




Participant Centred Framework to Support the Digital Transformation of Boardgames for Skill Development

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Abstract. As a pandemic spread throughout the world in 2020, restricting possibilities of physical presence, ‘going digital’ became acutely necessary for analogue serious game providers. Digitalization of analogue serious games based on player interaction is an arduous task requiring a substantial rethinking of the relationship between players, the facilitator(s), the game, and technology. Empirical research on the matter is inadequate, leaving practitioners without proper guidance in carrying out the digitalization process. This paper presents a novel framework, called the ‘Participant Centred Framework’, that can aid in moving from the analogue to the digital medium. The framework consists of several categories of relationships we believe instrumental in reimagining games for the digital realm. For each of these categories, several factors or topics to consider are included. The Participant Centred Framework is presented alongside a detailing of what we learned during our own, iterative digitalization process – mapped to the categories and factors of the framework.

Keywords: Digitalization · Board games · Facilitation · Serious games

1 Introduction

The use of serious games can be an important tool in the acquisition of tacit knowledge and competence development on abstract concepts such as negotiation, business strategy development, stakeholder analysis, and so on [1]. However, when developing the simulation driving such serious games, it is necessary to take a closed world assumption – limiting the sophistication of the competence developed. Consequently, it becomes beneficial to provide facilitated experiences usually held in a physical workshop involving multiple participants engaged in a role-playing experience, captured in boardgames. What happens when this acquisition needs to happen digitally?

With the recent upheaval caused by the global pandemic, the learning richness afforded by physical workshops with social interaction has been compromised as people are isolating. Consequently, the new normal is working remotely, by transferring

the necessary processes into the digital domain. This has created persistent challenges, particularly when considering training that has relied on analogue serious games in physical settings. Although the digital transformation of boardgames has taken place in the past, with literature documenting a few cases of comparative studies between different modalities of boardgames [2], guidelines for handling the transition are lacking. For practitioners of analogue serious games this change has been especially challenging, as no ready-made tools could be picked up, learned, and applied – the move to the new medium required the creation of an entirely new product. This can be an unnecessarily resource-intensive task when a good analogue game exists, and one that can be avoided with the right tools. However, the process is further complicated by the fact that simply making a digital version of an analogue game is insufficient. To maintain the strengths of analogue games, face-to-face interaction, communication, and collaboration, thinking anew regarding the strengths and weaknesses of the digital platform is necessary. As Kriz put it in the August 2020 issue of *Simulation & Gaming* “Under what conditions ... can learning outcomes be reached if the focus of the game ... includes the embodied experience and related tacit knowledge of the participants?” [3]. One assumption to make in identifying such conditions is that games cannot be “copy-pasted” to a novel medium, they must be reimagined and redeveloped – preserving the strengths of analogue games and translating them to the digital medium. For instance, it cannot be taken for granted that participants will interact in the same way with digital tokens as physical tokens. More profoundly, however, it cannot be assumed that players meeting digitally via video chat will interact and collaborate in the same manner as they would in a face-to-face setting. Despite these challenges, how can designers avoid “starting from scratch” when moving into the digital realm? In moving from analogue to digital, what can be done to ensure the experience of play is not being hindered by the limitations of the new medium? And how can novel opportunities be exploited?

There is a lack of literature providing documented evidence for this move of boardgames from face-to-face workshops to virtual setups in the digital realm. Even though some comparative studies of boardgames in different mediums do exist [2, 4], it is rare to find the transitioning reported with a set of milestones or guidelines for others to follow. Thus, in place of empirical evidence, we explored the role game design principles/frameworks can have in the transformation process, as we believed that could be fruitful. There are manifold frameworks claiming to facilitate the game design process. Therefore, in the interest of brevity, only some of the most popular approaches [5] will be explored here. First, the Mechanics, Dynamics and Aesthetics (MDA) framework [6] aims to provide a foundation to support the iterative process of game design, building upon the relationship between the game designer and the player. However, the focus is chiefly on the game, neglecting the user experience and the impact of technology. Although the framework can be used for analysis of existing serious games, the focus is on entertainment games, and it fails to address the pedagogical underpinnings foundational to the design of a serious game. Secondly, the Design, Play and Experience (DPE) framework [7] expands on the MDA to address the shortcomings of its application to serious games, including addressing technology and its impact on game design. Yet, it still does not support the digitalization of a physical tabletop game. Lastly, the triadic framework consisting of pedagogy, play and fidelity proposed by Rooney [8] takes a

comprehensive approach to linking the targeted three aspects of game design, but the approach is mainly theoretical with limited practical association to design decisions based on impact of technology. None of the frameworks analysed provided practical guidance for supporting the transformation from physical to digital, thus there was little understanding of the necessary trade-offs implicated in the many design decisions to be made along the way. In lieu of a framework guiding the process, we applied a trial-and-error approach with prototyping to work out how we could retain the advantages of the analogue game whilst utilizing the advantages of the digital medium – a “journey” that will be presented and reflected upon in the next sections. When taking this kind of explorative approach, the digital transformation of games is a fuzzy, complex process that can be challenging to manage. One solid ‘footing in the bog’ we relied on is the psychological and pedagogical principles underpinning how people communicate, act, and interact in situations of learning and knowledge exchange – gleaned in part from the presented frameworks. Therefore, we focused on the four relationships of participant with other participants, facilitator, game, and technology. The transformation lessons to be presented are categorized based on these relationships.

This paper presents in Sect. 2 the boardgame to be transformed, *War Room*, and the theoretical principles on which it is built. The process of digital transformation was iterative, and as such the initial digital mock-up is presented in Sect. 3, which yielded the current digital version, presented in Sect. 4. In Sect. 5 the journey culminates in the presentation of the *Participant Centred Framework* for digital transformation of boardgames, which is the synthesis of the lessons learnt throughout the process. Finally, Sect. 6 contributes to the discussion and conclusions on how to go about the digitalization of analogue boardgames for the purpose of facilitated learning and skill development in workshops.

2 The War Room Learning Experience

War Room, the game to be transformed, is a commercial learning game revolving around complex problem solving and discussion in a team setting, using uncertainty and time constraints to create an engaging experience. The main goal of the game is to provide an understanding of Intellectual Property (IP), Intellectual Property Rights (IPR), and competitiveness. These concepts should not only be memorized, but rather understood for their significant role in business strategy, both as a potential problem and as something that can be beneficial to the organization. This is achieved by creating opportunity for participants to extract and sort relevant information in order to make informed strategic decisions. Before delving into how such learning can be achieved, a short description of the game as an artefact and the progression of play is in order.

The game, in its original, analogue format, consists of a large board/canvas and playing cards providing contextual information and happenings, as can be seen in Fig. 1. These parts are used by players divided into groups of up to five, commonly with several groups simultaneously. Cards are presented in a specific order by a facilitator at set intervals or when deemed necessary. Based on information received from the cards, participants put sticky notes on the board to keep track of extracted information and decisions made throughout the play session. The facilitator(s) is available for aiding



Fig. 1. *War Room* in action

participants when needed during the play phase, both for team dynamic and in process facilitation to provide novel insights, challenge participants, and provide contextual input. In addition to the playing of the game, there is a briefing and a debriefing that is considered part of the process. During the briefing the expert facilitator presents the basic IP/IPR concepts that must be applied to successfully manoeuvre the challenges that arise throughout the play phase. This provides players with the basic vocabulary (explicit knowledge) needed to play. In the debriefing phase, groups of participants come together to recap concepts, discuss solutions, and evaluate applicability outside the game with the facilitator. A full playthrough of the game can take, depending on the needs and skill level of the players, two to seven hours.

How, then, does *War Room* provide a meaningful learning experience to players? To answer this, central game mechanics are presented alongside the overarching theories that make them viable – leveraging certain psychological and pedagogical (or andragogical [9]) principles that promote learning through *action* and *interaction*. First, participants are presented with an actual business case as a starting point which is elaborated and that they expand on, taking on the roles of employees in the company. The information provided in the game must be “digested” throughout, and relevant details extracted to deal with several contextual constraints and fictitious happenings presented on the playing cards. Furthermore, the game offers opportunity for participants to obtain new information from the game as well as other players and the facilitator(s), combine this with what they already know [10, 11], apply it in a novel setting, and reflect on how it can be used in real-life situations [12, 13]. This provides players a way of *acting* on

information, solving problems, and making decisions – based on new knowledge and existing experience [14, 15]. Second, dealing with these challenges requires participants to discuss possible solutions within their groups, often involving a certain degree of creativity. The problems discussed rarely have a single correct answer, can have built-in “traps”, and requires players to collaborate to provide a viable strategy that includes protecting their intangible assets [16–18]. Thus, this represents an opportunity to *interact* with other players in a team setting and learn from the knowledge and experiences of each other – on a topic of shared interest and benefit [19, 20].

3 “Quick and Dirty” Prototype

For the digitalisation of the analogue tabletop game, a user centred design approach was taken, starting with the creation of a quick digital prototype (Fig. 2). The purpose of this first step of the journey was to understand the key differences when transposing from the physical environment to a digital one. Therefore, the tabletop was replicated as closely as possible with minimum design effort beyond making the serious game playable digitally. As such, the following digital artefacts were used:

- a digital whiteboard was used for sharing the canvas that held the joint context of the gameplay. The participants were able to place sticky notes of different colours.
- a video conferencing tool was used for multi-participant communication. The participants were encouraged to share video, but due to screen size the streaming was done via thumbnail sized images that conveyed little in terms of nonverbal communication (NVC) cues.
- mobile phones were used to access the game cards (happenings and information), which required some time to setup appropriately.
- links were used to share additional information via URLs. In this type of game, information is an essential part of the gameplay used for decision making – part of the game mechanics is time constraints and restricted information access to impose uncertainty.

The initial session was conducted with four participants, an observer that was acquainted with the gameplay, and an experienced facilitator of the serious game in physical settings. With the focus on participant centred relationships, the key findings were:

Participant with Participant: The video conferencing tool was inadequate at conveying a sense of social proximity, with inability of leveraging NVC cues. There was no concurrent communication as this would introduce noise into the dialogue between participants and the facilitator. Finally, the group size was deemed borderline as participants struggled to contribute effectively.

Participant with Facilitator: Although the facilitator was very experienced, it was difficult to be fully aware of the interaction across all the participants. Attempts were made at supporting additional simultaneous groups, but barriers to effective monitoring and facilitation restricted the group number to one. The importance of the briefing

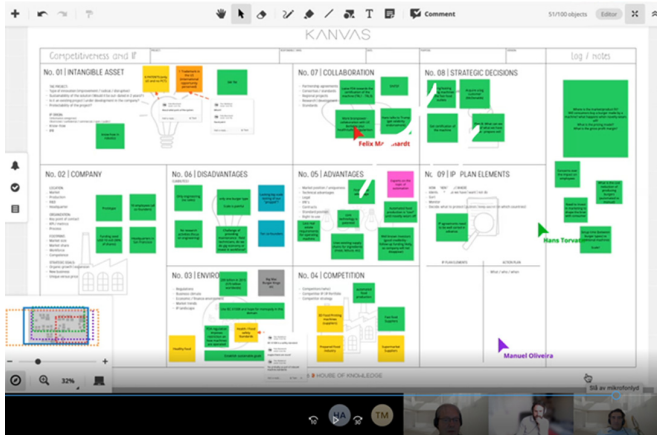


Fig. 2. The prototype

was underestimated when considering the transition, clearly indicating necessity of a framework to convey rules of engagement and understanding of the game.

Participant with Game: Although the game was functional, the intuitiveness of key functions was low, making interaction unnecessarily difficult. Furthermore, as several different digital applications were used concurrently, efficient information management was hindered by screen real estate constraints.

Participant with Technology: The participant population is one with high digital literacy, but still there were difficulties experienced in both the setup and execution of the gameplay. This has a high cognitive cost and potentially dilutes the play experience.

The game was play-tested in two further rounds at this stage, one with an interaction designer subcontractor, and one with a client. Each session had only one team, one facilitator, and observers. In comparison, the analogue game has previously been played with more than 20 groups simultaneously.

4 The Digital Arrival

In moving towards the fully digital version, two overarching goals guided design mitigations from the “quick and dirty”-prototype. First, retaining the key underlying mechanisms, like gameplay, interaction, and the “War Room-experience”, when transforming to the final digital medium. Second, understanding how to utilize the benefits of digital media to improve the learning experience offered in the analogue format. The completed digital game was tested by several groups, from which some feedback is included here to support the changes made.

Participant with Participant: To improve communication from the prototype, players are divided into smaller groups and communication via sticky notes was made more

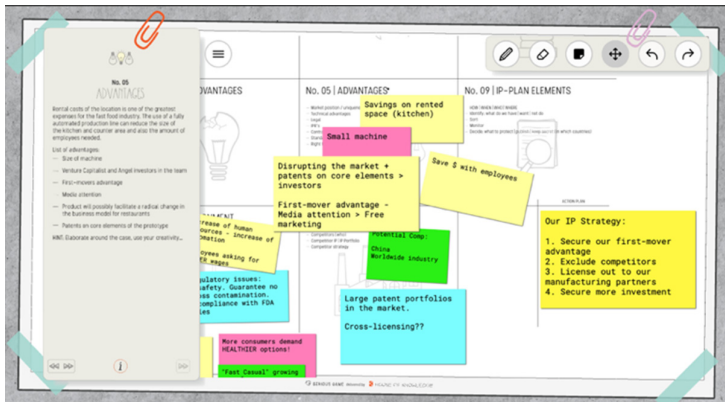


Fig. 3. The digital arrival

intuitive. This mitigates some NVC challenges by reducing the number of video feeds to follow. Play testers experienced interaction in the new version as providing opportunity for realistic discussion and strategizing. What is more, the need for concurrent communication is reduced by having fewer players in each group.

Participant with Facilitator: Measures were implemented to alleviate some of the work that fell on the facilitator in the previous version – in part to ensure consistency. This is necessary because the digital medium allows the facilitator to engage with only one group at a time, with limited possibility of moving between groups to pick up on problems. To achieve this, videos and links were provided for players to use on their own initiative to achieve some of the insight previously provided by the facilitator. This led to less need for the facilitator to provide information, freeing up more time to facilitate interaction.

Participant with Game: To make the interaction between participant and game more seamless than in the prototype, minor animations and sounds that mimic materiality in the analogue game (e.g., flipping cards in a pile) was implemented. Additionally, the onboarding process was simplified by making the login process smoother and by including an informational page prior to the game starting. Lastly, some alterations were done to reduce the issue of real-estate to improve information management (see Fig. 3). Play testers overall experience of the game was reported both as enjoyable and beneficial/helpful in strategic thinking and decision making.

Participant with Technology: To alleviate issues of cognitive cost and digital literacy, the design of the game interface was improved to better user interaction. For instance, button functionality was made more obvious when using the sticky note functionality, as well as making it easier to navigate through the cards. These alterations led to play testers reporting far less technical difficulties when using the current digital version compared to the prototype.

5 Participant Centred Framework

In this section the result of the digital transformation process is presented within each of the four categories applied throughout the text, contextualized by connection to theoretical concepts when applicable. These lessons learned make up the *Participant Centred Framework*, a framework of relationships to take into consideration when moving from analogue to digital media.

5.1 Participant with Participant

At the heart of learning games based on (role-playing) interaction for the development of skills and acquisition of tacit knowledge is the interplay of the individuals with one another. As captured in the SECI model [18], interaction is foundational to socialization, externalization, combination and internalization in the creation of knowledge. In a physical face-to-face setting, there is a richness of social interaction between individuals, which is significantly compromised and requires rethinking when transitioning to a digital medium. These challenges can be aggregated into four distinct dimensions:

- **Nonverbal Communication.** In the physical world, people have a high bandwidth for communication, including NVC cues, which makes it easier for users to coordinate interventions and reduce the necessity for explicitly conveying their reasoning when taking actions. In the digital domain, NVC richness is reduced due to the constraints in the medium.
- **Social Proximity.** Close physical proximity between participants contributes to higher level of engagement [21], a factor not applicable in the digital domain. This can lead to lower engagement in digital games.
- **Concurrent Communication.** Closely related to both social proximity and NVC, is the ability of supporting concurrent communication. In a physical setting, where there is implicit acceptance of rules of engagement, concurrent communication happens naturally. It is, however, harder to support digitally. Smaller groups can support concurrent communication, but at the cost of hindering flow of communication.
- **Group Size.** In the face-to-face setting, participants understand the actions of one another based on engagement with each other, the board, and the sticky notes. In the digital version, however, there are limitations to the attention and focus of the users, causing larger groups to pose a potential challenge.

5.2 Participant with Facilitator

Although the learning experience of multiple participants relies on their social interaction, the power and influence of the facilitator in ensuring the best outcome for all those involved is unquestionable [20]. Thus, the second relevant relationship to consider is that of participant and facilitator. There are four key processes that are, in our experience, severely impacted by the digital transition:

- **Monitoring.** The facilitator needs to have a good understanding of the full context of the learning situation and the participants. Consequently, they are constantly monitoring and assessing the situation. When transitioning to digital media, several barriers emerge that makes it harder for the facilitator to be fully aware of this context.
- **Consistency.** The unfolding of learning afforded by the analogue boardgame is dependent on the expertise of the facilitator, who draws on their experience to facilitate the learning experience. In the digital version, the facilitation can become more consistent as the facilitator may be supported by automated in-game activities and rule enforcement. However, dynamic adaptation to unpredictable and unforeseen circumstances is lost due to the limitations of the underlying model that support automation.
- **Communication.** In the physical setting, the facilitator can be called to groups or intervene in groups limited only by the number of groups requiring facilitation. In the digital it can be difficult for groups to call out for help, and due to less concurrent monitoring, communication is weakened.
- **Briefing and Debriefing.** The quality of the experience depends significantly on the facilitator and both phases are fundamental in the pedagogical underpinning of learning with tabletop games [22]. In the digital version, de-/briefing necessarily encompasses additional topics, and can therefore be more challenging.

5.3 Participant with Game

A third noteworthy relationship is between participant and game. This covers the issue of interaction with physical game elements vs. digital interaction. We identified four relevant core processes:

- **Materiality.** Tangible physical artefacts anchor the experience of users and support emotional engagement [4]. Nonetheless, the manipulation of physical artefacts may also introduce extraneous strain [23]. In the digital domain, however, all artefacts are intangible.
- **Onboarding.** Engagement with the physical artefacts is intuitive (e.g., write and submit sticky notes, roll die, move game pieces), but there might be barriers to interaction in the digital game due to less intuitiveness. Interaction onboarding should therefore be especially prioritized when using a digital medium.
- **Time Management.** Time management, i.e., adjusting or controlling pace, is an important skill of analogue game facilitators that may be supported by physical artefacts, which impacts participant interaction with the game. In the digital domain strong opportunities to manage the time exist, both for the facilitator and as a function of gameplay, yet time management opportunities can be hindered by reduced visibility of participant engagement and progress.
- **Information Management.** In a physical environment, it is possible to have immediate access to all relevant decision-making information simultaneously, as real estate constraints are virtually non-existent. In the digital version, presentation is limited to relatively small screens.

5.4 Participant with Technology

The final relationship to consider is that of the participant with technology, as the impact of the digital transition is proportionate to the digital literacy of the individual. For this relationship, three main factors are identified.

- **Cost.** Individual, cognitive cost of using the medium significantly impacts the experience of the participant and the overall group experience. In the digital, this cost can be high if not combatted by appropriate measures to increase intuitiveness.
- **Flexibility.** In a physical game, the unfolding of the game state depends very much on the experience and skill of the facilitator – without guarantee of consistency, but with great flexibility and adaptability. Using the digital medium, consistency can be improved (at the expense of flexibility), which has the benefit of reducing the potential strain of participant-technology interaction.
- **Interfaces.** In the real world, the rules of engagement are transparent. In the digital form, however, the potential utility of the boardgame cannot be reached unless the usability is reasonably high.

6 Discussion and Conclusions

The Participant Centred Framework for digital transformation has been created incrementally as a way of capturing the insights and lessons learnt along the journey. When moving from the analogue version to the prototype we identified the ways in which the digital format provides both limitations and possibilities. Consequently, the prototype was instrumental in recognizing how to properly utilize the strengths of this novel format when moving towards the fully digitalized version. Thus, the journey of the digital transformation of *War Room* yielded interesting insights that have been distilled into the Participant Centred Framework, as a means of facilitating the transition from physical to digital in commercial serious games. A final analysis is presented below to show how the relationships in the framework were useful in the process of digitalization:

Participant with Participant: The nonverbal communication richness was greatly hampered by the constraints of online communication. The video portals provided a segmented view of the group that implies an increased cognitive load as more video portals are shown. This necessitated limiting the number of users or redesigning the interface to facilitate the orchestration of large number of users. With regards to backchannel communication, the digital design can highlight, support, and guide participants' attention and focus, assisting in situational awareness.

Participant with Facilitator: The digital facilitator cannot provide adequate hands-on aid to a large number of groups in the same manner that the physical format allows. This is especially relevant in relation to the role the facilitator has in spotting and aiding subpar intragroup communication. Irrespective of the orchestration design features of the digital game, the need to invest in more onboarding time and clear rules of engagement became clear. In the case of large groups of participants where there are constraints with

oral communication, it is possible to ameliorate the sharing of information with written communication – at the cost of the significant benefits of the spoken word.

A strong advantage of digitalisation is the possibility of automating tasks that traditionally would be managed by the facilitator, such as time keeping or the release of events affecting the game state progression. The story progression can be dependent on a multi-variable simulation, but the facilitator must retain the option of overriding the system to drive the learning trajectory toward the desired outcomes.

Participant with Game: The physicality element of gameplay is significantly affected when going digital as the game board size is limited by the physical size of the device used by the participant. This means the whole play area is reduced to sometimes as little as 17×25 cm (approx. size of 10" tablet), as opposed to the 59×84 cm (A1 paper) *War Room* canvas plus additional table space. It is important to be aware of this limitation and be careful regarding how to provide mechanisms of scope/focus without losing participants in their navigation of the game state, either as an individual or a group.

Participant with Technology: Digital transformation allows for easy access to information, such as how we used QR codes to let participants easily retrieve information for better decision making. However, it is necessary to accommodate the difference in digital literacy amongst the participants and focus on strong support where the most common problems are seen or foreseen. Visual cues and labelling should guide participants during normal use, and especially when issues occur (e.g., network problems).

6.1 Evaluation and Direction

A main strength of this framework is that the factors listed should be applicable as a check list to all digital game transformation endeavours. Being conscious of and accounting for the different interactions should be beneficial, even if each factor might not be relevant in every situation. Another key strength is that the explication of these relationships can encourage thinking anew about the process of digital transformation more broadly, highlighting that it is not necessarily as straightforward as it might seem. Lastly, the framework explores important ways in which the digital medium creates novel opportunities, especially pertaining to support, focus, automation, and information access which should be useable in most digitalisation efforts. However, due to the limits of reporting on a single game, the framework cannot be claimed to be exhaustive. Each digital transformation is likely to bring specific challenges that cannot be foreseen in a general framework. Furthermore, some common challenges and opportunities could have been missed due to the nature of the researched game. It should also be noted that some of the technical challenges met in this research (e.g., size of play area, use of several different applications) might differ substantially from those met when transforming other games.

Future work should focus on using the framework at the onset of the digital transformation of other analogue boardgames to test its usefulness and applicability under different contextual conditions. What is more, the generalizability of the framework should be tested with different populations to establish how factors like, for instance, age, education, and job characteristics could impact use.

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