enhancing tools.

The positive reactions with regards to team cooperation and varying expertise synergy indicate the success of the mixed team compositions of the FGCE game. Debates on the originality and implementation of other team's game concepts, as well as efforts to reframe their game concepts in order to persuade the Game Master (GM) to allocate more points to their creation showcased the effectiveness of the competitive elements with regards to engaging its players and fostering teamwork. A point of contention that arose from the competitive elements was in the allocation of points by the GM, as often teams with disparaging game concepts would have similar scores. The simplistic nature of the scoring device, e.g. two standard points for adherence to the project's requirements and another two for novelty and feasibility respectively, left little room for distinction. Future versions of the FGCE game would do well to include a more differentiating scoring mechanic, for instance one that gives a rating from one to five in each relevant category. As there was some confusion in the final test run as to which team was in the lead, the usage of a public scoreboard could further increase competitive drive and thus intra-team synergy, as teams indicated that the competitive nature contributed positively to their idea development and teamwork.

8.2 Future-forward Thinking

The presented scenario videos were found to be an effective method of focusing participants' attention to the new topic at hand, however, their direct relevance to the projects was low. Extra explanation was required to fit the videos to the projects and even then it was not always clear. This problem arose due to the reuse of the scenario videos from the previous Future Forces capability workshop. While cutting edge news at the time, modern day footage does not contribute to placing participants into a new mind-set due to its familiarity, nor does it evoke questions and possible future scenarios as some issues have been either resolved or covered extensively. In future iterations of the FGCE game, care must be taken to better adapt the projects to the videos or produce entirely new videos specifically aimed at the proposed projects.

The framing devices used during the FGCE game (e.g. Technologies, scenario videos and project-specific examples) were both judged as strongly forcing participants into a technology-focused direction, as well as being too ingrained in the modern day to evoke effective future narrative transportation. This difference can stem from personality differences, with some more inclined to 'realistic' future scenarios while others value the freedom afforded by a more fantasy oriented scenario. Furthermore, a middle ground must be found between military personnel whom have been trained to utilize available resources only and game designers for whom creative solutions overrule logical constraints. Thusly, there is no clear-cut answer to this complex design choice, yet the importance of these framing devices cannot be underestimated and must be adjusted accordingly to the group composition of the participants.

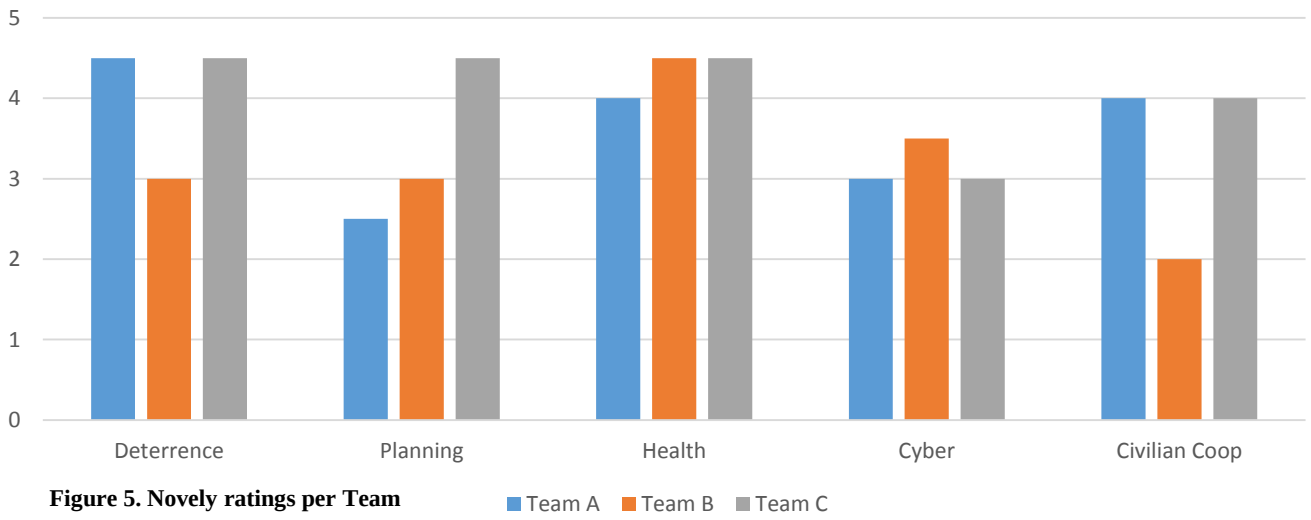

Figure 5. Novely ratings per Team

During the reflection, participants indicated that the available Technologies should be expanded to include related game design options other than the (mainly interface) computer-technologies presented, such as board games and alternate reality live games. The danger here is that game concepts will be based on familiar low-tech solutions and move away from more futuristic technological implementations. A comparative game test that includes these added options could reveal any differences between the two with regards to novelty of the game concepts.

The Technologies that were added in addition to those available included an expanded virtual environment, a software application and an advanced A.I. None of these are hardware-focused solutions that require different technology than the already available Technologies, however, their creation does point to the question of whether or not the definition of the Technology cards were not too narrow. The arbitrary distinction of focusing on hardware was made due to an early focus on technological capability generation instead of higher level game concepts, however, as noted by the participants, this approach is not completely in line with the goal of producing these game concepts. Care must be taken in future iterations of the FGCE game that focus is placed either on technologies or on the applications of the technologies. A focus on the latter should include software development, larger frameworks or technological paradigms and aforementioned analogue game design aids (roleplaying, card games, etc).

The outcomes of the statistical correlation test between Technological Feasibility and Psychological Feasibility are not surprising, as it indicates that they are strongly related. Game concepts that are more realistic to produce are easier to relate to already existing measurements of validity, thus more easily imaginable game concepts are rooted more in expected outcomes. Novelty and Psychological Feasibility on the other hand share a negative correlation, which showcases the distance between thinking in novel direction with entirely different techniques and technologies, and the expected proof of an unconventional game concept's validity.

The moderate agreement found in the Cohen's weighted kappa analysis between the independent raters showcases that their ratings are sufficiently similar to enable interpretation of the average scores. The mean averages for Technological Feasibility (3.95), Novelty (3.70) and Psychological Feasibility (3.35) indicated that overall the game concepts produced by the participants of the FGCE game were of sufficient quality with a cut-off point of 3.00. Both Technological Feasibility (3.95) and Novelty (3.70) were rated high, which indicates the FGCE game allowed for the development of new, yet realistic game concept generation. A lower Psychological Feasibility score was to be expected with futuristic game concepts at the forefront. Figure 5 showcases the rating performance of each team based on the Novelty of their game concept, which gives an indication that the separate team ratings were not incredibly far apart. Initial discussion revealed a tendency for the military-expert heavy team to be focused on content over conceptualization, however, this quick overview showcases these fears were largely unfounded. Moreover, none of the individual game concepts were rated below 2.00, meaning wholly unoriginal ideas were discarded by the teams themselves during the conceptualization phase.

8.3 Challenges

Although seemingly not directly contributing to the game concept generation itself, the ambiguity of the project's phrasing was deemed beneficial to the overall discussion. Each team interpreted the questions slightly differently, which led to semantic debate on the inherent meaning of key concepts. While the discussions did take away from the limited time teams had to develop their game concepts, their insights contributed to the value they placed on the value and the content of the game concepts. Due to the conceptual nature of FGCE, this observation can be seen as positive, as with a greater understanding of the project comes a better evaluation of the game concept as accurately fulfilling its intended purpose.

It became clear in the reflection and subsequent post-mortem that each project's requirements could often be leading and thus determine the type of game concepts that were developed. Although not necessarily a negative aspect, care must be taken to not steer game concept generation into a single direction: the FGCE game's outcomes are highly dependent on these concepts and overabundant framing could lead to skewed results.

Moreover, Challenges were often seen as yet another requirement to be taken into account, further diminishing participants' freedom. Challenges in the Cyber and Deterrence rounds were received positively and denoted as examples of Challenges that reframed participants' points of view by fostering future-forward thinking. A possible explanation for this is that both of these Challenges, respectively on NATO-wide cyber recruitment and stately versus non-stately conflict deterrence, addressed large societal shifts instead of focusing on minor alterations to specific game concepts. Moreover, the adversarial nature of these Challenge was far clearer. Whereas other Challenges were aimed at the game concepts themselves, the Cyber and Deterrence Challenges emphasized foreign military presences as the crucial problem. Although difficult to determine, future iterations of the FGCE game must clearly focus on these larger, adversarial issues instead of seeking to change the game concept alone. Moreover, a focus on more adversarial influences could shift the FGCE game away from an experimental analytical game to explicitly being denoted as a wargame [35].

9. CONCLUSION

The Future Game Concept Exploration game's core design is based on disparaging theories with a single common denominator: immersing participants enough to allow for an exploration of possible future game concepts and the associated technological and other capabilities required for their successful implementation. Predicting future developments, even when using sophisticated simulations and predictive algorithms, does not offer clear-cut answers. It is crucial to note that the Future Game Concept Exploration game as presented in this paper is but a first step in crafting an analytical wargame that can produce these valuable insights. By repurposing wide-ranging theories for fostering creativity and immersing participants to a gaming context, the FGCE game has showcased the potential usefulness of (analytical) wargames as tools for other purposes beyond education and training. Its structured brainstorming setup and competitive game elements allow for greater immersion and engagement, which could be beneficial when compared to regular, more open brainstorming sessions.

By tackling synergy, future-forward thinking and seeking to challenge participants in order to reframe their thought process, the FGCE game sought to improve the current future capabilities assessment format by implementing gaming mechanics into its design. The final test run revealed that both novel and feasible game concepts were developed by its participants, whose diverse, competitive team compositions led to innovative insights and relevant discussions.

The answer to the research question *How can the current future capabilities assessment format be improved through wargaming?* is multi-faceted, however, it is clear that using framing devices such as Technologies, scenario videos, relevant examples and narrative can improve upon existing analytical wargames and methods that seek to predict interesting future avenues for technological and game concept development. This paper has shown the potential of wargaming for supporting decision making with regards to future (war) game development. Follow-up studies must examine the mechanics used in the FGCE game on a larger scale, in order to further refine its systems and thus increase the social creation and brainstorming processes the game currently facilitates.

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11. APPENDIX

A. Questions group discussion

Reframing

Are the presented Game Concepts novel?

Did the Challenges force new thought processes on and revisions of the proposed Game Concepts?

In how far did the Game Concept Sheets assist with thinking up a solution to the Project?

In how far did the short inspiration sessions (videos and examples) assist with creating novel concepts?

Synergy

How did the cooperation between military officer and gamer go during the game?

In how far did the different points of view / expertise add to the game concepts?

General

Did you enjoy your experience, and why (not)?

Were the descriptions on the Technology Cards sufficient?

Were there crucial Technologies missing or were certain Technologies useless/superfluous?

B. Game Concept Rating Statistics

Weighted Kappa

Weighting	Kappa	Asymptotic Standard Error	Z	P Value	Lower 95% Asymptotic CI Bound	Upper 95% Asymptotic CI Bound
Quadratic	.530	.083	4.291	.000	.367	.694

RaterA vs. RaterB

Correlations

		Technological _Feasibility	Novelty	Psychological _Feasibility
Technological_Feasibility	Pearson Correlation	1	-.245	.383*
	Sig. (2-tailed)		.128	.015
	N	40	40	40
Novelty	Pearson Correlation	-.245	1	-.314*
	Sig. (2-tailed)	.128		.049
	N	40	40	40
Psychological_Feasibility	Pearson Correlation	.383*	-.314*	1
	Sig. (2-tailed)	.015	.049	
	N	40	40	40

*. Correlation is significant at the 0.05 level (2-tailed).

Group Statistics

	Rater	N	Mean	Std. Deviation	Std. Error Mean
Technological_Feasibility	A	20	4.0000	.72548	.16222
	B	20	3.9000	1.16529	.26057
Novelty	A	20	3.6500	.81273	.18173
	B	20	3.7500	1.06992	.23924
Psychological_Feasibility	A	20	3.5500	.99868	.22331
	B	20	3.1500	1.03999	.23255

Report

GameConcept		Technological_Feasibility	Novelty	Psychological_Feasibility
AdversarialMMO	Mean	4.5000	3.0000	3.5000
	N	2	2	2
	Std. Deviation	.70711	.00000	.70711
AdverserialMatrx	Mean	4.0000	4.5000	4.0000
	N	2	2	2
	Std. Deviation	.00000	.70711	.00000
AlternatedRealit	Mean	4.5000	3.5000	3.5000
	N	2	2	2
	Std. Deviation	.70711	.70711	.70711
BothWorldDiplom	Mean	2.5000	4.5000	4.0000
	N	2	2	2
	Std. Deviation	.70711	.70711	1.41421
BrainWave	Mean	2.0000	4.0000	2.0000
	N	2	2	2
	Std. Deviation	.00000	.00000	.00000
DigitalDiplomat	Mean	2.5000	3.0000	2.5000
	N	2	2	2
	Std. Deviation	.70711	1.41421	.70711
Hackcraft	Mean	4.5000	3.0000	3.5000
	N	2	2	2
	Std. Deviation	.70711	.00000	.70711
HackYourGrade	Mean	4.5000	3.0000	4.5000
	N	2	2	2
	Std. Deviation	.70711	1.41421	.70711
HeartratePlatfor	Mean	4.5000	4.0000	2.0000
	N	2	2	2
	Std. Deviation	.70711	1.41421	.00000
MovingEliza	Mean	3.0000	4.0000	2.0000
	N	2	2	2
	Std. Deviation	1.41421	.00000	.00000
Multi-LevelGame	Mean	4.0000	4.0000	4.0000
	N	2	2	2
	Std. Deviation	.00000	.00000	.00000
Multidisciplinar	Mean	4.5000	2.0000	4.5000
	N	2	2	2
	Std. Deviation	.70711	.00000	.70711
Operation Rewind	Mean	4.5000	4.0000	4.0000
	N	2	2	2
	Std. Deviation	.70711	.00000	.00000
PaintShopMisinf	Mean	5.0000	4.5000	3.5000
	N	2	2	2
	Std. Deviation	.00000	.70711	.70711
RealLifeStress	Mean	3.5000	4.5000	2.5000
	N	2	2	2
	Std. Deviation	.70711	.70711	.70711
RebootCamp	Mean	4.0000	4.0000	3.5000
	N	2	2	2
	Std. Deviation	.00000	.00000	.70711
TouchySkype	Mean	4.0000	4.5000	2.5000
	N	2	2	2
	Std. Deviation	.00000	.70711	.70711
TouchyTable	Mean	5.0000	2.5000	4.5000
	N	2	2	2
	Std. Deviation	.00000	.70711	.70711
VRLivingRoom	Mean	3.5000	4.5000	2.0000
	N	2	2	2
	Std. Deviation	.70711	.70711	.00000
VRMap	Mean	4.5000	3.0000	4.5000
	N	2	2	2
	Std. Deviation	.70711	1.41421	.70711
Total	Mean	3.9500	3.7000	3.3500
	N	40	40	40
	Std. Deviation	.95943	.93918	1.02657

C. FGCE Game Structure

Inspiration Short briefing explaining the context of the **Project** of this **Round**.
5 minutes

Preparation GM makes **Teams**, chooses **Jury**, Teams receive **Funding Points**.
3 minutes

Ideation Teams discuss the Project, its **Target Group** and its **Requirements**, determining further Requirements where necessary. Teams have to come up with two solutions to the Scenario using the **Game Concept Sheet** and associating **Technologies** with their concept. After 5 minutes, GM issues a **Challenge**, restricting or adapting the Scenario.
20 minutes

Selection Teams present their solutions to Jury in short 30 second pitch. Jury grants Funding Points to Teams. Next Round starts.
5 minutes

After several Rounds (depending on the time available) of phases I, II and III, the Reflection phase starts

Reflection Discuss resulting ideas and capabilities associated with them, fill in Game Concept Sheet.
5 minutes per completed round

Total game length for 6 rounds: *210 minutes Game plus 30 minutes Reflection, or 4 hours total*

D. FGCE Description of Terms

Project A question/frame to focus discussion and capability generation, each Project consists of a question (e.g. "How do we recruit new cyber security officers for the military?"), a Target Group, Requirements and Challenges. They emphasize realistic and futuristic problems focusing on the domain (in this case: wargaming in 2030).

Target Group This part of the Project indicates at whom the solution is aimed: care must be taken to think about the wants and needs of this group.

Requirements For each Project, specific aspects are a bare necessity for its successful completion and acceptance by the Jury. Requirements serve as an extra foothold in an otherwise free-form ideation phase, however, Teams are stimulated to think of other crucial Requirements in addition to the ones presented with the Project.

Challenges After determining the Requirements and coming up with initial ideas, the Challenge influences the ideation phase by adding sudden restriction or new piece of knowledge. This is meant to evoke a sense of urgency and forces Teams to adapt to changing situations.

Teams These consist of two members, one military officer and one field expert relevant to the scenario. Teams attempt to create the best solution for the Challenge, with the Target Group in mind. Every round one Team wins if they are selected by the Jury.

Jury The group that has been chosen by the GM to moderate the Round. This Team discusses various possible solutions of the Challenge in order to formulate the best advice for the other Teams with regards to the Fit, Ingenuity and Feasibility of the proposed solutions.

Technologies Descriptions of future technologies that are used by the teams to create new solutions to the Challenges and lead to the discovery of relevant capabilities. Information shown includes name, evocative image, general description, strengths/pros and pitfalls/cons.

Round Each FTEG session consists of Rounds, each with four Phases: *Preparation*, *Examination*, *Ideation* and *Selection*. The number of Rounds depends on the amount of players and the time allotted to the session.

FGCE Game Technologies
Advanced Artificial Intelligence
Augmented Reality HMD
Brain-Computer Interface
Biofeedback
Cloud Gaming
Haptic Feedback
Holography
Motion Controls
Omni Treadmill
Projected Interface
Room-scale Virtual Reality
Social Media API
Touch Screen
Virtual Reality HMD
Internet of Things

E. FGCE final test run Projects and Challenges

In order of appearance during the session. Underlined Challenges were selected based on participants' game concepts.

How can gaming improve military deterrence training?

Inspiration: Veilig Blijven video, Civilization/Diplomacy
Project Type: Education, training & exercise
Target Group: Officers, Military envoys/diplomats
Requirements: Focus on non-nuclear deterrence, diplomatic or non-violent solution
Challenge 1: Unknown Enemy: How can the game concept be adapted to function when the enemy is not represented by a fixed entity such as a state or (known) ruling body?
Challenge 2: Generic Deployment: How can the game concept be applied to various different war scenarios?

How can high level strategic (mission) planning improve through gaming?

Inspiration: Veilig Blijven video, Decisive Action/Board(war)games
Project Type: Support of decision-making & mission preparation
Target Group: commanders
Requirements: Round-table setting, multi-user, no dice or peripherals that slow gameplay, no simulation model due to cost, wide application and quick turn-around
Challenge 1: Increasing Prevalence of Cyber: How can gaming improve visualisation of cyber missions in conjunction with physical-based missions?
Challenge 2: Powerful Computing on the Move: How can this game concept be deployed mobily?

How can troop morale and (mental) health be improved through gaming?

Inspiration: Veiligheid Brengen video, Fitness apps/Health monitoring
Project Type: Resilience & revalidation
Target Group: soldiers in the field
Requirements: Non-invasive option, direct/live feedback
Challenge 1: Statistics vs. Health: How can this game concept aid in correct long-range decision making?
Challenge 2: Transhumanism as reality: How can this game concept be applied to work with implants?

How can we improve military recruitment of cyber security personnel through gaming?

Inspiration: Veilig Verbonden filmpje, Hacking Experience 2 / Quadrilateral Cowboy
Project Type: Recruitment, selection & assessment
Target Group: university students (Computer Science), high schoolers (HBO/WO)
Requirements: Challenging, wide appeal
Challenge 1: Competition with Other Countries: How can we prevent other countries from using the same recruitment tool?
Challenge 2: NATO-wide recruitment: How can the game concept allow for selecting only the best internationally?

How can gaming improve military and civilian cooperation in national emergency situations?

Inspiration: Veiligheid in Eigen Huis video, Aftershock / Emergency 4
Project Type: Support of decision-making & mission preparation
Target Group: emergency workers, police, military personnel
Requirements: Combine both military and civilian points of view,
Challenge: Intensifying Terrorist Threats: How can the game concept contribute to a transition to a constant state of high alert?

F. Produced Game Concepts

Below the descriptions of the game concepts by the participants, some are very limited.

	Final Test Run Game Concepts	**Technologies**
military and civilian cooperation	**Multi-Level Game**: movement in VR to simulate circumstances, strategic planning changing the gameworld on touch table. Military and civilians switch roles.	Omni treadmill, VR, Touch screen, LVC*
military and civilian cooperation	**Operation Rewind**: Live Action training supported by modern interfaces. Different groups exchange members to also see situation from the other's perspective. Possible to 'rewind' situations after making wrong choices, enabling participants to replay the final moment as learning tool. Instead of simulation uses game masters.	Touch screen
military and civilian cooperation	**Multidisciplinary scenario-based serious game with role exchange**: As the tensions grows at home, it is anticipated that a more military approach is needed to counter terrorism. Military and civil personnel change roles within counter terrorist excercises. That means that Military can take a leading role in civil scenarios. Terrorist setting created emphasis on military: three-block war with civil parties.	-
recruitment of cyber security	**Alternate Reality Game**: trail of digital breadcrumbs that take the shape of increasing complex challenges in coding, hacking and understanding the digital landscape. Starts with a large social media campaign.	Social Media API
recruitment of cyber security	**Hack Your Grade**: competition within class to create awareness. Learn to program, with small challenges lead up to larger obstacles. Learning to solve exploits and exploit systems until you can 'hack' the school system	-
recruitment of cyber security personnel	**Hackcraft**: MMO hacking game with emphasis on teamwork.	-
troop morale and (mental) health personnel	**Virtual Living Room**: Use VR technology to 'transport' soldiers during deployment to his/her own living space to e.g. play games and interact closely with family members, so that people can be closer and also touch and share images. Collects data on stress,	VR, Haptic Feedback, Video/Camera

	morale and mental health that can be in turn used for planning.	
troop morale and (mental) health personnel	**Moving Eliza**: Run and play with family at home using Virtual Reality techniques. Followed by a game with a Virtual Psychologist, name Eliza. Data is collected and fed info a medical ethical commission.	Omni treadmill. VR, Digital Psychologist* (AI)
troop morale and (mental) health	**Real Life Stress Resistance Training**: Confront people unknowingly with stressful circumstances in order to train their psyche. Use sensors embedded in clothing to measure their current physiological state, in particular indicators for stress.	Biofeedback
high level strategic (mission) planning	**Adversarial Matrix Game + AR Filters**: Use AR and 3D modelled environs to show economical, diplomatic, cyber, psy, etc.	AR
high level strategic (mission) planning	**Virtual Map**: adverserial game - output shown by means of Virtual Map containing layers with political, military, operational, technical, tactical levels, hearts & minds/psyops.	-
high level strategic (mission) planning	**Touchy Table**: Adversarial boardgame played on touch table. Differeny overlays for cyber connections. Includes unexpected events for the opposing teams.	Touch screen
deterrence	**Digital Diplomat**: AI person with whom to practice application of communication techniques	AI, Hologram
deterrence	**The Winning Game**: multiple opponent adversarial game focusing on intel and spreading misinformation. Uses 2 different kinds of measures, known ones from the escalation ladder, and the ones that the players come up with. Only for the latter ones they gain points. Propoganda and misinformation is created by players. Game is lost if the other party attacks- hence beyond deterrence.	Advanced Photoshop*
deterrence	**Both Worlds**: full AI diplomacy simulator (both outcomes and consequences of diplomatic actions) connected to social media and group think. VR interface for simulations	Social Media API, AI, VR
	Dry Run Game Concepts	**Technologies**
recruitment of cyber security	**Reboot Camp**: few day long introduction to hacking through utilizing the available interconnected system on-site. A central hub keeps track of all participants' achievements.	Internet of Things, Social Media API, App*
recruitment of cyber security	**Adverserial MMO**: simulated IoT where hackers attempts to enter gates by hacking their way through the system's defenses	Internet of Things, AI
troop morale and (mental) health	**Touchy Skype**: enables soldiers to play with children at home physically	Haptic Feedback, HMD
troop morale and (mental) health	**Heartrate Platformer**: couch-coop multiplayer game that adjusts itself based on bio/neurofeedback, requires soldiers to stay calm, fosters connection with other soldiers, perhaps playable with the homefront	Biofeedback
	Adversarial ?	?
	Brainwave: allow officers to give orders through a BCI	BCI