

## Proposal for workshops – AGILE 2023

Delft, Tuesday 13 June 2023

<https://agile-online.org/conference-2023>

### 1. Workshop name/title (and acronym is applicable)

Digital Serious Games: Toward a Design Framework

### 2. Description of the workshop by listing topic(s), objective(s) and planned outcome(s)

#### 2.1 Topic(s)

- Smart Cities
- Digital Twins
- Geo Data for co-creative urban design and planning
- XR: Virtual, Augmented, Mixed Reality (VR, AR, MR)
- Serious games

Digital serious games (DSGs) – a playful and engaging mode of digital twins – are an emerging research and application area that aims to support users' learning about complex systems. Cities are among those complex systems of various socio-ecological-technical changes that became the context for DSGs, especially for aiding decision-making that involves a variety of stakeholders, raising awareness and developing skills of particular groups. The complex situations that DSGs are applied for are often related to sustainable planning and design, co-creative efforts, and multi-dimensional effects such as climate change, and the balance between human activities and nature [1;2]. The interplay between serious games, (big) data, simulations and interactive digital technologies, of DSGs, enables complex systems to virtually adopt simulated changes (scenarios), and communicates these changes and their consequences to users [3]. Such games can support the learning of users who have different levels of experience and expertise on the complex situation by enabling (i) the interaction between them and the contextual environment and (ii) the exchange of contrasting views between users on the possible developed scenarios.

On account of rapid growth in interactive technologies, including eXtended Realities, and the wealth of open data accessible to all, DSGs are becoming increasingly data-driven, intelligent and immersive. DSGs provide opportunities for digital twins to be more playful and engaging with powerful simulations and realistic visualizations. However, in recent years, serious game research resulted in variety of application areas and, research and development solutions. This multiplicity resulted in fragmentation of efforts, limited knowledge exchange and lack of standardizations which makes it difficult to build on existing achievements, avoid overlaps, and enable the reusability of resources [4;5]. In order to reduce the fragmentation and propose a way forward, it is vital to know the state-of-the-art of DSGs that deal with the complexities of cities.

To date, most DSGs are assessed based on the game itself in terms of users' learning and gaming experience, and several of DSGs are assessed based on the digital environment in terms of user interaction and platform functionality. These assessments are done mainly to understand the effectiveness of the DSGs with regard to their success and attractiveness. It is also important to understand how we can adapt existing DSGs into future challenges of cities, how we can (re)use them responsibly and meaningfully [3], and how we can make them accessible for all.

This workshop will start a discussion on a possible assessment framework that can enable DSGs to be designed more efficiently and also be repurposed for future DSGs. Therefore, we will present and assess the existing DSGs for their visualization techniques (i.e., which interactive digital platforms should be used and when), data (i.e.; openness; privacy; ethics; possibility to link with other datasets) and reusability (i.e.; accessibility of platforms; data; models and information; funding; the language used).

## **2.2 Objective(s)**

This workshop aims to address and discuss above issues by

- Facilitating a discussion of a possible assessment framework
- Inviting participants to present case studies of DSGs that they are involved in
- Analysing the presented DSGs based on the earlier discussion
- Plenary discussion on (i) the obstacles to design efficient DSGs and (ii) the repurposing of existing DSGs, and (iii) how to overcome these mentioned obstacles.

## **2.3 Planned outcome(s)**

*An outcome can be e.g., the publication of a report, a special issue of an International Journal, a white paper, a book, etc. If you already know the publisher, please provide this information as well. The workshop can also be a hands-on tutorial in which the participants are taught a new method or software relevant to one of the conference topics.*

The outcome of the workshop will be a full journal paper that combines the results of the discussions and the workshop report. In this journal paper, all workshop contributors will, ideally, be co-authors. We will also initiate a discussion about organizing code and experiences of serious games on an open platform to facilitate their development and accessibility.

## **3. Abstract**

*This is how you want your workshop to be presented on the conference webpages (maximum 1000 characters)*

Digital serious games (DSGs) are great assets to different disciplinary domains of learning and decision-making. In the field of urban planning and design, as more and more data will become open for all, this is a timely workshop to discuss the capacity of DSGs that deal with the complexity of cities, to gain the most out of these data, and to advance the identification

of future applications. Currently, the multiplicity of DSGs resulted in fragmentation of efforts, limited knowledge exchange and lack of standardizations. To reduce the fragmentation and propose a way forward, synergies are required to interconnect existing competences, usually technical, and enable DSGs to be designed efficiently and to be repurposed for future applications. This workshop aims to start a discussion toward a design framework for DSGs by gathering a scientific community that can provide feedback on data usability, visualisation techniques, the quality of digital environment and a possible open platform for the reusability of DSGs. The outcome of the workshop will be a journal paper that combines the results of the discussions. All contributors will be invited to be co-authors.

#### **4. Short description of the intended length (half or full day) and the format of the workshop**

- Half day workshop,
  - Discussion on assessment frameworks (45 min),
  - Presentation of DSGs (60-75 min),
  - Break (15-20 min),
  - Analysis of presented DSGs (45 min),
  - Plenary discussion (30 min).

In this half-day workshop, we invite 10-15 scientists of the fields of interactive digital platforms, urban design and planning, and smart cities to discuss the criteria for designing DSGs (especially dealing with complex situations with respect to cities). The workshop starts with an open discussion on the assessment of DSGs, general ideas on the subject and key points of importance. Afterwards, participants will be asked to share their experience of developing DSGs and if applicable to present any use case they have tested the game in real-world problems. Then, in groups, we will assess core elements of each presented DSGs and will discuss to get to a consensus on a list of criteria for DSGs design framework with regard to the aforementioned themes of visualisation techniques, data, and reusability.

#### **5. Brief statement of the relevance of the workshop for AGILE**

Digital serious games which are designed for users' learning of complex situations are of importance in the multi-stakeholder, multi-sectoral, and uncertain urban decisions. On account of rapid growth of interactive technologies and the wealth of data becoming open to all, DSGs are evolving into digital twins – data-driven, intelligent, and immersive. In urban contexts, they are usually bound to a certain location and are mostly related to spatial thinking. Therefore, DSGs require the use of spatial data, delivery platforms and workflows. In this workshop, we will come up with a list of criteria for DSGs design framework with regard to the themes of visualisation techniques, data, and reusability.

## **6. What is the approximate number of expected participants?**

10-15 participants are expected who are experts in the fields of interactive digital platforms, urban design and planning, and smart cities to discuss the criteria for designing DSGs (especially dealing with complex situations with respect to cities).

## **7. Names and e-mail addresses of the organizing member(s)**

*Leading AGILE member (or sponsor) and contact person:* Prof. Dr. Alexander KlippeL ([alexander.klippeL@wur.nl](mailto:alexander.klippeL@wur.nl)) Wageningen University and Research

Assistant Prof Dr. Jiayan Zhao, ([jiayan.zhao@wur.nl](mailto:jiayan.zhao@wur.nl)) Wageningen University and Research

*Contributing AGILE members (including the persons involved) – at least one seconding AGILE member is needed:*

*Contributing non-AGILE members (including the persons involved) – if applicable:* Assistant Prof. Dr. Gamze Dane ([g.z.dane@tue.nl](mailto:g.z.dane@tue.nl)) Eindhoven University of Technology, Post Doc Researcher Dr. Maryam Ghodsvali ([m.ghodsvali@tue.nl](mailto:m.ghodsvali@tue.nl)) Eindhoven University of Technology

*Organizing Committee (if applicable):*

*Programme Committee (if applicable):*

## **8. Additional information about previous workshops, if held.**

NA

## **9. Expected resources needed**

*Explain here if you have any special needs (e.g. internet connection, break-out room(s), etc.), what are the expected resources needed. Please take into account that the fixed fee for the workshop (1 day) only covers the basic expenses made (coffee breaks, ...). If you need additional support, this request should be directed towards the AGILE Council, but this support cannot be guaranteed.*

- Internet connection in case an intended DSG to be presented in the workshop was web-based (online)
- 4-5 round tables for group settlements, and one separate table for plenary discussion session (all, standing)
- Projector, microphone, white board, note pads and pen.
- Preparation of a 15-20 minutes coffee break for 10-15 participants
- A number of empty poster sheets + sticky notes + markers for the plenary discussion session that participants will make a list of important criteria for DSGs design and development and to draw their relations and priorities.

## 10. Other information

### References

1. Ghodsvali, M., Dane, G., & de Vries, B. (2022). An online serious game for aiding decision-making on food-water-energy nexus policy issues: Design, implementation, and test. *Sustainable Cities and Society*, 104220.  
<https://doi.org/10.1016/j.scs.2022.104220>
2. Sajjadi P., Bagher M.M., Myrick J.G., Guerriero J.G., White T.S., Klippel A. and Swim J.K. (2022). Promoting systems thinking and pro-environmental policy support through serious games. *Front. Environ. Sci.* 10:957204. doi: 10.3389/fenvs.2022.957204
3. Tilburg University (2022). *Serious Games and Digital Twins*.  
<https://www.tilburguniversity.edu/current/news/more-news/serious-games-and-digital-twins> (accessed on 4/1/2022).
4. van der Vegt, W., Nyamsuren, E., Westera, W. (2018). Making Serious Games with Reusable Software Components. In: , et al. Serious Games. JCSG 2018. Lecture Notes in Computer Science, vol 11243. Springer, Cham. [https://doi.org/10.1007/978-3-030-02762-9\\_3](https://doi.org/10.1007/978-3-030-02762-9_3)
5. Stanescu, I. A., Warmelink, H. J. G., Lo, J., Arnab, S., Dagnino, F., & Mooney, J. (2013, May). Accessibility, reusability and interoperability in the European serious game community. In *The International Scientific Conference eLearning and Software for Education* (Vol. 2, p. 55). " Carol I" National Defence University.