

Systems Mapping to Support Interdisciplinary Understanding in Serious Game Design

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Abstract: This article discusses the advantages and limitations of systems mapping as a method of approaching serious game design on the highly complex social issue of Intimate Partner Violence (IPV) in an interdisciplinary team. The method of systems mapping has been evaluated for the research and design phase of a yet unfinished game. It has been shown to be useful as a tool for research, design and interdisciplinary collaboration. Systems mapping does not provide new knowledge in the respective research area nor does it offer direct solutions to difficult design problems, but it supports the process and makes it more structured and substantial.

Keywords: Systems Mapping, Serious Game Design, Intimate Partner Violence, Interdisciplinary Collaboration, Games for Social Change.

1. Introduction

This article discusses the advantages and limitations of systems mapping as a method of approaching serious game design on the highly complex social problem of intimate partner violence (IPV) in rural areas. As part of an ongoing, publicly funded, four-year interdisciplinary research project, we seek to develop, test and evaluate game based learning as an innovative way of primary prevention of IPV. Primary prevention aims to reach all members of civil society (especially in their roles of relatives, neighbours, friends, or work colleagues). We hypothesise that educational games have the potential to address a large number of people in order to improve empathy with victims of IPV, to understand the responsibility of perpetrators for their deeds and to promote support for survivors and affected children. Facing widespread knee-jerk reactions from outsiders, such as the question “Why doesn’t she leave?”, we see the need to educate about the complex interactions of the conditions behind domestic violence. Rather than addressing only the private problems of individuals or focusing on the act of violence itself, the game must address the deeply structural and long-term – even transgenerational – nature of the issue. Understanding this complexity also posed a first general challenge in our game design process, namely establishing a common ground of knowledge within the team. Another challenge was dealing with the different disciplines’ approaches.

1.1 Motivation

Due to its complex nature, our educational game theme falls into the realm of games for social change. Inspired by the presentation of game practitioner and scholar Macklin’s presentation at the Games for Change festival (Macklin 2020), we started the game development with Systems Mapping as a method to visualise and understand the elements and complexity of the target domain to be addressed. Meadows and Wright (2008) refer to systems thinking as a “lens” for looking at the world and its problems. Understanding the behaviour of a system requires examining not only its elements, but more importantly its connections, which are often not directly observable. In systems mapping, the elements are depicted as “stocks”, which are visualised as nodes that represent quantities of certain materials, values or information states. Nodes are connected by inflow and outflow arrows that link them to other nodes. These flow diagrams can form loops that illustrate either balancing or reinforcing system behaviour, which can explain why certain undesirable cross-system effects are too stable to be easily changed. Our hope was to see systemic interdependencies in the mapping process that would lead us to game ideas that could adequately represent the actual persistent problems.

The project team consists of different professional groups, such as game design and media pedagogy, as well as a group of IPV experts with a background in social work, political science, sociology and gender studies. With rough educational goals in mind (e.g. to create empathy with victims and to point out help hotlines), the aim was not to develop a formal model for a computational social simulation. Rather, we were looking for potential

influencing variables that could be incorporated into game elements and especially mechanics (such as, reward structures, winning strategies).

1.2 Application field of the serious game

Every fourth woman in Germany experiences sexual or/and physical violence by her (ex-) partner at least once in her lifetime (Schrötte and Müller 2004). Police crime statistics on Intimate Partner Violence show more than 148.000 reports with 79,1% male perpetrators for the year 2020 (BKA 2021). IPV is a social problem that occurs regardless of region, age, educational level, socio-economic status, ethnicity or sexual orientation. It has a high impact on the physical and psychological wellbeing of the victim as well as on children growing up in an environment of Intimate Partner Violence.

The focus of our project is on IPV in predominantly rural areas, as more than half the German population lives in rural communities. According to Völschow (2014), these areas have particular social features and factors related to local structures: scarce support resources, difficult-to-access intervention and counselling services, as well as a high tendency of victims and those around them to treat IPV as a taboo. Tightly knit, small communities, a lack of anonymity and the repercussions of increased social control for victims are reasons to play IPV down, or to fail to recognise it for what it is. Two main factors lead victims to stay in their abusive relationships: The fear of losing networks if they talk about the abuse and therefore keep the silence, and the lack of courageous intervention and support from those around them (Völschow and Janßen, 2016).

An extremely important factor in helping victims of violence against women and their children – especially in rural areas – is therefore to break the taboo and counteract the trivialisation of the problem. It is necessary to sensitise and activate a broad part of the civil society so that they become aware of IPV instead of ignoring it. To raise this awareness, our research project „In Jeopardy: New Ways of Prevention and Support in Case of Intimate Partner Violence (IPV) in Rural Areas“ seeks for innovative ways of primary prevention in a rural model region. The serious games designed in this context are embedded in a public relations campaign that aims to break the taboo surrounding IPV and sensitise adults and adolescents to this social problem.

1.3 Objectives

The focus of this article is a field report on the application of the systems mapping method with regard to the project's objective of developing game mechanics that can represent the interdependencies of the real problem. We are particularly interested in balancing and reinforcing factors of the social and structural conditions and effects of long-term IPV for victims, for communities and within society as a whole.

First, we explored the method as a way to transfer and accumulate knowledge from social sciences research on the subject matter into game design. At the same time, it served as a kind of translation aid between different disciplines, their differing idioms, logic, methods and methodologies, even mindsets. While the project is still ongoing, we present our approach with different steps of systems mapping, resulting in an abstracted map for the game system that will be a central part of the game mechanics. Beyond this success, we report on findings and experiences from the process and also highlight obstacles and limitations of the mapping method with regard to the interdisciplinary work between game design and the target domain, which is in the field of social work.

2. Related work

“Games are intrinsically systemic: all games can be understood as systems” (Salen and Zimmerman 2004). This insight is prevalent in almost every textbook and lecture on the foundations of game design. Salen and Zimmerman point out that there are differences between “open” cultural systems and “closed” formal systems like (digital) games, which are self-contained by their rules. By framing games as “experiential” systems, on the one hand the strategic game actions of players are only relevant internally within the closed game system, while on the other hand, their play is embedded in the emotional and social environment in which the game is set. With this in mind, we are aware that systems in our context are manifold. First, we are interested in understanding systemic dependencies that are unique to the social application domain in the real world. Second, we need to create a game system with a closed set of rules (the mechanics, apart from the also needed game narration), and third, the experience of that game has an educational goal. In this article, we explore the first two aspects, focusing on the method of systems mapping.

Systemic analyses of group behaviour and individual reasoning have already been carried out in the development of games with computational social interactions, for example in the social simulation "Prom Week" (McCoy et al. 2011). Based on a formal model called "social physics", players experience different situational reactions to their choices when communicating with characters. While the goal of this agent-based approach was entertainment and learning, computer-based simulations have long been used in the systems analysis branches of the social sciences for other purposes, such as prediction, proof or discovery (Axelrod, 2005). In contrast to these approaches, our modelling can be less formal. Our aim is not to simulate behaviour in a situation of violence or in an artificial society, but to understand the social context of the causes and ways out of IPV and to create awareness. In order to apply "systems thinking for social change", Stroh (2015) suggests to use the "Iceberg" metaphor (compare Figure 3) to distinguish perceivable symptoms above the surface from underlying root causes. Further, he underlines the difficulty to find effective leverage points in the deeper, structural areas of the Iceberg map that could lead to sustainable change. Sellers (2018) endorses systems mapping as an entry point to Game Design, but he also points out that designing systemic games may need to work from different directions, either top-down looking at the whole system or starting bottom-up from the parts. Game systems need to be balanced taking into account balancing and reinforcing loops. Colleen Macklin proposed systems mapping at the starting point of the creation of a game for change (Macklin, 2020), which inspired us to engage with it.

However, there is no linear path to derive educational success from a correctly analysed system. Game design is a holistic arbitrary process that requires creative decisions on mechanics, narrative details, feedback on game actions and options for player strategies. For example, the serious game "SPENT" (by Urban Ministries of Durham, <https://playspent.org/>) aims at raising awareness and empathy for people living in poverty. Similar to some aspects of our topic, persistent poverty is a systemic problem, but one that is attributed to individuals in the public perception and is associated with prejudice and the stigmatisation of those affected. The game SPENT's evaluation (Hernández-Ramos et al, 2019) shows that there can be unintended learning effects, although the design reproduces many systemic features. However, the player has the chance to "win" the game, which can reduce empathy with the "losers" in the game and in real life.

Previous work in the creation of serious games about IPV includes the following examples. The game "Jesse" was designed by the "None in Three" research centre for the global prevention of gender-based violence, to work against the apparent social acceptance of domestic violence in the Caribbean and to increase empathy. Evaluation shows that the participants, boys and girls, recorded a significant increase in affective responsiveness after one week of game exposure (Boduszek et al, 2019). "*Violent dad in child's shoes. A moment before*" stimulates a perpetrator's situational awareness and empathy for a child victim of gender-based violence (Arcidiacona and Di Napoli, 2021). In a therapy setting based on Virtual Reality, offenders are confronted with their deeds. The game "*Diana frente al espejo*" (department of equality of Málaga city council in collaboration with the University of Málaga, <https://dianafrentealespejo.com/>) aims at enabling young people to recognise sexist and violent behaviour in a relationship. The web-based game "*Decisions that Matter*" (Carnegie Mellon University, <http://decisions-that-matter.com/>) is intended to raise awareness about sexual assault in the university environment, focusing on the role of the bystander. Concluding, it can be stated that the goals of the previous games (in general) lie in the cautious sensitisation to problems, and the topic is probably hardly suitable for competitive games. For the German context and language, there is no comparable serious game on the topic so far.

3. Approach

In the following, we describe our two approaches that made use of systems mapping. First, the visual mapping strategy was used in the context of accumulating domain knowledge, and second, it was used to discuss and negotiate a game system with the aim of creating game mechanics as part of the serious game design.

3.1 Systems mapping as a research tool

The game designers in the team were completely new to the social research domain, without any background knowledge of Intimate Partner Violence, an area of research that spans 40 years of empirical findings. One of the first tasks in the whole project was to exchange at least sufficient information with the domain experts, before first drafts of game design could start, especially with regard to the specifics of the addressed rural area, and the importance of primary prevention in general. Also for the IPV experts in the research team, it was necessary to systemise and "condense" the whole field in order to focus on specific parts, such as reinforcing

factors for the persistence of taboos, the individualisation of the social problem, and the observed lack of community willingness to support survivors.

For the acquisition of knowledge, the game designers consulted literature, from which they created “mini maps” on different parts of the general topic, e.g. knowledge components about dependencies and reasons that keep battered women in an abusive relationship (emotional, financial, social reasons and more). Other mini maps covered findings about possible strategies, resources needed, and ways out of an abusive relationship, or typical phases of contact in which bystanders have different options for help (e.g. Brzank, 2012; Johnson, 2008; Kidder, 2006; Schrötte and Ansorge, 2009; Stark, 2007). In addition to literature, the rich experiences of a team member's practical social work contributed to parts of the maps, which helped illustrate incidents by vivid examples.

The interdisciplinary research team used the online collaborative whiteboard tool “Miro” (<https://miro.com>) to create visual maps of the dependencies found in these sources. This work was possible entirely during online collaboration periods pertaining to the pandemic. The research and sources consulted mostly described their findings as assumed causal relationships between entities, or at least as likely influences between concepts. In addition, reports from the field (e.g., experiences from a battered women's shelter) provided explanations with new connections to the items already existing in other maps. At this early stage in the process, it was easier to follow an approach of causal mapping than to recognize full system features. Thus, instead of maps with stocks and flow details, we mapped the discussed elements with arrows between entities that illustrate causative relationships, where positive vs. negative influence could be distinguished through green or red coloured arrows, or plus vs. minus signs. “Causal” here does not mean identifying a single causality or responsibility, but rather a collection of possible influences and explanations that entail the observations and form patterns of dependence (Sloman, 2015).

Because of many possible links from one theme to items in another one, we have combined the mini-maps into one large map representing all the material processed so far. Figure 1 illustrates the broad dimensions of possible overlapping connections between the different topics from literature and practical experience.

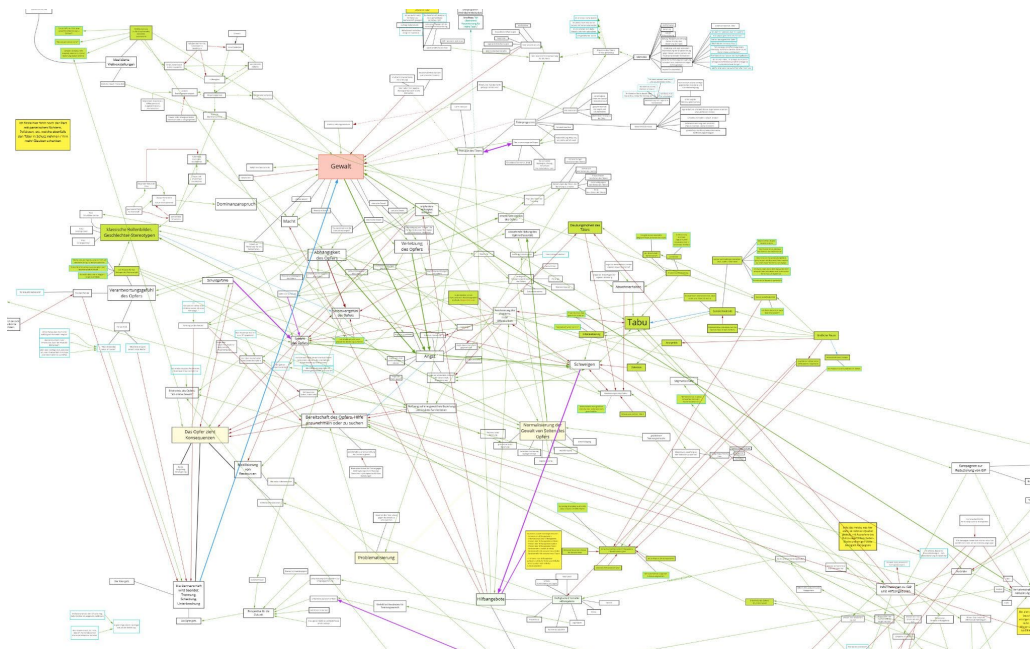


Figure 1: System map after the research phase: all aspects are connected, around a central concept of ‘violence’ in red

Parts of the maps point to repeating patterns, for example, to the cycle of abuse (Walker, 1979), or the deadlock created by the taboo against naming violence for what it is. Recognising the reinforcement loops within structures could help to get insights into these reasons. An example is shown in Figure 2. The taboo in the rural area leads to isolation of victims of violence who believe they are alone with this problem. This also affects their shame, which recursively silences them, reinforcing the taboo.

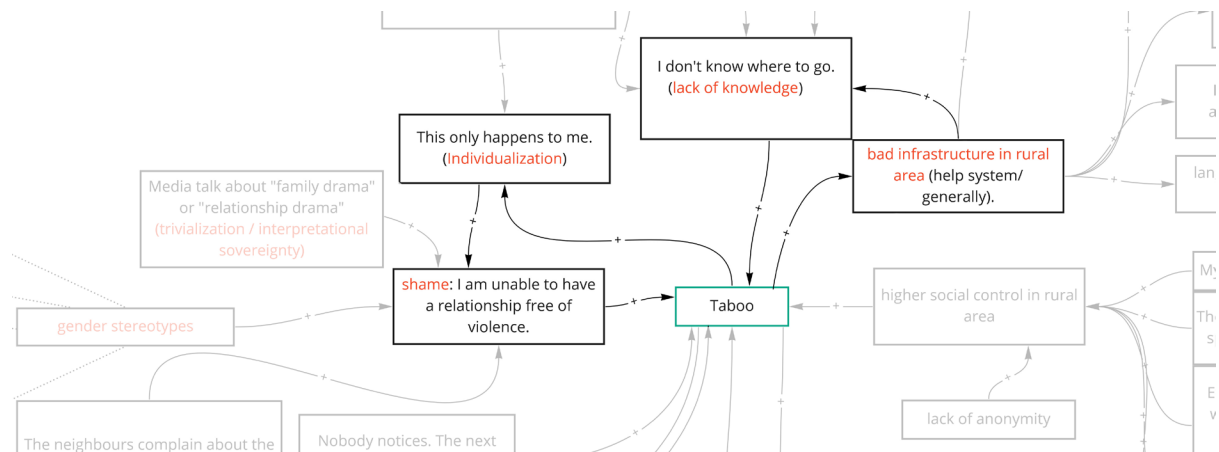


Figure 2: Example of a partial map (zoomed-in excerpt) around the key term “Taboo”

The attempt to better organise the elements in the map required a distinction between situational causes that affect individuals and more structural causes that allow the view of an abstract system. We ranked several of our map themes by placing them into an Iceberg model at different depths, according to their assumed structural aspects (see Figure 3). This helped us to discuss the potential leverage points for change, as a guide to find further themes and goals for our intended serious game.

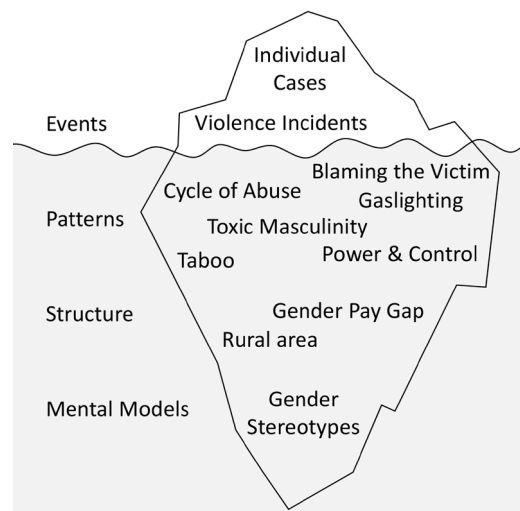


Figure 3: Sorting topics into the Iceberg model

In Figure 3, the aspects above the surface are possible situations that can be concretely depicted, e.g. how to intervene as a neighbour in an actual dispute or leaving an abusive relationship from the perspective of a victim. However, if we look beneath the surface, we find patterns and structures that are not so obvious to those who are not yet aware of this problem area. To understand why it is difficult to leave an abusive relationship, it is worth looking at the connections of IPV with gender stereotypes, or with structural aspects of typical women's occupations that lead to financial dependency, and much more. According to Stroh (2015), for sustainable change, it is necessary to find leverage points at deeper levels. However, since it is difficult and unlikely that e.g. gender stereotypes can be easily changed through an educational game, we decided to look mainly at the "patterns" level of the iceberg, which lies just below the surface. By learning names for phenomena such as "blaming the victim" or "gaslighting", players could learn to recognise these patterns when they occur in their environment.

3.2 Systems mapping as a design tool in an interdisciplinary team

We found that we could most effectively use the identified leverage points for a game if our topic appeals to bystanders (not victims or perpetrators) in terms of prevention. The premise is that they are generally responsive to the issue of IPV and willing to engage, but just do not have enough knowledge to do so. The instrumental goal is to enable them to recognise signs of an abusive relationship and get them to think about their own role in the IPV system and their potential contribution to improving it.

We could incorporate some of the dependencies of the IPV system into our game mechanics to convey its systemic aspects, as game mechanics can transport messages (Bogost, 2007). We developed guidelines on what messages we do not want to send with our game in order to avoid typical prejudices and stigmatisation related to IPV. One example is that we do not want to portray the victim as a helpless “damsel in distress” who needs to be rescued, but rather make their situation understandable and meet them at eye level. We want to illustrate that there are no easy solutions that fit every case, and therefore do not want to promote specific recipes for ending or reducing IPV as “ideal ways”. We must avoid further stigmatising victims, justifying perpetrators, assigning responsibility for improvement to victims or confirming other harmful misconceptions about IPV.

The removal of taboos surrounding IPV is one major instrumental goal of the project. We identified social control through a supportive network as a leverage point to tackle the taboo. In the IPV system, there is a reinforcement loop between the taboo and the social control of a traditional network typical for a rural area, which leads to a fear of isolation or rejection by that network and (unintentionally) tends to support abusers. People just do not want to stand out and break the taboo, because nobody else does. There is also a balancing loop that is manifested in people reacting negatively to other people who nonetheless break the taboo.

Figure 4 shows our design result, with which we have tried to abstract this problem as much as possible. Below left, the reinforcement loop of the taboo runs in the traditional community of a toy village (as the “old” network). The players’ mission is to counter the fear of isolation and explore different ways of contributing to a “supportive” network rather than strengthening the “old” network. They also face the risk of rejection and consequences if they try to speak out against the “old” system. The goal is to raise the level of awareness in the toy village and thereby recruit new members for the new “supportive” network. If successful, the “fear” stock can be reduced and the processes mapped lead to another reinforcement loop (Figure 4, top part) that enables the new network.

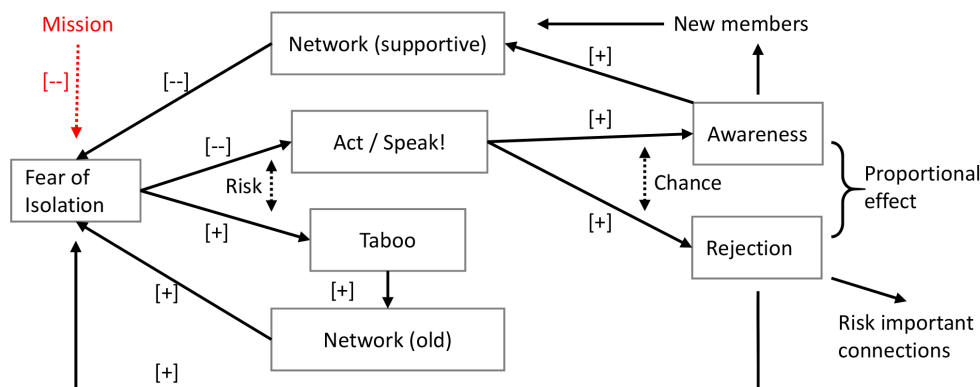


Figure 4: System map of the game about taboo reduction.

Our “taboo” mini map (see Figure 2) will serve as model content for the development of game narratives. Recent experiences of the “me too” debate show that if certain tipping points are reached, a discussion gets into the public awareness. The more people have yet broken the taboo, the easier it is to join.

This model describes IPV on an abstract level and provides the objective of the game. It also provides a framework for narratives to be filled with concrete events, incidents and vivid experiences. Based on the situations portrayed, players can immerse themselves in the problems. Depending on how far the players manage to expand the support network and what influence its members have, there are different epilogues at the end that tell what the future of the toy village will look like in terms of coping with domestic violence. Due to the simplicity of the mechanics, a sensitive and nuanced narrative will be an important factor for success.

4. Lessons learnt

In the following, we summarise our lessons learnt from the systems mapping exercise for our collaboration between the disciplines of game design and the diverse expertise from the social field.

4.1 Lessons from systems mapping for analysis

The main concern of the social work experts in the interdisciplinary collaboration was to incorporate the findings from 40 years of international research on IPV and the many years of experience of the help system for protection against violence into the game content. A comprehensive amount of knowledge needed to be imparted into the team in a short time, and the tool of systems mapping was very helpful to this end. The visualisation of literature sources used to map the topic of IPV supported the process in two ways. First, the mini maps depicted the essential findings of the papers, which therefore could be comprehended more quickly. Second, the addition of further sub maps worked as a protocol of the knowledge acquisition process. Misinterpretations could be easily detected, discussed and rearranged in the maps.

At the same time, the systems mapping approach was also experienced as mechanistic, which initially caused resistance and confusion among social work practitioners. The domain experts had not previously pursued social systems theory approaches, as their focus was clearly on the conception of solutions. The need for a rigid logic to find structures of cause and effect, combined with the attempt to clearly identify points of leverage and intervention, contradicted their usual approaches and seemed too deterministic. Ultimately, however, we assessed as a novel finding that the practice of these knowledge collections could potentially be transformed into a useful tool for professionals working in the field of protection from violence, as well as in training courses or as part of university education in social work sciences.

Also for the game designers, the process was not always straightforward. It was easiest to define the elements, while it was more difficult to define all the arrows with the logic direction, which led to an increased need for discussion.

4.2 Lessons from systems mapping for design

The game mechanics determine how the game system behaves and how it reacts to every possible action of the player. It is composed of calculations and clear conditions and can also be represented as a system map (Figure 4). However, it was not possible to simply derive this game map entirely from the system map created in the research. Most aspects are abstract phenomena that cannot be measured with numbers, such as "fear", so it is not clear from the system map how strongly the aspects influence each other. There are also no precise conditions. Even though the map shows typical influences and causalities, these describe possibilities rather than universal rules that can be applied in every situation. Many cases of IPV follow similar patterns, but they differ in the details of how these patterns develop and how they can be overcome.

To implement the digital game, designers must therefore draft the necessary values and conditions as they see fit. This means that the behaviour of the game system is the result of a creative process with fictional rules, even though it is based on the real world system known through established research. Some of the fictional processes underpin the message we want to convey, others are simply necessary for the game to work technically. However, players cannot distinguish between the two. We are aware of the risks that, as with the game SPENT, a divergent message may arise through the gameplay dynamics that are left to the player. It is the responsibility of game designers in the later design phase of game balancing to ensure that players understand the behaviour and message of the game. Storytelling has the potential to provide the necessary connection. By backing up certain causalities and conditions with narratives, we can reduce the risk of misunderstandings.

4.3 Lessons from interdisciplinary work

The demands on the work of social researchers and game designers differ greatly, which is reflected in the respective working methods aimed at meeting these requirements.

In the social workers point of view, IPV is a structural problem, but it still happens to individuals. Each case differs in its conditions, process, intensity, its social environment and resources, and its impacts on the lives of the persons concerned. Multiple factors need to be considered to understand – and so to map – one single case, not to mention the construction of a map with every detail in the right context and interdependency. One case – and accordingly one individual life – cannot be measured or described comprehensively. In order to make joint but final decisions for a small part of the map as the basis for the digital game, the general game design approach first had to be agreed by the whole team. The domain experts needed to understand that strict computable mechanics needed to be set up, prototyped and tested. The team could then weigh the pros and cons of each potential play focus and its impact on the project objective: the primary prevention of IPV.

In previous social worker practice, live workshops offered the possibility to adapt a possible role play to the communication of the participants. In contrast, a digital game is usually played in the absence of the designers. The core of the game designers' work is to attract and maintain the players' attention in the game. To avoid loss of interest, games should be designed to be self-explanatory and intuitive through a simple core gameplay loop and clear feedback. Achieving this goal through game tuning is an iterative work process characterised by intermittent failures – a concept unfamiliar to social work researchers and therefore sometimes interpreted as a weakness.

For our serious game project, the requirements of both disciplines need to be considered. To be able to translate the highly complex structures of IPV into game mechanics, game designers had to simplify them. However, too much simplification could result in unintended messages or perpetuating stereotypes. Once the game is distributed, there is no possibility to interfere if there are misunderstandings or if the player behaves in an unexpected way. Therefore, these risks need to be identified in advance as best as possible. In our process so far, simplification had to be weighed against accuracy in several iterations throughout the early analysis and design phases.

These difficulties did not stem from the systems mapping approach but from the complexity of the topic, yet they became visible through this thorough exercise. Overall, the systems map wrapped the topic into a vivid and ostensive metaphor that facilitated discussions between the disciplines.

5. Conclusion

We described the systems mapping procedure used in our interdisciplinary team for acquisition and exchange of knowledge and for design. Research and design required different mapping approaches and had different goals. The research phase was about creating a system map that included as many aspects and interconnections as possible to show the big picture of a complex problem. The design phase was about breaking the big map down to the core aspects surrounding one main chosen leverage point.

Using the system mapping approach, we defined the core mechanic system of our serious game. The game is currently still in development and our approaches are yet to be tested and evaluated. We benefited from both the process and the results of systems mapping. It was a useful tool for research, design and collaboration.

A major limitation of systems mapping for complex social issues is that it is never entirely complete or accurate. Hence, identifying where to stop mapping and how to handle the incompleteness is already a contribution to design. Systems mapping does not provide solutions for difficult design problems, but it supports the process, making it more structured and substantial.

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