

Serious Games for Education and Training in the Humanitarian Sector: State of the Art

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Abstract: Serious games and game-based learning have seen slow and stymied adoption in the humanitarian sector, despite their general efficacy as training tools. We looked at over 120 games released between 1990 and 2023 that dealt with topics relevant to the humanitarian sector such as disaster risk management, conflict mitigation, human rights and sustainability, and applied the following filters - serious games, games for education and training, and non-commercial games - to obtain a list of 89 serious games that were designed for awareness, education or training in the humanitarian sector. We then noted their accessibility and investigated the following information for each - year of release, developer, format, platforms, context, purpose, target audience, NGOs involved and related research papers - to understand the trends, challenges and future potential of games as a research and pedagogical tool in this field. Of particular interest to us was the subset of 31 training games aimed at professionals, policy makers and stakeholders. We noted concerning trends regarding the accessibility and longevity of games in this field, and tracked recurrent issues facing the development and dissemination of these games, such as the need for a trained facilitator, the difficulty of adapting the content to new settings, a lack of scientific frameworks to guide their design and a lack of long-term impact metrics. However qualitative surveys conducted by the game designers and some third-party researchers indicate that these games remain a valuable addition to traditional forms of education and training and help enliven a difficult topic through experiential learning. We thus propose that involving professional game designers, embracing digital formats, and investing in archiving and long-term impact studies will greatly benefit the development and accessibility of games for humanitarian education and training.

Keywords: Humanitarian Games, Aid Workers, Humanitarian Crisis, Serious Games, Disaster Risk Management, State of the Art

1. Introduction

Serious games have been defined as “games that do not have entertainment, enjoyment, or fun as their primary purpose” (Michael and Chen, 2005) or as “games with a purpose beyond play” (Sawyer and Smith, 2008) or as “an application with three components: experience, entertainment, and multimedia” that combine game elements like challenges, rewards, and immersion with learning strategies and knowledge (Laamarti, Eid and El Saddik, 2014).

There is a growing body of literature arguing for the efficacy of serious games and game-based learning for education and training. Games are useful as cooperative learning tools (Fonseca *et al.*, 2023) and have been found to be “particularly effective in promoting skill acquisition, knowledge retention, attitudinal change, supporting understanding of new concepts and ideas, shaping behaviour, and improving context-based problem solving” (Stevens *et al.*, 2020). The “capacity to safely fail in serious games” has also been found to be a “key component of their value as a learning tool” (Stevens *et al.*, 2020). This is because ‘productive failure’ in educational games has been identified as leading to greater learning gains (Anderson *et al.*, 2018).

A 2020 report by Save the Children NGO on the potential applicability of serious games and games-based learning to the humanitarian sector notes that despite serious games being increasingly adopted as training tools in other fields, they have seen slow adoption in the humanitarian sector (Stevens *et al.*, 2020) (Brynen and Milante, 2012). This could be because of the particular challenges faced by serious games in this field. One such issue is that serious games attempting to more faithfully capture real challenges are hard to make interesting because “increasing system realism allows you to communicate a deeper message but typically makes for a less accessible, less fun play experience” (Chris, 2007). The genre is also plagued by a lack of scientific impact analyses. A 2018 study published in the International Journal of Disaster Risk Reduction notes the scarcity of quantitative and qualitative research into the effectiveness of serious games addressing issues relating to Disaster Risk Management (Solinska-Nowak *et al.*, 2018). However, others note the value games add to the field, be it as useful tools for fundraising and creating awareness (Stokes, Seggerman and Rejeski, 2006), for researching humanitarian logistics (Lukosch and Comes, 2019) or to enhance learning and dialogue on humanitarian work (Harteveld and Suarez, 2015) though they all note the need for more research in this fledgling field.

Thus, to understand the rate of adoption of serious games for education and training in the humanitarian sector and the challenges faced by this field, we undertook a state-of-the-art study to discover games released over the past two decades that would fall into this category. We looked at their year of release, developers, stated purpose, target audience, format, availability (accessibility), and research on their efficacy (if available) to understand the challenges of this sector as well as potential for future growth.

2. Methodology

We began by using web search engines with the keywords - 'games' + 'humanitarian', 'games' + 'human rights', 'games' + 'disasters' and 'serious games' + 'conflict' - to discover a few dozen titles that fell within this category according to their descriptions. We then combed through the database of the Games4Sustainability website aided by search keywords 'humanitarian', 'disaster', 'conflict' and 'human rights' to add more titles that were not included in our previous list.

We combed through the database of ResearchGate and ScienceDirect with combinations of the search words 'serious games', 'games', 'humanitarian', 'disaster', 'conflict', 'human rights', 'education' and 'training' to find research papers referencing games that would fit our criteria and added those titles to the list.

We then excluded the titles that were commercially produced and intended primarily for entertainment that nevertheless dealt with related topics. We also excluded games intended for a very young audience (primary school students or younger).

We also excluded some interactive training modules that were not intended as 'games', and which also lacked public information since they were used for internal training by their organisations. Examples include the International Committee of the Red Cross (ICRC)'s *Disaster Response Training In VR* and World Food Programme's *Logistics Response Team (LRT) training*.

Finally, we compiled our filtered list of games into a spreadsheet and searched for the following information for each of them - name, availability, format, year of release, developer, publisher, purpose, target audience, context, scope, number of players, estimated duration, NGOs involved, link to game or game materials, and related research papers or reports.

In their 2008 paper on the taxonomy of 'Serious Games', Ben Sawyer (co-founder of Serious Games) and Peter Smith used two different axes - "Audience" and "Purpose" to differentiate serious games. Audiences included Government & NGO, Defence, Healthcare, Education, Corporate, Marketing & Communications, etc. while Purposes included Games for Health, Advertisement Games, Games for Education, Games for Training, Games for Work, etc. (Sawyer and Smith, 2008)

However, this taxonomy does not account for the context or scope of serious games; it does not for example distinguish between games training policy makers to deal with an external or unexpected crisis and games training policy makers to conduct their day-to-day work. These two additional categories were used by us to selectively identify serious games relevant to the humanitarian sector.

3. Findings

We found 89 serious games that had been developed between 1990 and 2023 to aid education and training in the humanitarian field. Of these, 18 games had no information about their original release date, but they can be assumed to have been developed between 1990 and 2023, since our study was conducted in 2023 and the technology used to make these games or research papers referencing them were dated well past 1990. We also noted details of 21 separate commercial games made for entertainment that dealt with humanitarian crises to compare their availability metrics.

The Serious Games were found to be either Unavailable (their software, website or physical game materials being no longer accessible), or Restricted (the game software or physical materials and rulebook could only be obtained by contacting the developers directly and requesting their personal copy (in case of a researcher) or by requesting a workshop (in case of an organization)), or Available (the game software or rulebook and materials were publicly available to download or access either freely or by purchasing).

We also differentiated the Serious Games according to their purpose - Awareness (communicating humanitarian issues to a lay audience), Education (teaching topics relevant to the humanitarian field to school or university

students), and Professional Training (training games for professionals, policy makers and stakeholders in the humanitarian sector).

Out of the 89 games, 49 were intended to spread awareness, either about humanitarian issues such as the plight of refugees (e.g., *Path Out*, *Darfur is Dying*, etc.), conflict zones (e.g., *Pax Warrior*, *Mission Zhubia*, etc.), resource sustainability (e.g., *Food Force*), gender inequality (e.g., *Half the Sky Movement: The Game*) or about disaster risk and mitigation for communities in disaster prone areas (e.g., *Ready!*, *Hazagora*, *Act to Adapt*, etc.)

Of these, 19 were no longer available, 3 had restricted access and 27 were still publicly accessible.

Similarly, of the 9 games that were intended as classroom tools to teach school or university students, 2 were unavailable, 1 had restricted access (though it could be accessed via a free sign-up process) and 6 were publicly available.

Finally, the purpose and target group of specific interest to us - training games for professionals and stakeholders in the humanitarian field - had 31 games in total, 11 of which were no longer available, 10 had restricted access (needed to contact the developers to gain access), and 10 were publicly available. **(Figure 1; Figure 2)**

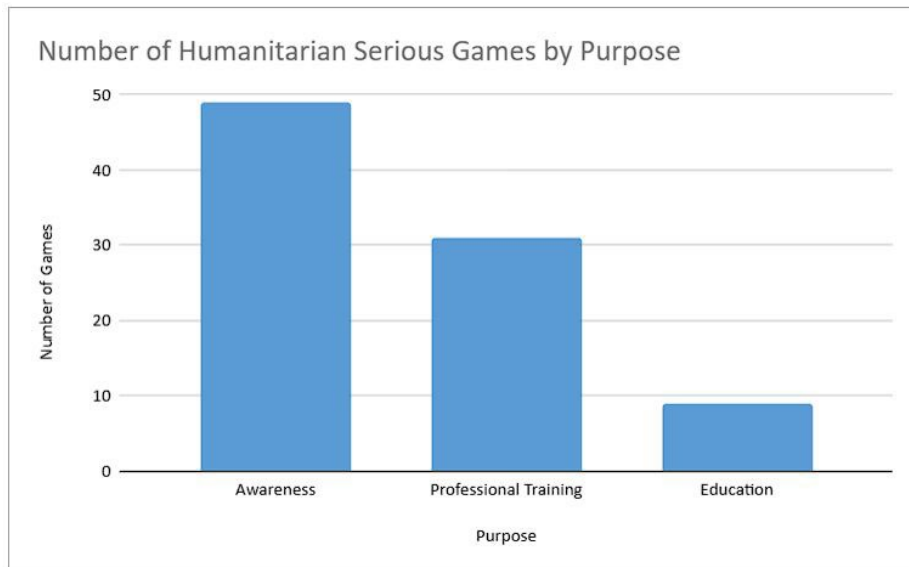


Figure 1: Number of Humanitarian Serious Games by Purpose

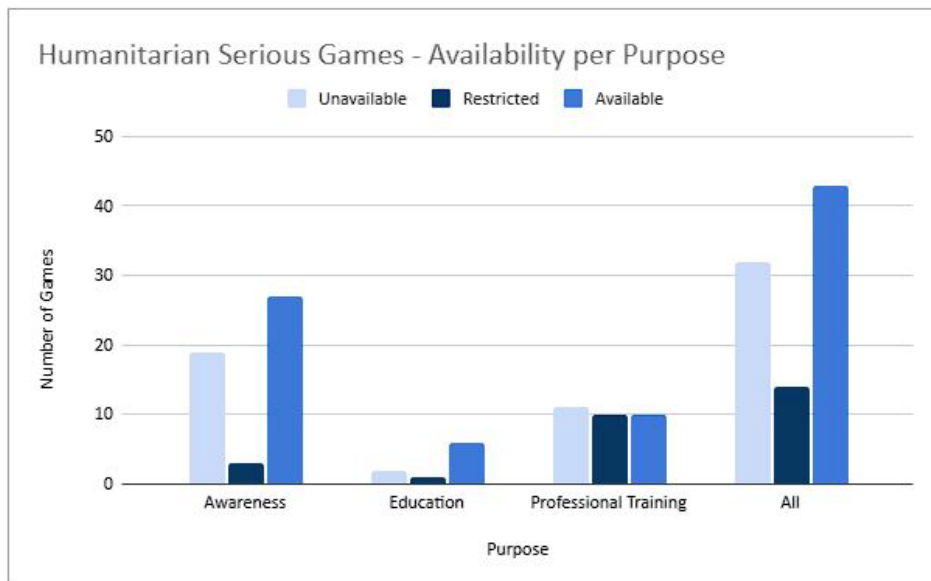


Figure 2: Humanitarian Serious Games – Availability per Purpose

All three types of serious games were found to have much lower availability compared to commercial games or games made for entertainment that dealt with related topics, which retained 100% availability. Even older commercial games no longer maintained by their developers such as the 1990 digital game *Conflict: Middle East Political Simulator*, the 2003 board game *Terra*, or the 2010 digital game *Cart Life* remained available via third party abandonware websites, second hand stores, and public archives, which was not the case for even relatively recent Serious Games that were not maintained by their developers.

We also differentiated the serious games based on their format - analog games (which were all face-to-face multiplayer) and digital games (95% of which were single player games). Games made for Awareness were largely digital, as were games made for Education. On the other hand, games made for Professional Training were mostly analog, multiplayer, and required a trained facilitator (20 analog games and 11 digital). **(Figure 3)** Moreover all 3 multiplayer digital games in our entire sample size of 89 games were intended for Professional Training. There were more digital games in total than analog games, but they also had a greater percentage of titles that were now unavailable. **(Figure 4)**

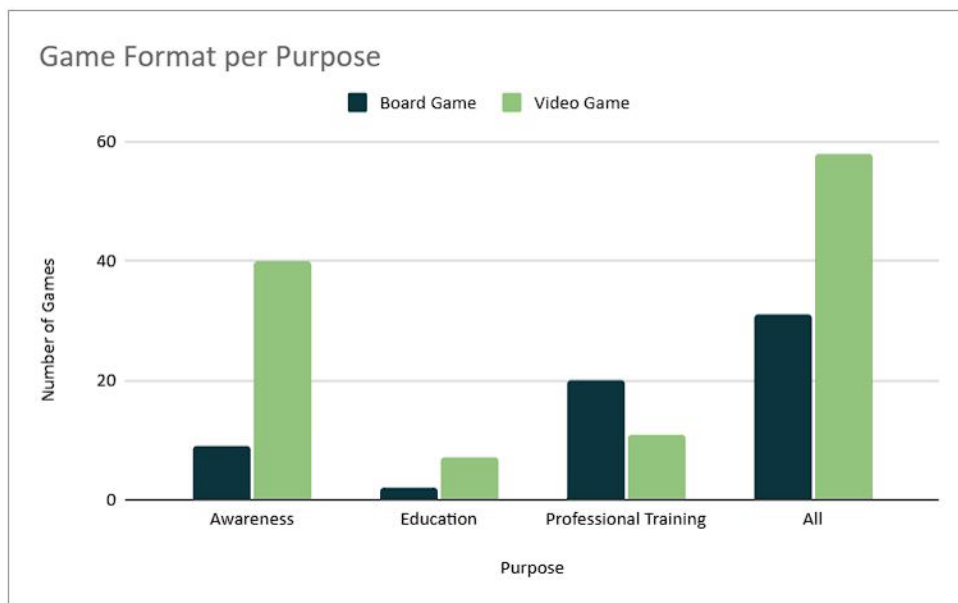


Figure 3: Number of Game Formats per Purpose

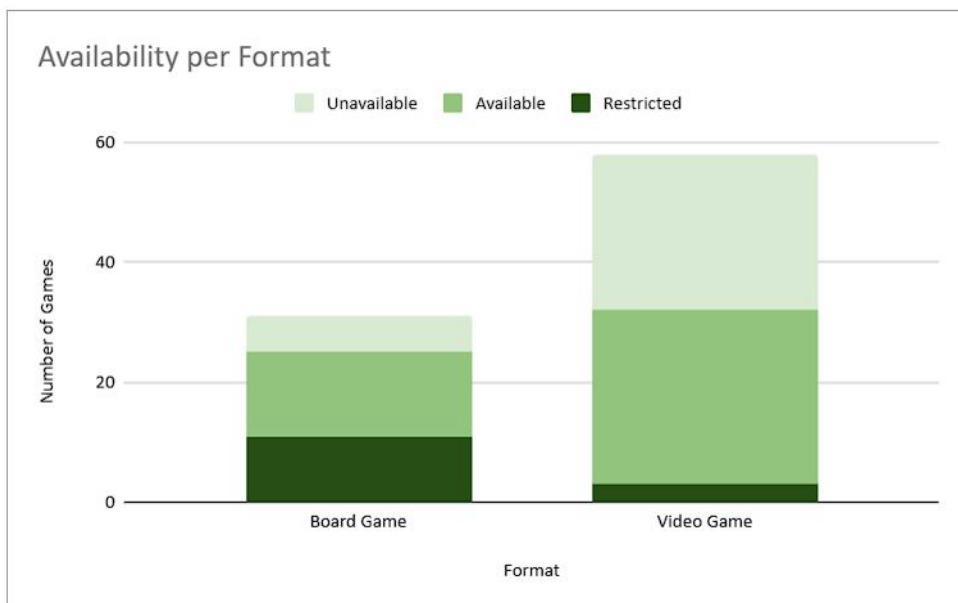


Figure 4: Availability per Format

In terms of NGO involvement in their development, 30 of the 89 games were developed closely with the help of an NGO, 16 of which were digital games and 14 analog games. 7 out of these 30 games were unavailable, and 5

had restricted access, the rest were publicly available. 17 out of the 30 games were for Awareness, 3 were for Education in classrooms and 10 were for Professional Training.

In terms of the research available on their design, efficacy, content or impact, we found 62 of the 89 titles had been mentioned in some form in a research paper, while 27 had no mention. 17 of the 62 games were all mentioned in a single research paper that looked at an overview of serious games specifically about Disaster Risk Management to consider their prospects and limitations, which was published in 2018. (Solinska-Nowak *et al.*, 2018)

4. Analyses

Our special focus was on the 31 Serious Games intended for professionals and stakeholders in the humanitarian field. 20 games out of these 31 were analog and 11 were digital. All the analog games and 3 out of the 11 digital games were multiplayer games, indicating a strong preference for multiplayer games over single player in games for professionals and stakeholders in the humanitarian field. This trend was reversed in games for general awareness.

We noticed three major issues that appeared to be hampering the development, widespread adoption and easy availability of training games for professionals, policy makers and stakeholders in the humanitarian field:

4.1 Need for Facilitators to Drive Learning Goals

The analog games were all multiplayer games requiring face-to-face interactions with other players in the presence of a trained facilitator to explain the context, guide the gameplay and conduct the post-game debriefing, all crucial to driving the learning goals. Debriefing in particular is noted to be an essential part of any effective simulation game. (Fanning and Gaba, 2007)

Rex Brynen, researcher and designer of two serious games for professional training - *Aftershock: A Humanitarian Crisis Game* and *Isis Crisis* notes that "game moderators need to tactfully keep the game on track without heavy-handed intervention. Rules must be enforced, and players who are deviating from their roles nudged back into more appropriate behaviours [...] it should not be assumed that all participants have learned the same things from their experiences [...] The debriefing provides an opportunity to draw out from the experience key insights for the participants, and address any misconceptions that may have arisen. It also provides an opportunity to link the experience to other course materials or parallel, real-world events." (Brynen, 2015)

The researchers who designed the serious game *DisCoord: The Disaster Coordination Game* for local policymakers in the landslide and flood prone Rwenzori region of South-West Uganda, also identified facilitators as one of the three core actors in the knowledge co-creation process, the other two being the game designers and the game players (target group). (Delima *et al.*, 2021)

Similarly, 4 of the 6 professional training games developed by the Centre for System Solutions could only be accessed via a workshop organised and facilitated by the organization. Of the two remaining, one was unavailable, and one provided downloadable instructions for the game moderator.

Thus, this need for expert facilitators makes these games hard to access and deploy regularly, especially in remote regions. Solutions can range from detailed tutorials with information on the context to multiplayer digital games with technology enabled communication channels and discussion portals. Two multiplayer digital games developed by the Centre for System Solutions - *Lords of the Valley* and *Forest@Risk* - seem to have employed such methods.

Another method for digital formats would be to incorporate Artificial Intelligence (AI) mediators, but this has not been attempted in any of the cases we studied. All 8 single player digital games for professional training - *In 90 Days*, *FloodSim*, *A Force More Powerful*, *Disaster in my Backyard*, *SerGIS: Malmö Flood Scenario*, *Supervolcano*, *VR for a New Climate* and *Disaster Relief Game* - use traditional algorithms to drive the gameplay and goals rather than the flexible moderation a human or advanced AI facilitator could provide.

Finally, the games could be designed with an open-ended narrative that would encourage players to draw their own conclusions, but then the results could deviate from pedagogical goals and also subvert the players' expectation of participatory and virtual completeness, particularly in digital games. (Van de Mosselaer and Gualeni, 2022)

4.2 Lack of Diversity and Difficulty of Adapting to Different Settings

Games are fiction and thus subject to the incompleteness problem. (Van de Mosselaer and Gualeni, 2022) To overcome this, serious games adopt great specificity in subject, context or setting to more authentically depict its issues. As researchers note, "Serious Games were initially conceived as being designed to train people for tasks in particular jobs [...] they are characterized by their specificity and applicability for particular work-related purposes." (Klopfer *et al.*, 2009)

Games such as *DisCoord: The Disaster Coordination Game*, developed for the Rwenzori Mountains in Uganda were developed for a particular socio-political and geographical context facing specific types of humanitarian issues - floods, landslides and displacement, while others that did not correlate exactly to a real-world setting were nevertheless focused around a particular problem – such as a flood prone region (*Lords of the Valley*, *Game of Floods*, *Flood Resilience Game*, *FloodSim*, *Disaster in my Backyard*, *SerGis: Malmo Flood Scenario*, etc.) or a volcanic eruption (*Supervolcano*) or an earthquake (*Aftershock: a humanitarian crisis game*, *Crossroad: Kobe*). These can be hard to adapt to different contexts without a design framework to guide the changes.

Like the 2018 report on disaster risk management games, which noted the lack of diversity in the disasters covered by those games (Solinska-Nowak *et al.*, 2018), our study also found that few games attempted to address less common natural disasters such as wildfires, temperature fluctuations or epidemics, or man-made crises such as insurgency, war, terrorism, genocide, or resource scarcity, some of the exceptions being the *Disaster Response Game* - a flexible digital platform addressing a range of disaster scenarios including, but not limited to, earthquakes, floods, pandemics, storms, and wildfires, *ISIS Crisis* on the conflict in Iraq and Syria, *The World's Future* on sustainable development, and *Ramsete I, II, and III* on inter-country cooperation, climate change adaptation and storm preparation.

As also noted by the 2018 report, most of the games failed to acknowledge issues such as gender inequality or social divisions that complicate the work of humanitarian professionals in these regions. "Surprisingly enough, little attention is given to issues such as cultural diversity, gender equality or learning from past events, which certainly could also positively affect communication and thus support disaster preparedness and/or resilience." (Solinska-Nowak *et al.*, 2018) This is especially relevant when local customs contradict the learning goals. For example, in *DisCoord: The Disaster Coordination Game*, the designers noted that when the game was tested with local policy makers, the use of contraceptives was the least proposed and voted among the methods to curb population growth, due to local religious beliefs opposing the solution. (Delima *et al.*, 2021)

Solutions to address the problem of adaptability to new contexts and diversity of viewpoints can be achieved by devising gameplay systems that work with changeable content to swap contexts, as seen in the *Disaster Response Game*. Another way is to map real-world data into the game for effective simulations, as done in the *Disaster Relief Game* to teach logistical planning.

With multiplayer games, asymmetric gameplay systems can be used to represent different interest groups and any social divisions. For example, in *Aftershock: A Humanitarian Crisis Game* the players represent the different interests of local governments, international agencies and defence professionals who need to cooperate in a crisis but may have different priorities.

4.3 Lack of Scientific Methods to Direct Their Design and Prove Their Efficacy

While a few frameworks have been proposed by different researchers to help create and analyse serious games in general, there is no industry-standard framework or testing methodology that can be universally applied for the development and analyses of serious games and none that have been proposed for serious games in the humanitarian sector in particular.

Moreover, the existing frameworks each have their own limitations that designers and researchers must be aware of. For example, the Serious Games Design Assessment (SGDA) Framework was found to be somewhat useful for a qualitative analysis but not for design (Mitgutsch and Alvarado, 2012) and the Activity Theory-based Model of Serious Games (ATMSG) was useful only to design simpler games, but could not be used for more complex simulations (Gauthier *et al.*, 2022). Problems with all existing frameworks include - the roles of all stakeholders not always being clear, no guidelines for the right balance between fun and pedagogy, and a lack of instruments to guide researchers and game designers in utilizing their evaluation results for validating and appropriately revising the design of their games.

In addition, there is a lack of follow-up studies and third-party studies to understand the long-term effect of these games. The report by the NGO Save the Children was the only detailed third party study that looked at the effectiveness of tabletop games vs digital serious games for the humanitarian sector via qualitative surveys of participants (Stevens *et al.*, 2020) whereas other studies were conducted by the designers themselves as in the case of *DisCoord: The Disaster Coordination Game* (Delima *et al.*, 2021), *Ramsete I* (Abad *et al.*, 2020), *Ramsete III* (Schueller *et al.*, 2020), *SerGIS: Malmö Flood Scenario* (Blochel *et al.*, 2013) or *Crossroad: Kobe* (Kikkawa, 2014).

A few games such as the digital single-player *Disaster Relief Game* (2018) for government personnel and non-technical professionals involved in disaster relief who need to understand the importance of logistical optimisation (De Souza *et al.*, 2018), or the multiplayer digital game *Disaster Response Game* (2020) for graduate students on co-ordination, communication, and decision making under pressure during disaster relief operations (Klein, Jackson and Mazereeuw, 2022), were proposed via research papers but have no information on their real world deployment.

None of the studies looked at long term effects of the games by reconducting the surveys months or years after the gameplay or by looking at changing performance metrics over time.

5. Conclusion

We used web search, a serious games database and references in research papers to find 89 serious games developed for the humanitarian sector. We analysed their availability, format, purpose, target audience, NGO involvement and research papers on their efficacy to discover the reasons for the paucity of games in this genre and potential for growth in the future.

From our study we noted that there is a pressing need to archive serious games made for the humanitarian sector to avoid losing the detailed research that went into their design, and to allow future developers and researchers to study them to improve their own methodologies and develop more robust design and analyses frameworks. The lack of availability and short shelf life is thus the first and foremost hurdle to the adoption and growth of educational and professional training games in the humanitarian sector. Methods to address this would be to digitize the games or game materials and instructions, create an archive to maintain the game files and ensure this archive remains publicly available.

Secondly, we need more researchers willing to study serious games developed by others in this field in order to devise design frameworks that can enable easy development and adaption of these games in different contexts. Researchers and developers designing their own games in this field should accompany their design methodology with instructions for adaption into different regional, social or cultural contexts. Scientific design frameworks will also help researchers and professionals in the humanitarian sector work closely with professional game developers to create more interesting gameplay, combining their academic insights with professional game designers' mastery over their craft.

Finally, serious games in the humanitarian field suffer from a lack of any quantitative data on their efficacy as well as qualitative surveys removed in time from the gameplay to understand their long-term effects on the audience. Third-party evaluators are needed to follow-up after the deployment of serious games for professional training in particular to gather performance metrics and conduct surveys at a later date to understand their long-term usefulness and potential.

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Appendix 1:

<https://docs.google.com/document/d/1WIXSnnfZFZ2tTqDy9X3IJ3YbSHpWiJxz/edit>

List of 89 Serious Games for Education and Training in the Humanitarian Sector studied for our paper with abridged data