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Policy Gaming for Humanitarian Missions

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ABSTRACT

Aid workers increasingly face risks when working in crisis regions. In order to improve effectiveness and safety of humanitarians, it is of great importance to provide a well thought out real-time socio-technical support. Thus, new policies and innovative technological solutions need to be developed and integrated into humanitarian workflows. For the requirements elicitation process to realize this aspiration, we employ a board game approach that confronts players with situations aid workers experience in the field. From the first game session, we learned that the game is a valuable tool. It raises awareness to important challenges and trade-offs that humanitarians face. In addition, it is an effective catalyst for initiating a discussion on which system requirements are needed. Future work will include an update of the board game as well as sessions with the target group of practitioners to inform the development of a socio-technical system for humanitarian aid work.

Keywords

simulation game, humanitarian aid, crisis management, requirements elicitation

INTRODUCTION

The conflict in Syria is one of the largest humanitarian crises of the 21st century. In 2016, an estimated 13.5 million people, including 6 million children, were in need of humanitarian assistance. However, humanitarian access in this and other regions are highly constrained by on-going conflict, shifting frontlines, administrative and bureaucratic hurdles, and violence deliberately targeted against aid workers in contravention of international law, international humanitarian law and human rights law (Humanitarian Response, 2016). Last year in Syria alone, aid convoys delivering goods to the suffering people have been attacked multiple times. In September 2016, an airstrike on an aid convoy near Aleppo, killed twenty civilians including several aid workers and destroyed eighteen trucks containing relief goods. As immediate security measure, the United Nations suspended all aid convoys to Syria. Likewise, the International Committee of the Red Cross declared that this attack has serious repercussions on their humanitarian work in the region (The Guardian, 2016; Aljazeera, 2016).

For protection, international humanitarian aid organizations such as ISRC and the UN agencies rely on minimum operation security standards (MOSS) (ISRC, 2015; United Nations, 2006; WFP, 2009). However, as humanitarian aid work comprises of a complex system with many different stakeholders (local and international NGOs, field experts, host governments, and other authorities), it is alarming that a shared security standard, used by all organizations involved in the workflow of humanitarian aid is yet missing (Armstrong, 2013). Although there is a widely shared and intuitive understanding that proper communication with well working policies and technology is key in order to secure the safety of the aid workers and to support the effectiveness of the aid work, in reality, aid agencies often fail or find it difficult to collaborate (Fenton, 2003). Balcik et al. (2010) provide an extensive overview of challenges in coordinating humanitarian aid efforts. Firstly, the emergence of information technologies like GPS, telecommunication networks, and tracking mechanisms provides opportunities for improved security planning and coordination. This development also creates new safety issues in the humanitarian environment (Armstrong, 2013; Lindenberg and Bryant, 2001). Secondly, coordination activities cost time and money for the aid organizations. As a result, agencies have to weigh costs of participating in coordinative initiatives against the provision of direct services. Thirdly, the coordination of

humanitarian aid work is challenged by the fact that the humanitarian system includes a large number of actors (Stephenson, 2005). Not one institution is vested with authority and control to prioritize activities and allocate assets, and inevitably, different organizations have competing multiple interests.

With regard to the effectiveness and efficiency of aid delivery Minear (2002) argues that a number of policy tools are indispensable. Such policies and strategies include strategic planning, information gathering and sharing, resource mobilization, common accountability frameworks, assuring a shared division of labour in the field, and maintaining workable relations amongst the aid organizations and with local authorities. Besides, (Balcik et al., 2010) argues that as logistics is a major component of disaster relief operations, the coordination of the transportation of relief goods is likewise vital for the success of aid work. Still, decision-support systems in humanitarian aid supply chains are not as developed as their commercial counterparts (Balcik et al., 2010).

Furthermore, the nature of crises suggests that humanitarian organizations have to make decisions such as the allocation of resources under severe uncertainty in a highly dynamic environment. Typically, this condition leads to the movement of authority to lower levels and a flattening of the communication network (Turoff et al. 2004). As a result, many decisions are made ad hoc with little considerations of the strategic consequences or possible look-in effects. On the other hand, preserving a hierarchical structure in times of emergency produces even more unfavorable results – e.g. slow response and misallocation of aid (Dynes & Quarantelli, 1976). Therefore, Dynes & Quarantelli (1976) argue that emergent organizations that organize around information flows and break up traditional organizational boundaries are needed for an effective emergency response system. Emergent structures are characterized by greater resilience and more flexible to respond to the unknown. However, designing and implementing emergent organizations remains a great challenge and until today an active line of research as many questions are still unanswered.

Considering specifically the situation for aid workers in Syria, we argue that new policies and innovative technological solutions need to be developed and integrated into humanitarian workflows. To realize this aspiration, we make use of an interactive board game as tool to identify and prioritize requirements. The outcomes of the game play and its debriefing discussion will inform the development of the new system. In this paper, we present the design considerations towards such a game, the outcomes of a first game play session, and outline further steps of our research.

GAMING & REQUIREMENTS ELICITATION

Defining appropriate system requirements is fundamentally important for evolving and re-designing complex systems, specifically in high-risk security environments (Nuseibeh and Easterbrook, 2000). Requirements engineering, in the context of complex socio-technical systems, refers to the systematic process of identifying, specifying, and validating user requirements (Van Lamsweerde, 2001). Here, we focus specifically on the identification of requirements and make the case for employing a gaming approach to support this task. In the following sections, we first present the current best practices of requirements elicitation and secondly focus on the value of gaming in this process.

Best Practices in requirements elicitation

In a nutshell, requirements elicitation describes the process of collecting requirements of a system from users and other stakeholders. Before that, a rigor domain analysis is an inevitable premise before beginning the formal requirements elicitation. The domain analysis aims at providing an in depth understanding of the application domain and includes the identification of relevant stakeholders, as well as their interest and perceptions of problems (Jackson, 1995; Nuseibeh and Easterbrook, 2000). By involving stakeholders in the domain analysis, the current system state and opportunities for improvement can be captured and jointly objectives that the target system should achieve be clarified (Van Lamsweerde, 2001). A good domain analysis is able to identify root causes of problems and provides a complete picture of the socio-technical environment in which humans and technological devices interact (Ross and Schoman, 1977). Following Dietz (2006), the outcome of a domain analysis needs to fulfill the following quality criteria:

- Coherence: the domain analysis should constitute a logical and truly integral context.
- Comprehensiveness: the domain analysis should have a complete coverage of all relevant issues.
- Consistency: the domain analysis should be free of contradictions or irregularities.
- Conciseness: the domain analysis should be compact and succinct.
- Essence: the domain analysis should only show the essence of the problem domain.

Multiple techniques for eliciting requirements are discussed in the literature. Goguen & Linde (1993) provide a comprehensive survey and assessment of different techniques, considering: brainstorming, document analysis, survey/questionnaire, interviews and focus groups, observation, prototyping, and interactive workshops. What is interesting is the notion of conscious and tacit knowledge. Robertson (2001) argues that it is relative straightforward to identify conscious requirements, however, it is more difficult to identify unconscious requirements (requirements stakeholders implicitly assume) and undreamed requirements (requirements stakeholders do not realize are possible) (Robertson 2001). Consequently, she calls for employing different complementary techniques. Briefly, Robertson (2001) suggests that conscious requirements can be effectively obtained from interviews and surveys. However, unconscious requirements can be more readily identified by participatory approaches. Finally, to capture also undreamed requirements, Robertson recommends organizing brainstorming sessions and make use of explorative simulation models.

Furthermore, techniques for eliciting requirements should also be chosen with the characteristics of the domain in mind. As described in the introduction of this paper, the field of humanitarian response is a complex multi-actor setting and involves enormous challenges with respect to inter-organizational communication and coordination (Balcik et al. 2010). What is more, agencies working in conflict areas have to strike a balance between humanitarian and security concerns. Since individual humanitarian agencies only have partial view on the problem, multiple stakeholders needs to be involved in the system design process in order to collecting both new requirements and feedback about existing ones (Saab et al., 2008). A proper technique that can deal with such setting is on demand and we argue that gaming has great potential to fill this gap.

Gaming for requirements elicitation

In recent years, increasing focus has been paid to game based approaches towards requirements analysis, since games have been proven to be an effective tool to collaboratively generate innovative ideas, communicate knowledge, and engage stakeholders across multiple domains. Nevertheless, the idea of adapting a serious gaming approach for user requirements elicitation is relative new and only few applications exist (Marcelino-Jesus et al., 2016). In the following we will discuss the motivation for using gaming for requirements elicitation.

Games facilitate the process of eliciting requirements, because games are able to put requirements for system design in a useful context (van Lamsweerde, 2001). In addition, games provide a safe environment that mimics real life experiences and provides opportunities for participants not only to reflect on their own behaviours, but also to experience other stakeholders' roles (Westera et al. 2008). Knauss et al. (2008) argue that games can illustrate and convey insights that are difficult to gain using other requirement elicitation approaches. A well-designed game is fun to play and able to produce robust and reproducible results. Hainey et al. (2010) concludes that game-based learning is an effective tool, which increases the knowledge level of users and is suitable for requirements collection. Likewise, Fernandes et al. (2012) report promising results suggesting that gaming for requirements elicitation possibly enhances the user involvement in the eliciting process and assures the quality of obtained requirements.

Also, in the humanitarian field, researchers have already successfully adopted similar approaches. Games have been utilized for making the development of information management tools more user centred (Meesters and Van de Walle, 2014; Meesters 2014). Besides, given the inexpensive yet authentic evaluation of the technological solution, the authors argue that games can be used as training environment as well as be part of the dissemination strategy for deploying developed tools into the field.

THE BOARD GAME - PLEHON

Simulation games come in many different formats – from simple card or board games, to extensive role-plays and advanced computerized models of complex systems and situations. In general, a game can be defined as an artefact based on rules, roles, and resources (Klabbers, 2009). More specific, a game represents a system in which players engage in an artificial conflict defined by rules that results in a quantifiable outcome (Salen & Zimmerman, 2004). Games are powerful tools to represent, understand and design complex systems (Bekebrede, Lo, & Lukosch, 2015). They enable human participants to enact a specific role in a simulated environment (Duke and Geurts, 2004) and are often used to train specific skills (Lukosch et al., 2014), transfer knowledge, explore the effect of novel technologies (Lukosch et al., 2015), or develop new strategies or policies.

In our case, we make use of a board game in order to illustrate the role of communication and coordination in humanitarian aid work, and to analyse the workflows needed to collaborate and carry out aid work in an efficient and safe manner. In this sense, the board game serves as a research tool with the aim to understand the field of humanitarian aid work and its needs. For doing so, a game model is constructed from a systems analysis,

after which the game is played and the results are transferred back to the reference system (Peters, Vissers, & Heijne, 1998).

We have chosen to use a board game, as a board game is relatively simple to develop, compared to e.g. advanced video games. It can be played in a relative short time period and still can provide a realistic experience of a complex system (see for an example from the logistics field (Kurapati, Lukosch, & Verbraeck, 2015). Games can be distinguished as being either competitive or cooperative in nature (Zagal, Rick, & Hsi, 2006). In our case, the game includes both. One the one hand, the players compete for the highest score in order to win the game. On the other hand, the main goal of the game is to save as many people as possible, which can only be achieved by cooperative behaviour.

The board game developed and used in this study is called Plehon. Plehon represents a crisis area in a fictitious game world, and consist of three locations in need of help: Forestia, Cap City, and Hilltown. Those are represented on the game board (Figure 1), as well as a score indicator and a satisfaction meter for the local government. Stacks of event cards, asset cards, and mission cards are placed in the middle of the board. Four players are playing in equal roles of an NGO that is able to provide assets (blankets, food, and vaccines) to different locations. The mission cards indicate how many assets are needed in which location and how long each aid mission is allowed to take.

A facilitator introduces the game, its goals, rules and roles, and manages the rounds, scoring, as well as introducing the events. The facilitator helps the players with the game play, and encourages for quick decisions. The game is being played round-based, with each player taking actions in turns. The tasks of the players include drawing asset cards and making their operational decisions. Based on the mission information and optionally the event information, the players can either share information and put resources directly into a mission, or put recourses into a convoy first without accouchement. Each player has a limited number of communication tokens and can share their resource allocation decision of the round by spending one token. A meeting (limited to 1.5 min) of all players can be organized, which costs three communication tokens. These tokens can come from different NGOs. If communication is not chosen, the allocation of assets into a mission is invisible for the other players. The game score is based on the number of assets a player allocates to a certain mission. Points are only allocated if a mission succeeds. If a mission fails, no player gains any points. This leaves a certain risk to the decision on the investments of assets into the missions.

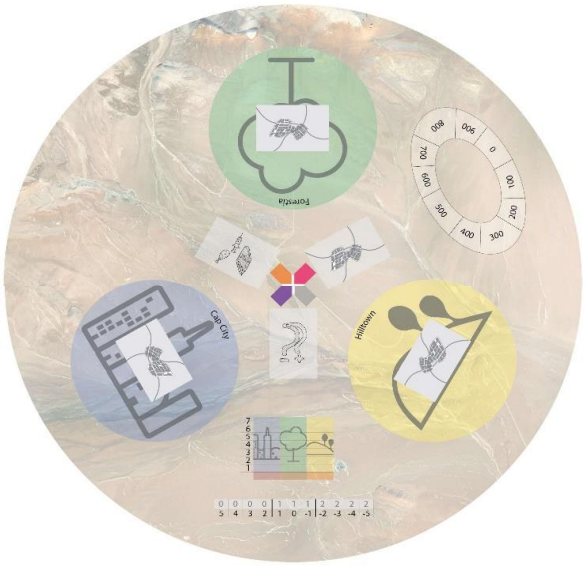

Figure 1. Plehon Game Board

METHODS

The game session was introduced with a scripted briefing, supported by power point slides briefly explaining the problem, the roles, rules, and resources of the game. The whole session was videotaped, and the debriefing was also recorded. In addition, based on the video recording the elapsed time of the different phases was logged. After the game play, the participants filled in the Game Experience Questionnaire (GEQ) (IJsselsteijn, Poels, & de Kort, 2008a). The GEQ is a self-reported instrument to capture different aspects of participants' subjective

in-game experience in a convenient and time-efficient manner (IJsselsteijn et al. 2008b). It is constructed modularly. For this study, only the core module was utilized. The questionnaire consists of a set of neutrally formulated 5-Level Likert Scale questions. The core module consists of 33 questions and addresses 7 dimensions of game experience: (1) Sensory and Imaginative Immersion, (2) Tension, (3) Competence, (4) Flow, (5) Negative Affect, (6) Positive Affect, and (7) Challenge (IJsselsteijn et al. 2008a). The de-briefing was based on the JamToday Game Scope card set, developed by the JamToday project (http://www.jamtoday.eu) and ended with an open question round on the experiences during game play.

THE GAME PLAY SESSION

Participants

Eight test persons were invited to the game session. All were researchers, three of which had a background in the area of humanitarian aid, while the others were experienced in game design. The participation was on voluntary basis, and all participants gave their spoken consent that data from the session could be collected in order to evaluate the game play.

Set-up

Four teams of two participants played the game during a facilitated game session. The game session took about 2 hours, and was structured into briefing, game play, debriefing and discussion. The two independent game facilitators began the session with a brief presentation on the humanitarian decision making context. Subsequently, depending on seating arrangements, teams of two were formed, and the facilitator representing the UN OCHA (United Nations Office for the Coordination of Humanitarian Affairs) in the gaming world introduced the rules of the game as well as team and overarching common objectives.

The first few game grounds started with some easy missions to provide the opportunity to familiarize participants with the rules of the game. Then, without interruption of the game play, the missions became more difficult and the game dynamics more interesting. One of the game facilitators continued to play the role of the UN OCHA and supported the participants to comply to the rules of the game. The other facilitator computed the interim scores and publicly announced the scores regularly, which provided the players with feedback on the effectiveness of their actions and strategies. The end time of the game came as surprise for all players allowing no strategic behaviour in the last round. The game facilitator computed the final score and shared their observations, after which the winner was rewarded and asked to explain his/her strategy. Likewise, the other teams were then also invited to share their experiences in the game. Hereafter, to assess the game quality, participants were asked to fill in a game experience questionnaire. Then, the game facilitator opened the debriefing discussion. Based on a list of prepared questions, the group discussion centred around reflection on how well the game translates humanitarian practice, what would have to be changed to improve the game in the future, and how future versions of the game could be used to elicit requirements.

RESULTS OF THE GAME SESSION

Observations during game play

The rules of the Plehon game were quickly clear. Nevertheless, at the beginning of the game, the rounds went slow. This is because participants were engaged in their teams and discussed sensible strategies. The scoring system was not unequivocally transparent and random events were introduced, resulting in some uncertainty that made it difficult to decide for a specific strategy. Players were highly committed to the game, as demonstrated by a player celebrating a first victory, accompanied by envious glances from opposing teams. The atmosphere was serious and concentrated, while participants tended to play primarily cooperatively. The option for coordination meetings was only used after a massive overspending of resources occurred and not activated before more than 30 minutes of game play. The discussion was organized and focused; quickly all teams agreed upon a short-term strategy for the on-going missions that were complied to. Shortly after, the next joint meeting was initiated. Again, the outcomes were implemented, but long-term strategies were not discussed. In the end, all lives were saved but due to a lack of communication, cumulatively 26 resources were overspent, which could have been used to support others. In the debriefing, the facilitators addressed the painful subject that one team considered to deliberately let some die in one place and other teams were talking about their personal score instead of the people they could potentially safe.

Game Experience Questionnaire (GEQ)

Scores for the dimensions were computed as the mean score of respective question items. Due to the limited number of subjects (N=8) that participated we report stacked bar plots with contrasting colour schemes. The results (Figure 2) suggest that overwhelmingly players find the game stimulating and had fun playing the game according to the very high score on positive affect and low values for negative affect. However, players felt only fairly competent in what they were doing. This outcome may be explainable by the low number of players with experience in the humanitarian context but likewise could be attributed to the quality of the game. The score for immersion is moderately high and for a simple first version of a board game respectable. The average score for flow suggests that there is room for game design improvement.

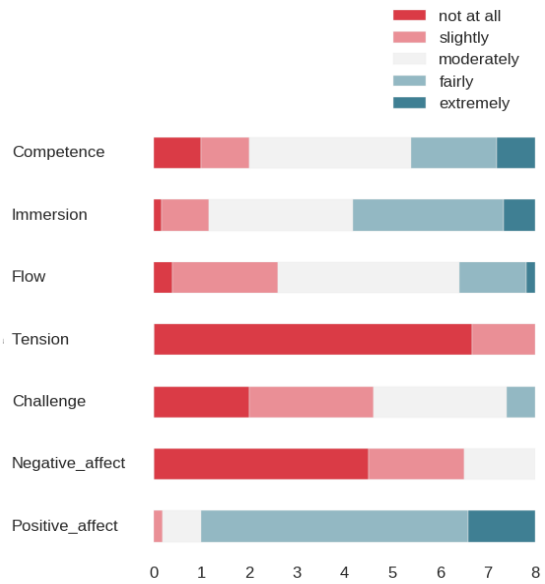

Figure 2: Descriptive results of the core module of the GEQ

To address this shortage, as described, a discussion was organized aimed at reflecting on possible game improvements. Finally, the score on challenge clearly shows the perception that the game was not challenging enough and therefore also not as competitive as intended. Social presence, commonly defined as social connection to other entities, is an important aspect of gaming experience. The findings from the survey are supported by the debriefing session. In summary, the Plehon game provided a meaningful and at the same time engaging learning experience. The level of difficulty was rather too easy and the level of immersion is expandable. Nevertheless, it is respectable for the first simple version of a board game.

Observations during debriefing

The semi-structured debriefing session was focused on assessing the quality of the board game as tool for requirements elicitation. The main objectives of the game are twofold, namely to make participants aware of the crucial role of communication in humanitarian aid work and its usefulness for requirements elicitation based on the workflows of humanitarians. The session was opened with a question regarding whether these main goals of the game were reached. All participants agreed that the game very well displayed the importance of communication to reach shared goals and the difficulties to allocate resources when communication was impeded. Furthermore, the participants noted that the game was fun to play and that there was a clear learning process regarding strategies based on the actions allowed in the game and the feedback given by the scores.

However, the game was perceived as not detailed and comprehensive enough to be useful for requirements elicitation. One criticism that was voiced concerned the unrealistic simplification that communication in the game was modelled binary (either on or off). Speaking from own experience in the field, one participant explained there are various means of communication used and numerous challenges concerning the communication present in reality, for instance language barriers, interpretation and implementation of decisions, and pressure of time. In short, there are more shades of grey than only on and off.

Furthermore, several participants said that more details needs to be added to make the game more realistic particularly with respect to logistic operations. In addition, some players reported that during the round, there was relative limited interaction and hence at times it was boring to just watch people thinking. Asked whether the game was challenging enough, participants reported that it was challenging to find an appropriate balance

between competition and cooperation – win the game or save as many lives as possible. However, some saw the missions as too easy, because players could often overspend on missions without consequences. It was concluded that more difficult missions would support the objectives of the game better. There were different perceptions on whether the game provided sufficient consistent strategic options. The majority of participants agreed that they played overall cooperatively and nice to each other. Would the game be repeated, some players voiced they were eager to test the effectiveness of more advanced strategies such bluffing (e.g. not following agreements).

Suggestions for improving game

Hereafter, participants were asked for suggestions and recommendations for improvements to be implemented in the next version of the game. Already during the game play, the suggestion had been made to limit the decision time for each team e.g. with an hourglass or to draw cards all at the same time.

One participant with extensive experience in the humanitarian sector, proposed to add the internal struggles within organizations to communicate, interpret information and take appropriate action. Adding this aspect, the game would better mirror how practitioners are sandwiched between different stakes and influences and create more interesting dynamics having to manage information flows at two fronts. The workflows of humanitarian aid workers that regularly attend internal as well as inter-organization coordination meetings (cluster meetings etc.) could be translated into the board game by establishing a single point of inter-organizational coordination. For the rest of the time, players could be situated within their teams discussing and managing their own organization. Challenges that could be addressed within their organization include the accountability for decisions, handling of logistics, and dealing with donors or headquarter demands.

This core idea could be refined and extended by limiting the time of coordination meetings. Another suggestion was to introduce different roles (manager, logistician, technician,) and characters (e.g. evil, unmotivated, incapable) within organizations that do not necessarily need to be disclosed. Furthermore, organizations could be made specialized by default or strategic decisions during the game by the team. Specialized organizations would have their respective core competences and deficiencies and would add another dimension of strategic options. Other proposed changes to make the game more realistic were to raise and diversify the types of resources, for example add rescue teams, personal vehicles, and trucks for the transport of relief goods.

Based on their observations, participants suggested to introduce more dynamic elements and diverse event cards that could impact all players as well as only individual organizations (teams). On the other hand, participants also warned that too many activities would be confusing and make the outcomes of the game random. Another crucial aspect suggested to be considered was that in rural areas it takes longer and more assets to save fewer lives. This is one of the fundamental problems of humanitarian interventions, which leads to a misallocation of resources towards easy targets in urban regions.

It was suggested to provide room for participants to improve their own processes and learn from communication failures, by creating themselves tools they need and adopting techniques like taking notes, or introducing the cluster mechanism within the game play. Finally, one participant suggested that players should be co-located and modern communication technology should be introduced into the game.

In summary, the participants agreed it was interesting and engaging to play the game. The game represents a great basis on which improvements and extension could be built. Workflows of humanitarian aid workers are in reality more complex and dynamic and hence more detail should be added to the game. To balance the trade-off between complicated and difficult to understand rules and the ability of the game to represent reality, the complexity of the game could be gradually or stepwise increased after a few rounds. Thus, players could understand the backbone of the game before being challenged with new difficulties.

DISCUSSION AND CONCLUSION

In this research, we adapted a simulation gaming approach for user requirements elicitation in the humanitarian context. The game was designed as a simple board game for 4 teams, addressing communication needs in humanitarian aid work and targeting explicitly practitioners and policy-makers. The game's quality was evaluated based on the analysis of video-recordings of the game play including debriefing and by surveying participants. These two evaluations were complementary and mutually supportive. The game Plehon is perceived as highly engaging and supportive to demonstrate the need for communication in its context, humanitarian aid work. The game's design is able to capture two essential aspects of complex socio-technical systems of humanitarian aid work. On the one hand, the game is able to show the challenge humanitarian aid workers face in allocating limited resources while dealing with multiple external risks and uncertainties as well as impediments of communication. On the other hand, the game illustrates that humanitarian aid work, in spite

of the shared commitment to provide aid to as many as possible, is also a competitive, in which NGOs seek for donor support, recognition and individual aims. As reflected in the game, this leads to strategic behaviour and can make collaboration and trust difficult. Humanitarian organizations need to recognize and balance between these conflicting objectives.

The current version of the game is useful in an early stage of requirement elicitation, especially when the domain – humanitarian aid network – is complex and not well understood by the researchers. Based on the game observation presented above, using the game can be considered as a sufficient catalyst for initiating discussions among participants and subsequently for generating requirements for needs. In the facilitated debriefing, the participants made valuable suggestions on how to improve the game's fidelity and how to enhance the usefulness of the board game in identifying and prioritizing tangible requirements. Overall, we can state that the game supports the goal to represent an important part of humanitarian aid work and provides an experiential learning experience.

In future research, based on this input, we will explore how realistic the game can and needs to be designed for requirements elicitation. The first design steps in this direction include a more realistic map as game board, as well as the distinction between a central coordination meeting point and the discussion within the own teams. We will further explore whether and how combining the classical board game with computer-based game elements affects the game experience and fidelity. Here, we are especially interested on whether the computer-based game elements influence flow and immersion. As we assume that the useful technological support for the facilitator makes the feedback for the players somehow intransparent, we will also explore a game version without IT support, and with direct feedback. To achieve a stronger focus of the debriefing discussion on current and future system requirements, we intend to introduce another decision-layer allowing players to invest into different technical and organizational innovations. Therefore, we already developed an inventory of technology that is currently in place, as well as possible alternative technologies. The challenge for participants will be to balance the various trade-offs of these innovations and manage with limited resources. By adding this decision layer, it would also increase the dynamism of the game and may lead players to make different tactics for field operations. This will provide useful insights into the emerging organizations in humanitarian missions. We will assess the improvements of the game based on qualitative criteria and by statistical analysis of the GEQ scores. We are planning to facilitate several gaming sessions with practitioners from different organizations and with diverse backgrounds. A first test session with humanitarian aid workers is already planned. This setting will contribute to demonstrate the benefits of an elicitation process using a simulation gaming approach compared to results obtained with conventional methods.

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