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CURRENT TRENDS IN USING SERIOUS GAMES AND VIDEO GAMES IN THE FIELD OF URBAN PLANNING

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Current trends in using serious games and video games in the field of urban planning

Abstract: The use of games for research and practical use has gathered considerable momentum in recent years. In the presented paper, the author analyses past and current research as well as non-research practical uses of serious games and commercial video games for the purposes of urban planning. First, the experience of using games as a learning tool in urban planning classes is discussed, both the benefits and the concerns this approach brings. Another preferred use of games in urban planning is to engage various stakeholders in a participation project. This can be done by employing digital serious games that incorporate attractive modern information technologies but also by using popular commercial video games such as *Minecraft.* One of the main functionalities that enables the use of video games "seriously" is the possibility of modifying the game to solve a given problem by modding, the process of implementing user-written custom scripts. Further, digital serious games, video games and video games with modding that have been employed in urban planning are compared in six selected criteria: *attractivity*, *configuration*, "*white box*", *reusability*, *reflecting reality* and *support*.

Keywords: games in participation, serious games, gaming simulations, modding, SimCity, Minecraft, Cities: Skylines

Introduction

The use of games in the field of urban planning has its roots in the second half of the 20th century. Gaming simulations have been used in the military for decades, arguably centuries (Starr, 1994), and this concept was then brought to the field of urban planning. One of the pioneers of this approach was Richard Duke, who developed an urban game, *Metropolis*, which simulated communal budgeting issues in order to support consensus among stakeholders (Duke, 1964). This game was later redeveloped into an updated version, *Metro*, and finally into the most recent version of this game, called *Apex* (Duke, 2011). Another urban game, *The Cornell Land Use Game* (CLUG) was one of the first board games that were designed to support planning processes (Feldt et al., 1972). Many of the urban games developed in the 1960's and 1970's utilised large scale models for their simulations that, however, turned out to be largely inaccurate and failed to provide conclusive outcomes (Lee Jr., 1973). Armstrong and Hobson (1972) suggested that games can be used for other purposes in urban planning such as facilitating participation and communication among stakeholders. This led to the use of games in the field of urban planning in several ways: for experimental simulations (despite indistinct outcomes), for engaging the general public and other stakeholders in participation projects, for visualizations, data collection or for teaching and education. Tóth (2014) analysed the use of selected games in the field of urban planning between the years 1999 and 2013 and provided comprehensive distinction of the games based on: field of application, genre, technology, target group, date and location. From 19 games studied, Tóth (2014) identified 3 participatory games, 9 educational games, 4 data collection games and 3 awareness raising games in the genres of role-playing, strategy game, simulation game or an adventure. However, in some cases, the game can be applied in more fields than suggested by Tóth (2014).

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For example, *Block by Block* (a specific edition of Minecraft) can be used for visualization, participation, as well as data collection (Reinart and Poplin, 2014). In this paper, we will examine the uses of serious games as well as video games for the purposes mentioned above.

1. Serious games and video games

The term "serious games" was introduced by Clark C. Abt (1970) in his influential book of the same name, "Serious games", where he defines this term as games that "have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement". Since then the term has evolved, incorporating any non-entertainment uses of games instead of just education (such as simulation, propagation, visualization or participation) and could be simply rephrased to: games with a non-entertainment main goal. The majority of games used for the purposes of urban planning are referred to as serious games; nevertheless, commercial video games are used in this field as well. However, to distinguish these two types of games can prove challenging. Serious games include non-digital games such as board- or card games, pervasive games and – in the last two decades – also digital games that utilise modern information technologies. Commercial video games seem to be easy to label at first, but what if they are used seriously? Should they still be referred to as video games (which indicates entertainment) or as serious games? For example, *Minecraft* was developed clearly for entertainment, but what about its education edition – is it a serious game? It is clear, that the worlds of serious games and video games often overlap and the specific definition may depend on a given context. In this paper, the term serious game represents a game, mainly digital, developed by an academic or research institutes to solve a given problem. The term video game then represents a game that is commercially developed primarily for entertainment, including its variations – formal editions or user modifications – that are used "seriously".

2. Games as a learning tool in urban planning classes

Games, in general, are entertaining and thus attractive. In the search for the definition of the word game and the reasons why playing a game is an entertaining activity, numerous researchers have concluded that it is due to the game's educating features that makes playing them entertaining. According to Salen and Zimmerman's (2003:83) definition, a game provides a quantifiable outcome in the form of immediate feedback. This allows the player to learn from his (or her) actions. Games offer a safe space for exploration and experimentation where the player can learn from the actions taken without the danger of any actual risk (Abt, 1970). A player progressing through challenges in such an environment then experiences a feeling of satisfaction and reward (Juul, 2013:5). This enhances the learnability of the information presented by the game and because of that, games are considered to be an efficient learning tool (Prensky, 2001; Gee, 2003). Numerous serious games have been used for the purpose of education in urban planning classes (Bagley and Shaffer, 2011; Duke, 2011) though not enough studies have been completed to report on their effect on the taught subject. The opposite case applies for a commercial game, *SimCity*, which was used widely in education of urban planning. The original *SimCity* was released in 1989 and defined the genre of city building games where many titles followed. Various versions of *SimCity* were implemented in numerous educational classes in the field of urban planning (Adams, 1998; Gaber, 2007; Minnery and Searle, 2014; Kim and Shin, 2016; Terzano and Morckel, 2017). Adams (1998) concludes that the most important outcome of using *SimCity* for teaching is developing urban-planning like attitudes. Lobo (2005) states that "no other game has been used so widely in schools to help understand the different elements of local government". Lobo (2005) further reports on the qualities of *SimCity* as a GIS tool, providing spatial visualizations and provoking thoughts in students that play it. Gaber (2007) sees the use of *SimCity* as successful in specific learning objectives but warns from thinking that such tool would serve as "a panacea that can save a poorly taught class". However, major simplifications of the simulated urban processes are seen as a disadvantage (Minnery and Searle, 2014; Bereitschaft, 2016). The reviewed studies presented benefits but also some concerns with using *SimCity* (or any similar city building game) in education. A realistic approach while using games – serious games and video games alike – for the pur-

pose of education should be taken for achieving sensible learning results. The instructor leading the class must be aware of the inaccuracies of the game and reflect on them rather than using the game as a dogmatic presentation of the taught topic.

3. Games enabling participation in urban planning

According to UN research (Un, 2018), an estimated 3 million people per day migrate from rural areas to cities, resulting in approximately 54% of the world population living in urban areas, and this trend is predicted to continue. The complexity of urban planning processes and the number of stakeholders involved is increasing (Dalsgaard, 2010). These facts challenge the traditional model of top-down urban planning, ignoring the local knowledge that lies within the inhabitants who can serve as sensors (Goodchild, 2007). A bottom-up approach, in which all stakeholders, including the general public, are involved, is considered favourable (Deyle and Wiedenman, 2014). However, involving the general public in the planning processes can be problematic. Planning processes are complex and require time and effort to comprehend; therefore, many people choose to be 'rational' and ignore the planning processes (Krek, 2005). Thus, researchers and urban planners should try to bridge the gap of data, information and knowledge between the general public and planning processes. One of the ways how to do this is by using games that offer an attractive environment and playful participation.

Numerous uses of games for participation projects have been documented in the last decade. *Participatory Chinatown* is a multiplayer digital urban game in a 3D environment that was developed to support communication on the planned development of Boston's Chinatown neighbourhood (Gordon, Schirra and Hollander, 2011). *Community PlanIT* is an online game platform that has been used for civic participation in planning processes (Gordon and Baldwin-Philippi, 2014). Games based on this platform have been played by over 10,000 people in scenarios ranging from neighbourhood to international level (Engagement Lab, 2019). Another example of using a game for participation in urban planning was done at the HafenCity University in Hamburg, Germany, were the development team created a digital game called *B3 – Design your Marketplace!* The game was designed in the Adobe Flash program and thus aimed to provide a playful and visually appealing environment to citizens who as players learned about the current situation about the district of interest and had the option to submit their own designs of renovations of this area (Poplin, 2014). Devisch, Poplin and Sofronie (2016) further elaborated on the use of the game *B3 – Design your Marketplace!* as well as on the use of another game *Cure for the Campus* and based on these practical examples concluded that the use of games for civic engagement is beneficial. A comparative study done by Reinart and Poplin (2014) lists other serious games that have been used for participation purposes.

3.1 Modern technologies in civic engagement

The serious games as *Participatory Chinatown*, *Community PlanIT* and *B3 – Design your Marketplace!* mentioned above implement modern information technologies to enhance the likability of the presented game. However, due to budget limitations, serious games cannot match the audio-visual attractivity of commercial digital games that are often designed by large development studios. Commercial game titles utilise gaming engines such as *Unity* that are at the forefront of progress in the visual graphics field. The city-building game *Cities: Skylines* is built on *Unity* engine and thanks to that offers a visually appealing environment in spacious 3D space that can be roamed freely. Due to these possibilities, a model of a city (or its part) can be created within the *Cities: Skylines* and used for visualization. Two case studies were identified where the potential of modelling a city in *Cities: Skylines* was tested. The city of Hämeenlinna in Finland held a contest to design an area near the city centre using the game *Cities: Skylines*. First, the city council created a map for the game containing a road network and water resources that served as a template for the contestants, who then turned this map into a playable model of the given city area (Rappler, 2016). The second case study was in the city of Stockholm, Sweden where they used *Cities: Skylines* to model the intended development of the Royal Seaport district and offered this model to the general public who could then explore the modelled area and contribute new ideas to the development plan

(BBC, 2017). Figure 1 displays the participation meeting of the Royal Seaport redevelopment project.

Fig. 1 *Cities: Skylines* in a participation project in Stockholm (Borg, 2016)

The most used commercial game in non-entertainment ways today is arguably Minecraft. The indexing database Web of Science (WoS, 2019) currently registers 174 scientific articles that include the game's name as a keyword. A report of the top ten fields of these scholarly articles is shown in Figure 2.

Developed by Markus Persson in 2011, *Minecraft* is now the second-highest selling digital game in history. *Minecraft* is set in a virtual world that is made up of 1 m^3 blocks that can be used to build almost anything, provoking creativity and imagination within the player and thus is often referred to as a "digital Lego". These qualities have led to the implementation of *Minecraft* in schools (Nebel, Schneider and Rey, 2016). *Minecraft* has a large and active world-wide online community of over 100 million players. A convention named *Minecon* is held every year where thousands of *Minecraft* players gather, discuss and share innovative ideas. UN-Habitat saw the potential in *Minecraft* and its active community and partnered with Mojang, the development studio behind *Minecraft*, for a program called *Block by Block*. As part of this program, *Minecraft* was used to model selected areas that UN-Habitat was studying for redevelopment (McDaniel, 2018). By using geographical and satellite data, a model of the selected area is created in *Minecraft*. This is presented to the members of the surrounding community who then use, or rather play, the game to rebuild the area according to their wishes. The resulting models are then translated into plans for further implementation (UN Habitat, 2015). This approach has been used in more than 300 urban areas around the world. Another participation project using *Minecraft*, unrelated to the *Block by Block* programme, is being done in the city of Exeter, England, where *Minecraft* is being used for a design challenge of the town historic centre (Minecraft Education Edition, 2019).

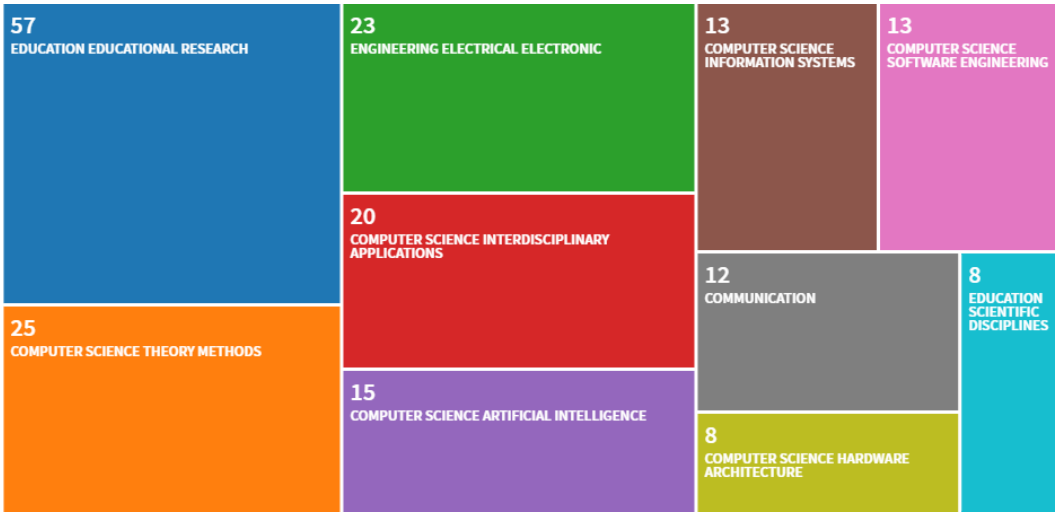

Fig. 2 Top ten fields of articles using "Micraft" as a keyword (WoS, 2019)

3.2 "Bending" the game through modding

The use of commercial video games in their original version is limited. The main constraint is the "black box" behaviour that limits the game's configuration (Rufat and Minassian, 2012). These constraints can be overcome or at least mitigated by incorporating changes to the game's behaviour. The process of changing the game using custom scripting is known in the gaming community as "modding". This process can "bend" the original version of a video game to solve a given problem. Modding is available in most modern digital games as it is a desired feature by the gaming community; however, the level of extensiveness and support varies from game to game. Whereas in some cases the modding possibilities are quite limited, in other cases the game's behaviour can be changed significantly. In the following examples, I will demonstrate the possibilities of modding in the games *Cities: Skylines* and *Minecraft*, both of which offer extensive modding capabilities and online support in form of modding documentation and user forums.

Cities: Skylines offers extensive API built on the Unity engine and written in programming language C#. This feature is highly appreciated by the *Cities: Skylines* community, which is best documented by the number of 175,970 mods created. Most of these mods are cosmetic additions to the game (e.g. a new type of tree) but some mods are professionally written and modify the game's behaviour substantially: changing the traffic management, allowing mixed zones, providing preservation of historic buildings, importing and exporting geographical data into the game, etc. Juraschek, Hermann and Thiede (2017) chose *Cities: Skylines* for its visually rich outputs and the extensive possibilities of adjusting the game using modding to model the city of Braunschweig, Germany, in order to simulate the production of urban factories and evaluate various phenomena such as air pollution. Eisele et al. (2017) utilised the multi-agent-based simulations of vehicles in *Cities: Skylines* to implement and model decentralized smart traffic systems. To apply the desired behaviour of traffic lights, a custom mod was programmed using the game's API (Eisele et al., 2017).

Minecraft is written in Java and offers many ways of modding the original game through extra editions of *Minecraft* or added tools such as *Forge*, *ModLoader* or *Spigot*. *Spigot* was used to deploy and modify server installation of *Minecraft* for the creation of *Geocraft*. *Geocraft* is a virtual representation of the Netherlands created within *Minecraft* from real geographical data from various sources (point clouds, Digital Elevation Model, topographic data, 3D data, sensor data) that allows players to roam the created geo-visualizations. Players can also redesign the environment

according to their visions and these modifications can be then exported into existing Spatial Data Infrastructures. Therefore, *Geocraft* has been used for various participation and data collection projects (Scholten et al., 2017). Figure 3 shows buildings (with orange roofs) that have been generated in *Geocraft* from a Digital Surface Model (DSM). Buildings in the centre of the figure have been visually updated by *Geocraft* players.

Fig. 3 Buildings in *Geocraft* generated from a DSM (Scholten et al., 2017)

4. Comparison of serious games and video games

As presented above, the use of modern video games in the field of urban planning is becoming more popular. But can these games be used in similar ways as games developed in academic institutions specifically for a given problem? To answer this question, as part of this research, serious games were compared to video games regarding their use in the field of urban planning. Serious games can be divided into non-digital (most commonly board games) and digital games. Non-digital serious games will be excluded from the comparison as their application significantly differs from digital serious games and video games. For the comparison, six criteria were chosen: *attractivity*, which indicates how attractive is the game to the players; *configuration*, which indicates how much the game can be configured to fit a certain scenario; "*white box*" (opposite to the term "*black box*"), which indicates whether the core code of the game is known and accessible; *reusability*, which indicates whether the game can be used again in a different scenario; *reflecting reality*, which indicates how realistic the game is; and *support*, which indicates whether support is provided for the game. Each criterion was rated by the author based on the reviewed studies. Additionally, video games with modding were added to the comparison as the modding process can adjust the original game considerably.

4.1 Attractivity

Numerous digital serious games have applied modern information technologies in order to increase their attractivity when targeting a wider audience, especially the youth (Gordon, Schirra and Hollander, 2011; Strachan, 2013; Poplin, 2014; Gordon and Baldwin-Philippi, 2014). Though the quality of the final product can vary from game to game, it can be argued that in general digital

serious games are topped in attractivity by commercial video games, which are often created by professional development studios with large budgets. Therefore, it can be concluded that video games are more attractive than serious games. Modding in this case does not add significant value hence video games with modding are rated the same as original video games.

4.2 Configuration

From the player's point of view, digital serious games and video games offer a similar level of configuration, usually in the form of several setting options offered in the graphical user interface. However, from the creator's point of view the situation is largely different. Whereas the creators of a commercial video game will most likely not configure the game to fit a certain scenario (technically they can but have no reason to), the creators of a digital urban serious game have the full possibilities as well as a strong reason to change the game to fit a certain scenario, as solving a given scenario is often the goal of the developed game. Therefore, digital serious games are rated as providing the highest level of configurability and video games the lowest. However, when the modding process is used in a video game then the *configuration* possibilities extend beyond the possibilities of the original game.

4.3 "White box"

The term "*white box*" was chosen as an opposite to the well-known term "*black box*". The use of video games for research is often criticised for its "black box behaviour", meaning that the core code of the game is inaccessible and thus the simulation logic is unknown and can be observed only through trial (Rufat and Minassian, 2012). The term "*white box*" then indicates whether (and how much) the simulation logic of the game is known and its core code accessible. The creators of digital urban serious games are the ones that are aiming to solve a given problem with the use of the game, therefore full access to the simulation logic in this case is a given. On the other hand, the creators of a commercial video game protect the game's core code as an intellectual property. The users, who are trying to use a video game for solving a given problem, do not have access to the core code and can learn about the simulation logic only through exploration. As a result, the criterion "*white box*" was rated as a clear weakness of video games. Nevertheless, the modding environment – depending on its extensiveness which might vary from game to game – opens the "black box" at least partially, which then enables the user of the video game not only to learn about the simulation logic but also to modify it.

4.4 Reusability

Digital serious games that are developed for the purposes of urban planning are often created for a specific scenario. The game *Participatory Chinatown* was used to support the communication on the planned development of Boston's Chinatown neighbourhood (Gordong, Schirra and Hollander, 2011). The game *B3 – Design your Marketplace!* was used for a participation project of redeveloping city district Billstedt, in Hamburg, Germany (Poplin, 2014). The game *Securing Sydney's Urban Planning* was used, as the name suggests, for planning activities in Sydney, Australia (Strachan, 2013). The pervasive game *Cure for the Campus* was used to identify problematic areas of the school campus in Hasselt, Belgium (Devisch, Poplin and Sofronie, 2016). Only the game, *Community PlanIT*, from the reviewed studies has been used for various scenarios in different cities (Engagement Lab, 2019). Video games are not developed for a specific scenario but neither do they offer significant possibilities for reuse with just the out-of-the-box functionality. However, a video game with a strong modding environment could be considered as a platform that can be used for participation, visualization or data collection projects all around the World (UN Habitat, 2015; Rappler, 2016). Thus, the *reusability* of video games with modding is rated as the highest.

4.5 Reflecting reality

Any tool that is trying to model the real processes of urban planning utilises many simplifications because the reality is simply too complex to be modelled with conclusive results (Batty and Torrens, 2001). Games are no exception. As for representing the actual processes of urban planning, digital serious games are assumed to be reasonably realistic – considering the limitations of complexity of the reality – since these games are developed by the experts in this field. Video games fall short in this criterion. Nevertheless, video games are arguably stronger in representing the visual reality due to its rich graphic environments (e.g. in modelling city environments). Adding modding to the mix, video games can reflect reasonably well both the procedural and visual reality of urban processes.

4.6 Support

Since digital serious games are often developed for a specific scenario, after the scenario completion, it is only natural that the game support decreases significantly. Though some serious games are supported by established research institutions such as GeoGames Lab or Engagement Lab, the level of support is still arguably lower compared to video games. Commercial video games, if still played by large numbers of players, are well supported by the development studios. Official support from the game creators may include fixing bugs, releasing new features and maintaining game documentation. Unofficial support provided by the gaming community may include user forums, guides and training videos. Therefore, this criterion was, in the case of video games, rated high. Modding in this case does not add significant value, hence the games with this feature are rated the same as other video games.

4.7 Comparison table

The evaluation of digital serious games, video games and video games with modding is summarized in Table 1. The rating of each criterion ranges from one "plus" if game's success is low in a criterion, to 3 "pluses" if game's success in a criterion is high. A game's weakness in a criterion is represented by a "minus".

Tab. 1 Comparison of serious games, video games and video games with modding regarding their use in the field of urban planning

Criteria	Serious Games	Video games	Video games with modding
Attractivity	++	+++	+++
Configuration	+++	+	++
"White box"	+++	-	+
Reusability	+	+	++
Reflecting reality	++	+	++
Support	+	+++	+++

Conclusion

The use of games in the field of urban planning has a long tradition and is expected to continue. The first "urban" games were largely non-digital (board- or card games) that were used for simulating urban planning processes or as a learning tool for developing urban-planning-like attitudes. The later introduced term "serious games" is now used to describe games that serve a non-entertainment primary goal. In the field of urban planning these goals are mostly education, participation, visualization and simulation. One of the main reasons for establishing the term "serious games" was to distinguish these types of games from games that are solely for entertainment (Crookall, 2010). This is the case of commercial video games that have swarmed our households since the start of the era of personal computers and gaming consoles. Though video games are developed mainly for entertainment, a few titles have proved to be useful in the field of urban planning as well. In 1989, the game *SimCity* put the player in a position of an all-powerful mayor who plans

the development of a city. This game defined the city-building game genre in which later numerous titles followed (Moss, 2015). Several studies implemented *SimCity* as an educational tool in urban planning classes and reported on the effects of its use, first by Adams (1998) and the latest by Terzano and Morckel (2017). However, the use of *SimCity* for other purposes is limited due to its poor modding environment (Moss, 2015). Modding is a process of modifying the game, usually by custom scripting, that enables the user to "bend" the video game so it can be used "seriously" to solve a certain problem. Examples representing a strong modding environment include the city-building game Cities: Skylines and the immensely popular block-building game *Minecraft*. The use of these games in urban planning is presented above.

As part of this paper, a comparison of digital serious games, video games and video games with modding was conducted in six chosen criteria: *attractivity*, *configuration*, "*white box"*, *reusability*, *reflecting reality* and *support*. Digital serious games were rated with the highest score in the criteria *configuration* and "*white box*" where the access to the core code and options of modifying it is assumed (at least by the creators of the game who are often the solvers). On the other hand, the options of *reusability* and *support* of digital serious games were rated with the lowest score, as serious games are often designed to fit a certain, non-repeatable, scenario (e.g. rebuilding a city area). The *attractiveness* of digital serious games was rated as very good; in comparison, video games were rated with the highest score because they are developed by professional development studios. Support of a commercial video game is also typically excellent. The criteria *configuration*, *reusability* and *reflecting reality* in the case of video games were rated low. Often critique of video games is their "*black box*" behaviour (Rufat and Minassian, 2012), thus in the criterion "*white box*", these games were rated as having a clear weakness. From this comparison it can be concluded that the use of digital serious games should be preferred over base versions of video games. However, an extensive modding environment and a strong and active gaming community can turn a video game into an appropriate and alluring tool for solving urban planning related problems. Modding can increase the possibilities of video games in its *configuration*, *reusability* and realism. Modding can even open the "black box" and enable understanding of the game's simulation logic. Moving forward, serious games will continue to be used within the field of urban planning, especially in situations when high level of configurability and access to the core code is required. Nevertheless, the use of commercial video games is expected to grow as well, specifically for games that are equipped with an extensive modding capabilities and a strong gaming community.

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References

ABT, C. C. (1970). *Serious Games*. New York (Viking Press).

ADAMS, P. C. (1998). Teaching and learning with SimCity 2000. *Journal of Geography*, 97(2), 47-55.

ARMSTRONG, R. H. R., HOBSON, M. (1972). The Use of Games in Planning. *Long Range Planning*, 5(1), 62-66.

BAGLEY, E., SHAFFER, D. W. (2009). When people get in the way: Promoting civic thinking through epistemic gameplay. *International Journal of Gaming and Computer-Mediated Simulations*, 1(1), 36-52.

BATTY, M., TORRENS, P. M. (2001). Modelling complexity: The limits to prediction. *Cybergeo: European Journal of Geography* [online] [cit. 2019-04-05]. Dostupné na: https://journals.openedition.org/cybergeo/1035t

BBC (2017). *Video game Cities Skylines helps plan Stockholm development* [online] [cit. 2019-04-11]. Dostupné na: https://www.bbc.com/news/av/39200838/video-game-cities-skylines-helps-plan-stockholm-development

BEREITSCHAFT, B. (2016). Gods of the city? Reflecting on city building games as an early introduction to urban systems. *Journal of Geography*, 115(2), 51-60.

BORG, J. (2016). *Workshop Cities: Skylines* [online] [cit. 2019-03-15]. Dostupné na: https://www.flickr.com/photos/stockholmroyalseaport/30021969111

CROOKALL, D. (2010). Serious games, debriefing, and simulation/gaming as a discipline. *Simulation & Gaming*, 41(6), 898-920.

DALSGAARD, P. (2010). Challenges of participation in large-scale public projects. In *Proceedings of the 11th Biennial Participatory Design Conference*, 21-30.

DEVISCH, O., POPLIN, A., SOFRONIE, S. (2016). The gamification of civic participation: Two experiments in improving the skills of citizens to reflect collectively on spatial issues. *Journal of Urban Technology*, 23(2), 81-102.

DEYLE, R. E., WIEDENMAN, R. E. (2014). Collaborative planning by metropolitan planning organizations: A test of causal theory. *Journal of Planning Education and Research*, 34(3), 257-275.

DUKE, R. (1964). *Gaming Simulation in Urban Research. East Lansing*. Michigan (Michigan State University, Institute for Community Development).

DUKE, R. (2011). Origin and evolution of policy simulation: A personal journey. *Simulation & Gaming*, 42(3), 342-358.

EISELE, S., MADARI, I., DUBEY, A., KARSAI, G. (2017). Riaps: Resilient information architecture platform for decentralized smart systems. In *20th International Symposium on Real-Time Distributed Computing* (ISORC), 125-132.

ENGAGEMENT LAB (2019). *Engagement Lab: Community PlanIt* [online]. [cit. 2019-03-25]. Dostupné na: https://elab.emerson.edu/projects/community-planit

FELDT, A. G., DOTSON, A. B., MONROE, M. W., SAWICKI, D. S. (1972). *CLUG: community land use game : player's manual with selected readings*. New York, NY (The Free Press).

GABER, J. (2007). Simulating planning: SimCity as a pedagogical tool. Journal *of Planning Education and Research*, 27(2), 113-121.

GEE, J. (2003). *What Video Games Have to Teach Us About Learning and Literacy*. New York (Palgrave/Macmillan).

GOODCHILD, M. F. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal*, 69(4), 211-221.

GORDON, E., BALDWIN-PHILIPPI, J. (2014). Playful civic learning: Enabling lateral trust and reflection in game-based public participation. *International Journal of Communication*, 8, 28.

GORDON, E., SCHIRRA, S., HOLLANDER, J. (2011). Immersive planning: A conceptual model for designing public participation with new technologies. *Environment and Planning B: Planning and Design*, 38(3), 505-519.

JURASCHEK, M., HERMANN, C., THIEDE, S. (2017). Utilizing gaming technology for simulation of urban production. In *24th CIRP Conference on Life Cycle Engineering*, 469-474.

JUUL, J. (2013). *The Art of Failure: An Essay on the Pain of Playing Video Games*. Cambridge, MA (The MIT Press).

KIM, M., SHIN, J. (2016). The pedagogical benefits of SimCity in urban geography education. *Journal of Geography*, 115(2), 39-50.

KREK, A. (2005). Rational ignorance of the citizens in public participatory planning. In *10th symposium on Information-and communication technologies (ICT) in urban planning and spatial development and impacts of ICT on physical space*, 420.

LEE Jr., D. B. (1973). Requiem for large-scale models. *Journal of the American Institute of Planners*, 39(3), 163-178.

LOBO, D. G. (2005). *A city is not a toy: How SimCity Plays with Urbanism* [online] [cit. 2019-02-27]. Dostupné na: http://www.deaquellamanera.com/files/Lobo_CityToy05LSE.pdf

MCDANIEL, T. (2018). *Block by Block: The Use of the Video Game "Minecraft" as a Tool to Increase Public Participation* [online] [cit. 2019-03-01]. Dostupné na: https://digital.library.txstate.edu/handle/10877/7214

MINECRAFT EDUCATION EDITION (2019). *Building a sustainable future with the Exeter 2025 Minecraft Challenge* [online] [cit. 2019-03-18]. Dostupné na: https://education.minecraft.net/blog/building-a-sustainable-future-with-the-exeter-2025-minecraft-challenge

MINNERY, J., SEARLE, G. (2014). Toying with the city? Using the computer game SimCity™ 4 in planning education. *Planning Practice and Research*, 29(1), 41-55.

MOSS, R. (2015). *From SimCity to, Well, SimCity: The History of City-Building Games* [online] [cit. 2019-02-27]. Dostupné na: https://arstechnica.com/gaming/2015/10/from-simcity-to-well-simcity-the-history-of-city-building-games

NEBEL, S., SCHNEIDER, S., REY, G. D. (2016). Mining learning and crafting scientific experiments: A literature review on the use of Minecraft in education and research. *Journal of Educational Technology & Society*, 19(2), 355-366.

POPLIN, A. (2014). Digital serious game for urban planning: "B3—Design your Marketplace!". *Environment and Planning B: Planning and Design*, 41(3), 493-511.

PRENSKY, M. (2001). *Digital Game-Based Learning*. New York (McGraw-Hill).

RAPPLER (2016). *Finland city holds city planning contest using video game* [online] [cit. 2019-02-25]. Dostupné na: https://www.rappler.com/technology/news/123474-finland-hameenlinna-cities-skylines-planning-contest

REINART, B., POPLIN, A. (2014). Games in urban planning – a comparative study. In *Proceedings of 19th International Conference on Urban Planning, Regional Development and Information Society*, 239-248.

RUFAT, S., MINASSIAN, H. T. (2012). Video games and urban simulation: New tools or new tricks? *Cybergeo: European Journal of Geography*, 622 [online] [cit. 2019-04-06]. Dostupné na: https://journals.openedition.org/cybergeo/25561

SALEN, E., ZIMMERMAN, E. (2003). *Rules of Play. Game Design Fundamentals*. Cambridge, MA (MIT Press).

SCHOLTEN, H., FRUIJTIER, S., DIAS, E. et al. (2017). Geocraft as a means to support the development of smart cities, getting the people of the place involved - youth included -. *Quality Innovation Prosperity*, 21(1), 119-150.

STARR, P. (1994). Seductions of Sim: Policy as a simulation game. *American Prospect*, 17, 19-29.

STRACHAN, F. (2013). *Securing Sydney's CBD* [online] [cit. 2019-04-04]. Dostupné na: http://newsroom.unsw.edu.au/news/design/securing-sydneys-cbd

TERZANO, K., MORCKEL, V. (2017). SimCity in the Community Planning Classroom: Effects on Student Knowledge, Interests, and Perceptions of the Discipline of Planning. *Journal of Planning Education and Research*, 37(1), 95-105.

TÓTH, E. (2014). Potential of Games in the Field of Urban Planning. In *Proceedings of the Central and Eastern European Game Studies*, 71-91.

UN HABITAT (2015). *Using Minecraft for community participation* [online] [cit. 2019-04-01]. Dostupné na: https://unhabitat.org/books/manual-using-minecraft-for-community-participation/

UN (2018). *2018 Revision of World Urbanization Prospects* [online] [cit. 2019-04-01]. Dostupné na: https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html

WoS (2019). *Web of Science* [online] [cit. 2019-04-01]. Dostupné na: https://www.webofknowledge.com/

R e s u m é

Současné trendy využívání vážných her a videoher v oboru urbánního plánování

Článek diskutuje současné trendy využívání her pro účely urbánního plánování. Hry jsou využívány již po desetiletí, a to převážně pro simulace, vzdělávání a participační projekty. Hry, které byly vyvinuty speciálně za účelem vyřešení daného problému jsou označovány jako tzv. vážné hry. V současnosti jsou využívány převážně digitální vážné hry, které implementují atraktivní moderní informační technologie. Komerční videohry jsou vyvíjeny hlavně pro zábavu, přesto pár herních titulů jako SimCity, Minecraft nebo Cities: Skylines také našlo uplatnění pro účely urbánního plánování. Jeden z hlavních důvodů, díky němuž je možné videohry použít „seriózně", je možnost hru upravit pomocí tzv. moddingu, což je proces implementace uživatelských skriptů do originální verze hry. Díky moddingu je možné překonat mnohá omezení, které využití videoher pro praktické účely skýtá. Srovnání v tabulce 1 ukazuje, že videohry, pokud jsou vybaveny rozsáhlým modding prostředím, můžou konkurovat více tradičnímu využití vážných her pro účely urbánního plánování.

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