Beyond Entertainment:
Academic Approaches to Gamedev Industry
ISBN 978-83-969444-4-3, AVANT Anthologies

Design and Mechanical Challenges of Adapting the Tower Defense Genre Into 3d—A Case Study of the "Orcs Must Die!" Video Game Franchise

Hubert Tokar
DSW University of Lower Silesia, Wrocław, Poland
hubert.tokar@dsw.edu.pl

Received 2025-07-14; accepted 2025-12-18; published Online First 2025-12-30.

Abstract

Orcs Must Die! (Robot Entertainment, 2011–2025) Franchise presents interesting solutions to design challenges in combining the Tower Defense game genre, which traditionally uses a top-down perspective and long and short-term management of resources and defenses, with a 3rd person control scheme and a focus on individual interactions with enemies. This paper outlines mechanics and design principles core to the Tower Defense genre, and examines their modified and unaltered forms that exist in the *Orcs Must Die!* Games. These mechanics will be then compared to other similar games, as well as more traditional Tower Defense games. Critical examination of these design decisions is crucial in empowering game developers with useful insides into mixing genres, especially when making similar games.

Keywords: Tower Defense game, game design, video game mechanics, Robot Entertainment, Orcs Must Die!

1. Introduction

Within genres in video games, gamers learn to expect certain gameplay elements and conventions (Vahlo, J., 2018). These expectations inform choices made in the production of new titles, for which increasingly specialised audiences of gamers and academics tend to reach and discuss (Santos et al., 2019; Howell, 2016), especially when the similarity to other titles in that genre is often

explicitly advertised. The apetite for an increasingly novel or mechanicaly complex experience then drives developers to make use of elements outside of known conventions, paving the way towards new genres (Clearwater, 2011; Alexander et al., 2013), pushing the evolution of the established (Apperley, Thomas, 2006) or further categorizing genres emergent from such study (Arsenault, 2009), then looping all the way back to expectation formation (Clarke et al., 2015). With that recursive relation, it is no wonder that video game genre evolution is widely recognised (Arsenault, 2009). The concept of genre itself often lacks a clear definition or constraints (Arsenault, 2009; Clarke et al, 2015; Aarseth, 2004), so many authors propose arguments for its restructuring, either according to games' aesthetics, psychological effects, the ways they are controlled (Doherty et al., 2018), or proposing faci and facets based approaches (Lee et al., 2014). Having acknowledged that complexity, for the purpose of this article and in regards to the *Tower Defense* genre, specific gameplay elements outlined in articles (Asfarian et. al., 2019; Avery et. al., 2011; Leong et. al., 2013) and by video game related outlets (MobyGames, Steam) will be chosen as demonstrative. These gameplay elements include the defense of a territory or possesions from enemies, which usually come in waves, and construction of obstructions along the path of attack to impede their approach (Asfarian et. al., 2019; Avery et. al., 2011; Leong et. al., 2013). Most of these games use some form of a top-down 2D perspective—out of 742 games listed by video game database MobyGames in June 2025, more than 678 use it (adding Fixed Screen, Diagonal-Down, Top-Down, Side-view and 2D-Scrolling tags together in the Tower Defense genre search on MobyGames and subtracting titles tagged by two or more of these to exclude doubles from the final result). The subject of this article, however, uses a third-person perspective with third-person shooter mechanics. The purpose of this article is to investigate the gameplay implications of this choice, which introduces several design challenges in conveyance of gameplay elements, such as the need to relay state-of-the-game information to the player through means other than the user interface, as the focus of players is captured by a demanding moment-to-moment gameplay (Hernández-Sabaté et al., 2015). Comparisons to other games will be drawn, which is an established norm in writing on video games. As Clarke (2015) puts it, "the present utility of using games as their own symbolic language [...] eclipses even advanced genre labels because each token game name is often representative of several hours of firsthand experience" (p. 11).

2. Literature Overview

Tower defense is a sub-genre of strategy games that, according to video game database MobyGames, includes 742 titles as of writing of this article. According to Asfarian, "the tower defense genre is characterized by (1) the player build defensive towers to obstruct the enemies (or creeps) from reaching the player's base, (2) the enemies come in waves with increased difficulties, (3) by defeating

the enemies, the player will get resources corresponding to the difficulty of the enemy, that can be used to upgrade their towers, and (4) the tower can be bought, placed in the map, upgraded, and fire automatically on the enemy forces" (2019, p. 249). These characteristics are also outlined by Avery et al. (2011) and Leong et al. (2013), which both influenced Asfarian's characteristics. Tower Defense games seem to also be created for reasons outside of just providing entertainment—there are documented examples of bespoke titles created for the purpose of spreading health literacy during a pandemic (Sun et al., 2024) and as research tools for medical research (Brich et al., 2017), both of which focused mainly on the narrative aspects of a game in the context of serious games discussions and medical research respectively. Hernández-Sabaté et al. analyzes the utility of tower defense games in teaching mathematics (Hernández-Sabaté et al., 2015), while Liu et al. focus on technological application of specific game engine features in creating such games (Liu, et. al., 2019). These examples provide useful insights into design decisions made with information conveyance through gameplay or narrative in mind, especially when they seem to influence not just the human perception and experience, but also affect reinforcement learning research for artificial intelligence, specifficaly models trained to beat Tower Defense games (Bergdahl, et. al., 2024). This article is focused on the adaptation of specific gameplay elements necessitated by the change in player's perspective and navigation. Analysis of gameplay elements is informed by Schell's game design lenses (Schell, 2008), which outline numerous perspectives for game design process, and Ibrahim's exploration of state-of-play information conveyance in 3D games (Ibrahim et al., 2023), which focuses on level design features in competitive games. Framework of ludic knowledge put forward by Howell (2016) will be referenced, as the idea of "adapting" certain gameplay elements, which players and designers might be aware of through other games, overlaps heavily with the concept of transludic knowledge, which Howell defines as "knowledge relating to multiple other games that an individual may have played in the past" (p. 1).

3. Methodology

The ways in which gameplay elements are altered in the *Orcs Must Die!* (2011–2025) games will be analysed in comparison to how they appear in other games in the tower defense sub-genre. These games include *Sanctum* (2011), *Sanctum 2* (2013) *Bloons Tower Defense 6* (2018), *Infinitode 2* (2019), *Diplomacy is Not an Option* (2022), *Thronefall* (2023), *Emberward* (Steam Early Access, 2024). The *Orcs Must Die!* games will be considered as a whole, as most gameplay elements discussed appear in all titles unless specified otherwise. A "baseline" of how certain gameplay elements appear will be established by comparing them to similar elements in other titles in the sub-genre (Goddard and Muscat, 2017), while their adapted versions are considered with the alteration to the player camera perspective in mind. As established before, the 3D perspective that

these titles use is not the norm in the genre. This choice introduces many interesting design obstacles which the *Orcs Must Die!* Series, in my opinion, solves in a manner that warrants interrogation, so that the games' boldests decisions won't go unnoticed. Much weight will be placed on the Tower Defense genre conventions when considering gameplay elements in the series, which, I hope, will not be interpreted as a sugestion that the creative decisions were ready-made from the start as a mere byproduct of its genre constraints. The concept of the genre is used only as a taxonomical tool for discussion about players' pre-play expectations and post-play reflections (Howell et al., 2014), as well as a frame of reference for how the "baseline" gameplay element can be conjured in the first place.

4. Complexity in Strategy Games

A two-dimensional top-down view of the play area in strategy games grants the player easy access to information about the current state of the game (Donaldson, 2017). It allows the player to plan and execute strategies, and then constantly monitor the effectiveness of their approach (Donaldson, 2017). Games like those in the *Bloons Tower Defense* franchise, as well as *Emberward* and *Plants vs. Zombies* go so far as to fit the entirety of the game area on a single screen. Additionally, the player does not directly control a player character—their focus is directed exclusively on the placement of obstacles and managing in-game economy (Hernández-Sabaté et al., 2015; Alexander et al., 2013; Tekinbas and Zimmerman, 2003), which is usually assisted by the user interface containing relevant information on the current state of the game, such as the amount of money accumulated, remaining lives or what obstacles the player can create. These obstacles, usually referred to as *towers*, either directly damage the enemy, or restrict enemy movement. Some obstacles can be placed directly on the way of attackers, restricting their movement and facilitating the creation of long mazes, which the enemies navigate with added difficulty (Bergdahl, et. al., 2024). For example, in *Emberward*, the player is given access to building blocks, which, when placed on the path of the enemy, extend the way towards the player's base, affording more time for the towers to stop them.

On the other hand, *Thronefall* and *Mindustry* do have a player character on which the top-down camera is always focused, and in both of these titles the player character may be killed by approaching enemies, which adds moment-to-moment challenge to the purely strategy oriented gameplay. The King in *Thronefall* is frail by default, but capable of drawing aggresion, which enables a skillfull player to underinvest in their defenses by manipulating the pursuants into fruitless chases as they are gradually worn down by towers or friendly units.

Some games allow for additional ways of generating income for the in-game economy, such as Banana Farms in *Bloons Tower Defense* series, the Bounty Modifier in *Infinitode 2*, or windmills, goldmines and houses in *Thronefall*. These options do not stop the enemies from reaching the base, but conditionally generate wealth used to further enhance defences, making them a good, but risky investment, as the defenses are immediately underfunded. Using these methods might prove necessaryt, as usually costs of upgrading defences scale exponentially, which increases the feeling of skill progression (Tekinbas and Zimmerman, 2003). Usually, investing in these upgrades is crucial for survival, but involves taking additional risk, when saving up money requires defenses to be weakened in the short term. The cost of upgrading a tower in Infinitode 2 ranges from 20 coins for the first upgrade on a basic tower up to 1770 for the last. Such challenges require complex strategising, and create room for expert players to express their skills (Donaldson, 2017).

5. Third-Person Perspective and Conveyance

All of the gameplay elements intoduced above are built on the assumption that the player understands the state-of-the-play at any moment on the entire play area. The changed perspective from a top-down view to a third-person perspective in *Orcs Must Die!* introduces challenges in this regard. The player is no longer able to focus their attention purely on managing resources and defences comfortably from a bird's eye view—they get up and personal with the enemy while having to consistently aim, shoot and navigate the three-dimensional map. This change in player's perspective and player navigation require certain gameplay element changes to be implemented, as shooting and navigating in the third-person control scheme pulls more players' attention (Hernández-Sabaté et al., 2015). These kinds of alterations will be referred to as adaptations. It is a concept closely related to evolution (Apperley, Howard, 2006; Arsenault, 2009; Clearwater, 2011), but refers to when the implied motivation behind a change to one system is caused or forced by changes to another, such as, in this case, a change in perspective necessites either implementing additional ways of informing the player about the state of the map, or diminishing the importance of having that information.

One such change was made to better accomodate player built obstacles. Towers are replaced by traps, which can be placed on the floors, walls and ceilings in a grid. These traps spring to action as enemies walk into their range, which improves the conveyance of their effectiveness, as the player will often already be looking at them as they are activated. The changes made to a traditional upgrade system also happen to work great with the 3D perspective. All trap upgrades are only a part of meta progression, which is to say that advances happen outside the scope of level playthroughs, and apply to all subsequent sessions (Donaldson, 2017; Tekinbas and Zimmerman, 2003; Vahlo, J., 2018).

They are purchased with currency earned after each level, which removes the need to constantly evaluate the cost effectiveness of any particular upgrade. Since the traps do not upgrade during a playthrough, the effectiveness of players' defenses scales laterally instead; relying on a single, yet powerful trap is not possible, so they become a part of sets of traps, to which the game refers to as *killboxes*. Utilizing walls and low celings, powerful killboxes can be created, and their composition leaves space for player's expression of skill, as they can be arranged freely (Vahlo, J., 2018), which better visualise the deadly potential of the killboxes, which start to look more visually intimidating than a single fully upgraded tower might. To better facilitate the creation of such killboxes, the player might benefit from making use of additional ways of generating income, which, while sparse throughout the series, still include some interesting design choices in how they are implemented. *Orcs Must Die! 1*, *2* and *Unchained* include a Coinforge—a trap that takes up a 3x3 square of floor space and generates additional coins whenever enemies die on it. It does not hurt the orcs in any way and takes up valuable space, but in return reward skillful play by doubling the reward for anything killed there. *Orcs Must Die!: Unchained* also included a Power Generator, which is a wall trap that generates a limited amount of coins whenever enemies walk past it, and *Orcs Must Die! 2* has the Scavenger trinket, which causes all enemies to randomly drop coins upon dying. All of these methods take physical space in player's view, which helps them feel more impactful upon interaction.

Another way of passing information to the player is through audio. Conveyance through sound cues is present for whenever enemies cross specific checkpoints on the map—an event, which would otherwise be easy to miss. Certain types of enemies, such as flying enemies, hunters and sappers, emit characteristic sound cues whenever they enter the map or are slain. Directional sound is used throughout the series, which improves the player's awareness of the current state of currently fought enemy wave (Holloway et al., 2011; Ng and Nesbitt, 2013). Orcs also chatter amongs themselves, and as they make it past the player, that chatter will be increasilngly heard from the back. As the enemies reach their goal (the rift), a loud alarm sound is played and the number of remaining health points (rift points) positioned on top of the screen expands briefly to pull the player's attention (Ibrahim et al., 2023). That attention to sound design aids player's awareness greatly which vastly improves the game feel and the feeling of being in control of what's happening.

6. Map Design and Player Awareness

All playable levels in the *Orcs Must Die!* series are laid out on a grid, onto which traps are placed. These levels include geometry optimal for staging defenses, where the best spots have low hanging ceilings, walls on two sides and an un-

obstructed floor. In these spots, bottlenecks for enemy movement can be created easily and affordably. Player can place barricades, which make a spot on the map impassable to enemies and can be used for creating winding paths, as well as cutting off certain passages entirely. When placed strategically, barricades can increase value of other traps placed nearby—since multiple enemies can be struck by a single activation of a trap, forcing them to walk in a line allows for better utilisation of them, as more will be affected with each activation. This aspect of the design of traps is often seen in other Tower Defense games. In *Bloons Tower Defense 6* each tower (monkey) throws projectiles at enemies (bloons). A thrown projectile will not necessarily expire after popping a single bloon—it may also potentialy strike targets behind, if such projectile has enough pierce, which make areas of the map with long straight paths especially valuable for tower placement. Here though, instead of creating spots especially valuable for a single trap, this gameplay element is adapted to include an entire set of them into concideration.

Map turns and corners represent highly valuable spots, as they require very few barricades to force enemies into a single file march. These turns are often sorrounded by walls, on which wall traps can be placed. Such map utilisation is not uncomon in other games. In *Diplomacy is not an option*, mountain ranges and resource piles are strategically placed on a map, such that staging defense around them becomes more efficient. Mountains cannot be destroyed or passed by units, so building walls around them serves triple purpose, as less walls need to be built, manned, and maintained. The prohibitively high cost of barricades in *Orcs Must Die!* encourages the player to find spots on the map with pre-existing geometry to connect to. Stage hazards are also present, which pose danger both to the player character, as well as to enemies thrown into them. These hazards include bottomless pits, bodies of water and comically large meat grinders, all of which can be used to dispatch enemies, which encourages staging defences around them.

Many levels include multiple entry points and exits, which need to be managed at the same time. This gameplay element is especially challenging, as it requires a level of multitasking and map awareness as well as skillfull moment-to-moment interactions, which introduces similar challenges to many MOBA (Multiplayer Online Battle Arena) games, as they often also make use of this combined complexity in design (Donaldson, 2017). If a wave of enemies is not dispatched swiftly at one entry, the player will not be able to run to the second one in time. This challenge can be circumvented in multiple ways—either by overinvesting in the defenses near one exit and managing the defense of the other with the player character, or by routing enemies through a single area, which is not always possible. Such routing dilema can also be seen in *Tower Dominion*, in which player builds out the map themselves by placing randomly assigned routes, turns and splits further out of their base. Through clever utilisation of these routes (and a bit of luck), a single bottleneck can be created and more

easily defended. Creating such bottlenecks for the enemies creates a multiplicative advantage to players' defences and mitigates strategical challenge in managing multiple pathways at once.

7. Different Hammers, Different Nails

Different kinds of enemies necessitate diverse approaches, which in turn justify a wide arsenal of options available to the player. Both are intertwined, thus will be discussed in pairs, starting with the "regular" enemies—plain looking, following simple patterns and usually not difficult to dispatch. The core enjoyment found in *Orcs Must Die!* series is found in setting up combinations and exploding orcs mid-air. The most often recipients of such treatments are the light, medium and heavy orcs, which differ only by the amount of damage that is needed to take them down. As most enemies, they walk towards the rifts in the shortest path possible, and will only attempt to destroy barricades if all paths are blocked. They are also especially vulnerable to physics traps, which knock enemies up, back or all around. This makes them a solid stalling option and opening the floor to synergies with other types of traps, most notably physical, which consist of saws, spikes, arrows, maces, crushers and other straighforwardly painful instruments that deal massively increased damage to airborne enemies. Defences are best utilised while working together and supporting each other. A catapult in *Dyplomacy is not an option* can decimate whole packs of enemies with ease, especially when they are held in place, engaged in combat with knights and cavalry. A tack shooter in *Bloons Tower Defense 6* sprays nails in all directions, making short work of crowds of bloons, but becomes especially lethal when placed close to an alchemist, who can increase the damage of each individual nail. These synergies create multiplicative advantages that expert players can take advantage of. A similar interaction can be seen with freezing traps, as frozen enemies will also take massively increased damage from physical traps. Freezing is especially dangerous towards flying enemies, which are a part of all entries in *Orcs Must Die!* series since the second one. As their type name suggests, they fly above most floor and wall traps and cannot be stopped by barricades, but when frozen, will fall to the ground and shatter instantly. Acid damage, similarly to freezing, multiplies damage done by other physical sources, as well as apply damage over time.

Heavy enemies include ogres and trolls. With increased health pools and invulnerability to being thrown by most physics traps, most of the player's attention will be turned towards them. *Orcs Must Die! 3* and *Unchained* include arcane traps, which are especially effective against massive health pools, as multiple instances of arcane damage deal multiplicatively more damage. Ogres in *Thronefall* fill a similiar role—bulky, heavy hitting, somewhat easy to outsmart, but still take a lot of time and attention. Armored trolls and ogres in *Orcs Must Die!* are even more dangerous, as their health pools can get ridiculous. Arcane

damage is still effective against them, although the game encourages players to use electric traps, which ignore enemies' armored perks and cause them to explode, dealing damage to all around. Fast enemies, which include cobolds, are killed easily, but often run fast enough that they can outrun timers on some traps, leaving their area of damage before they spring to action. Fire is especially effective against them, as most fire traps fire continuously and apply a damage over time effect, making them most effective when placed near the entry.

Such synergies, I would argue, are the most important gameplay element of Tower Defense games. They facilitate the most space for players' skill expression out of all included elements, but also encourage moments of brilliance and discovery among casual playerbase, who might discover these interactions unexpectedly during regular gameplay (Vahlo, J., 2018). Countering designs, where certain enemy types are especially susceptible to specific types of defenses, have always been a staple of the genre, and the visual distinctiveness, as well as the use of verbal callouts by the announcer for certain types, make up for players limited perspective and succesfully adapt this aspect into the 3D control scheme of the series.

8. Discussion

In this article several gameplay elements were isolated and discussed in comparison to their counterparts in other games of the same sub-genre for the purpose of identyfing changes in their design necessitated by the change in player's perspective through multiple game studies lenses. Adaptations of many gameplay elements characteristic of the tower defense sub-genre, such as towers/traps, enemy variety, enemy routing and manipulating enemy aggression have been isolated and analysed. While using other games and genre conventions themselves as lenses of analysis is an established way of structuring a discussion, it is, arguably, affording undue credit to influences that game designers might not have even been aware of. To that point, the intention of this article is not to presume causality or inevitability of certain game design decisions, only to view them as solid answers to questions emergent from other design decisions. Another limitation of the perspective taken in this article is the presumption of causality with certain gameplay decisions. Such causality cannot be proven, unless with a written confession by the game designer, but it is also not necessary.

9. Conclusion

The perspective outlined in this article is a useful tool for experimentation with established genre conventions for future games, as well as a viable perspective through which genre evolution could be viewed in game design discourse. The

argument goes that viewing certain gameplay elements as adapted to other elements in the title in question allows a critical examination of these changes, which might provide useful observations for broader analysis of both the gameplay element itself, or the design structured around it. As a follow up to this article, analogous discussions on other genre-defying gameplay elements could follow, using the outlined methodology.

References

Aarseth, E. (2004). Genre Trouble. *Electronic Book Review.* Retrieved at https://electronicbookreview.com/publications/genre-trouble/, 01.06.2025

Alexander, J. T., Sear, J., Oikonomou, A. (2013). An investigation of the effects of game difficulty on player enjoyment. *Entertainment Computing* 4, 53-62. Retrieved at https://www.sciencedirect.com/science/article/abs/pii/S1875952112000134, 29.05.2025

Apperley, D., Thomas H. (2006). Genre and Game Studies: Toward a Critical Approach to Video Game Genres. *Simulation & Gaming* 37 (1): 6–23.

Arsenault, D. (2009). Video Game Genre, Evolution and Innovation. *Eludamos. Journal for Computer Game Culture* 3, 2. p. 149-176. Retrieved at https://www.researchgate.net/publication/288970477_Video_Game_Genre_Evolution_and_Innovation, 01.06.2025

Asfarian, A., Ramadhan, W., Putra, W. A., Raharjanto, G. M., Frisky, R. (2019). Creating a circular tower defense game: development and game experience measurement of orbital defense X. *Kinetik: Game Technology, Information System, Computer Network, Computing, Electronics, and Control* 4, 3, p. 249—258. Retrieved at https://www.researchgate.net/publication/334780971_Creating_a_Circular_Tower_Defense_Game_Development_and_Game_Experience_Measurement_of_Orbital_Defense_X, 31.05.2025

Bergdahl, J., Sestini, A., Gisslén, L. (2024). Reinforcement Learning for High-Level Strategic Control in Tower Defense Games, *2024 IEEE Conference on Games (CoG)*, Milan, Italy, 2024, pp. 1-8, doi: 10.1109/CoG60054.2024.10645621. Retrieved at https://ieeexplore.ieee.org/abstract/document/10645621, 26.05.2025

Brich, J., Rogers, K., Frommel, J., Weidhaas, M., Brückner, A., Mirabile, S., Dorn, T., Riemer, V., Schrader, C., Weber, M. (2017). LiverDefense: how to employ a tower defense game as a customisable research tool. *The Visual Computer* 33, p. 429–442. https://doi.org/10.1007/s00371-016-1314-0. Retrieved at: https://link.springer.com/article/10.1007/s00371-016-1314-0#citeas, 01.06.2025

Clarke, R. I., Lee, J. H., Clark, N. (2015). Why Video Game Genres Fail: A Classificatory Analysis. Games and Culture 1, 21. Retrieved at https://journals.sagepub.com/doi/abs/10.1177/1555412015591900, 02.06.2025

Clearwater, D. (2011). What Defines Video Game Genre? Thinking about Genre Study after the Great Divide. *Loading...* 5, 8. p. 29—49. Retrieved at https://journals.sfu.ca/loading/index.php/loading/article/view/67, 02.06.2025

Doherty, S. M., Keebler, J. J., Davidson, S. S., Palmer, E. M., Frederick, C. M. (2018). Recategorization of Video Game Genres. *Proceedings of the Human Factors and Ergonomics Society 2018 Annual Meeting* 62, 1. p. 2099—2103. Retrieved at https://journals.sagepub.com/doi/10.1177/1541931218621473, 27.05.2025

Donaldson, S. (2017). Mechanics and Metagame: Exploring Binary Expertise in League of Legends. Games and Culture 12, 5. p. 426—444. Retrieved at https://journals.sagepub.com/doi/abs/10.1177/1555412015590063, 26.05.2025

Goddard, W., Muscat, A. (2017). Towards Genre as a Game Design Research Approach. *Proceedings of Digital Games Research Association 2017 Conference*. Retrieved at https://dl.digra.org/index.php/dl/article/view/924 , 01.06.2025

Hernández-Sabaté, A., Joanpere, M., Gorgorió, N., Albarracín, L. (2015). Mathematics learning opportunities when playing a Tower Defense Game. *International Journal of Serious Games* 2, 4. p. 57—71. Retrieved at https://www.researchgate.net/publication/286913995_Mathematics_learning_opportunities_when_playing_a_Tower_Defense_Game , 24.05.2025

Holloway, A., DeArmond, R., Francoeur, M., Seagal, D., Zuill, A., Kurniawan, S. (2011). Visualising Audio in a First-Person Shooter With Directional Sound Display. Retrieved at https://www.researchgate.net/publication/228754584_Visualizing_Audio_in_a_First-Person_Shooter_With_Directional_Sound_Display, 02.06.2025

Howell, P., Stevens, B., & Eyles, M. (2014). Disrupting the Player's Schematised Knowledge of Game Components. *DiGRA 2014 Conference: <Verb that ends in 'ing'> the <noun> of Game <plural noun>.*

Howell, P. (2016). A Theoretical Framework of Ludic Knowledge: A Case Study in Disruption and Cognitive Engagement. *The Philosophy of Computer Games Conference*.

Ibrahim, A., Novela, A. X. A. (2023). Information Conveyance: An Examination of Using Level Design to Communicating the State of Play in a Competitive Video Game. *Blekinge Tekniska Högskola, Department of technology and aesthetics.* Retrieved at https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1777675&dswid=9888, 26.05.2025

Lee, J. H., Karlova, N., Clarke, R. I., Thornton, K., Perti, A. (2014). Facet Analysis of Video Game Genres. *iConference 2014 Proceedings*. Retrieved at https://www.researchgate.net/publication/266629200_Facet_Analysis_of_Video_Game_Genres, 26.05.2025

Liu, S., Chaoran, L., Yue, L., Heng, Ma., Xiao, H., Yiming, S., Licong, W., Ze, C., Xianghao, G., Hengtong, L., Yu, D., Qinting, T. (2019). Automatic generation of tower defense levels using PCG. *Foundations of Digital Games '19: The Fourteenth International Conference on the Foundations of Digital Games*, No.: 10, p. 1—9, https://doi.org/10.1145/3337722.3337723. Retrieved from: https://dl.acm-.org/doi/abs/10.1145/3337722.3337723, 01.06.2025

Ng, P., Nesbitt, K. (2013). Informative sound design in video games. *IE '13: Proceedings of The 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death* 9, p. 1-9. Retrieved at https://dl.acm.org/doi/abs/10.1145/2513-002.2513015, 28.05.2025

Santos, T., Lemmerich, F., Strohmaier, M., Helic, D. (2019). What's in a Review: Discrepancies Between Expert and Amateur Reviews of Video Games on Metacritic. *Proceedings of the ACM on Human-Computer Interaction* 3, 140. Retrieved at https://dl.acm.org/doi/10.1145/3359242, 02.06.2025

Sun, X., Li, T., Miao, K., Zhang, M., Ren, X. (2025). InfecBlock: Investigating the Effects of a Tower-Defense Serious Game for Increasing Epidemic-Related Health Literacy. *International Journal of Human-Computer Interaction* 41, 10. Retrieved at https://www.tandfonline.com/doi/full/10.1080/10447318.2024.2375694, 02.06.-2025

Schell, J. (2008). The Art of Game Design: A Book of Lenses. Morgan Kaufmann Publishers.

Tekinbas, K. S., Zimmerman, E. (2003). Rules of Play: Game Design Fundamentals, The MIT Press, 2004.

Vahlo, J. (2018). In Gameplay—The Invariant Structures and Varieties of the Video Game Gameplay Experience. *University of Turku Faculty of Humanities.* Retrieved from: https://www.researchgate.net/publication/324390859_In_Gameplay_The_Invariant_Structures_and_Varieties_of_the_Video_Game_Gameplay_Experience, 01.06.2025.

Hubert Tokar is a 3D Animator born in Krotoszyn on the 3rd of November 1999. He finished Creative Media studies at the University of Lower Silesia DSW in 2023, where he teaches subjects related to 3D graphics, animation and rendering. His hobbies include running, swimming and biking, as well as media analysis, gaming and collecting pretty books.