GAMES FOR URBAN DESIGN-COMPARATIVE STUDY

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Abstract

The primary emphasis of our article is on the integration of professional video games and internet gaming within the field of urban planning. From the beginning, we establish clear definitions for games and serious entertainment and discuss the potential of these specific forms of games. We offer an overview of online urban planning games, along with gaming examples that encompass various topics and storylines. In order to guarantee the precision of environmental measurements, a standardised operating process is established, uncertainty is evaluated, and quality assurance methods are implemented. The main aim of the paper is to explore the potential of serious games in facilitating public engagement in the planning process. We provide a concise summary of the selected games that are now available for purchase. We opt to classify the accessible games according to their variety, distinguishing between traditional, digital, and non-digital gaming. The assortment of analog/conventional games comprises the subsequent titles: Masterplan, Neue Heimat, Pop-up Pest, Stadtspieler, Broken Cities, CLUG, and Ginkgo Polis; a few of these products have gained considerable recognition, while others are more recent innovations. The computer games that we considered are: Plasticity, Securing Sydney's Planning and Development, SimCity, Anno, City One, Civilization, Community Plant, Green Sight City, and Minecraft/Block by Block. Some of the widely available games included Pac Manhattan, REXplorer, and Mogi. We evaluated them based on predetermined criteria, which encompassed knowledge transfer, learning effect, realistic visualisation, involvement, and engagement. One benefit was the realisation that certain games are used to incorporate students or participants into the urban planning process. An noteworthy observation is that although many games dealt with urban planning subjects, only a small number of them actively included players in real urban planning activities. As we conclude our research, we provide a thorough evaluation of the study's results and suggest areas for future investigation about the relationship between video games and urban planning.

Keywords: Online Games, Public Participatory, Urban Planning, Planning Processes, Developed Games, Market, Environmental Measurements, Game Stories, Comparative Study.

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I. INTRODUCTION

Urban planning and urban design has recently seen the emergence of a new field focused on the development and utilisation of games for teaching and pedagogical research. Engaging in gaming activities can serve as an enjoyable method to demonstrate both conceptual and intricate strategies for organising and preparing. Within the context of a game, participants have the ability to assume multiple identities and conform to the specific requirements and rules of the game [1, 3]. Residential property investors and environmental activists, due to their different roles in urban development, may come to conflicting views [3]. Research on the application of games in urban planning investigates the methods of utilising games to actively involve individuals and educate them in an enjoyable manner about the procedures associated with urban planning [1, 2]. An apparent advantage of games is that they enable players to make decisions inside a simulated, game-based environment [2]. Von Borries asserts that the realisation of spaces takes on a different form when engaging in activities within metropolitan zones. Simulation is not just at the forefront, but the actor's involvement and enthusiasm are also emphasised, resulting in an examination of the city as a gaming object. Furthermore, since games are primarily about having fun, they are frequently criticised. These are among the most often played games that serve only as entertainment. Moreover, serious computer games exist [3], which feature serious elements in addition to enjoyment. Clark C. was among the first specialists [2, 3]. Serious games are defined by Anderson as "those which achieve an explicit, cautiously educational function and whose major feature is not just enjoyment." That's not to suggest that games can't be amusing; in fact, they can be a fun way to convey knowledge [3, 4]. [4,5]. This brings up a crucial query: Are there any games that can provide enjoyment to individuals while also encouraging their participation in practical planning procedures and providing meaningful way of learning about the design process? Our research is driven by this question [5].

The study of online games, particularly serious ones, is a relatively new area of study in regional and urban development. For many years, the gaming industry has prioritised play and enjoyment, creating games that fulfilled these objectives. Urban planning was one of the game creators' primary themes in a number of instances [5, 6]. SimCity is among the most well-known instances of a game of this type [7]. When this game was originally released in 1989, [6], it became popular right away. In addition to being a commercial success, it also garnered numerous accolades, involving Best PC Game, Best Entertainment-, Educational-, and

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Simulations Programme, Best Consumer Programme from the Software Publishers Association, and Most Novel Publisher from the Computer Game Developer's Meeting, to name a few. The captivating game narrative, which featured potential perils and calamities like flames, volcanoes, earthquakes, etc., drew in a lot of gamers [6].

A distinct objective is pursued by serious games, which are made for purposes other than amusement and play [7]. Serious games have grown in popularity within the gaming industry in recent years. Researchers and technologists explore an array of potential applications in the fields of organisation administration, education, healthcare, and the armed forces [7, 8]. The study of game-based learning for educational purposes has grown to be a demanding field [8]. The creation of serious online games related to urban planning is only getting started. As a result, the body of work in this topic is quite small [8]. We would like to learn more in-depth information regarding the potential applications of serious games in urban planning [9]. We focus on the idea of serious online gaming in our research [8, 9].

Our first step towards a more comprehensive research programme is this publication [8, 10]. It is a summary of the challenging games and games with urban planning integrated into the game plot [10]. In this section, we define a few terms related to games and serious games, as well as talk about their potential [11, 12]. Examples of computer-based games for urban planning are shown [12, 13]. We examine the potential seriousness of a game in the planning of cities at the end of the article and we offer some possible avenues for future research.

Definitions for Games

It would be impossible to include every definition of a game in this article due to their abundance. Those that are pertinent to our study were chosen [13]. Draws a crucial line between the official and informal games. He claims that unstructured play is the essence of an informal game [13]. A formal play is divided into two sections: ends and means. Finals stand for the struggle to accomplish a goal [13, 14]. A set of agreed-upon tools and procedural guidelines that can result in a successful outcome is called a means. In its most basic form, a game is a process in which two or more autonomous decision-makers attempt to accomplish their goals within a given constraining framework [14]. According to a more traditional definition, a game is an adversarial situation in which rules are followed while attempting to achieve outcomes [15].

1.1 Serious game

Games that are intended for more purposes than just entertainment are referred to as serious games. "Serious games are produced when simulation and gaming technologies are applied to non-entertainment domains." In addition, he describes serious games as "a mental match, played with an electronic device complying with specific guidelines that uses games to further government or company instruction, health, education, policy development, and strategic outreach objectives" [15]. In contrast to computer games, serious games have components other than plot, designs, and gaming [15, 16]. When pedagogy—or instructive or academic activities—is included, games take on a serious tone. In order to promote civic engagement, connectedness, active participation, and leisure activities among people living in urban areas, serious games can be used in urban planning. There are various gamification techniques that are applicable to urban planning. Urban gamification may create hubs for enjoyable engagement, which can change how people perceive their time in the city. Using techniques like point systems, tournaments, and set rules to encourage participation is one strategy to encourage interaction between people and their physical environment [10]. The term "urban gamification" describes the use of game mechanics and components in urban settings to encourage and engage people in a variety of activities. It entails bringing aspects like rivalry, incentives, and challenges into actual environments to improve user experiences and promote engagement.

The implementation of gamification in the context of urban planning has the potential to enhance the processes of motivation, exploration, and interaction [9]. By enabling people to comment, review, and offer input on projects, gamification can be used in urban planning to promote community involvement and raise community engagement.

Gamification is a useful tool for teaching community engagement and collaborative urban design. In order to effectively design public spaces in urban regions, this curriculum focuses on teaching and facilitating contact among architecture students, specifically those focusing on urbanisation. Gamification can be used in creative urban design education, where it can be easily integrated with activities and public participation. It is possible to maximise learning and promote active involvement by utilising virtual approaches and gamified strategies [9, 13].

Furthermore, he highlighted that the primary focus should be on entertainment and that education should be secondary to story [15, 16]. The phrase "serious games" itself has an issue because it appears to contradict itself; the words "serious" and "game" don't seem to go together. Games should promote learning after they are only meant to be enjoyable. One more

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description of fun as a by-product of learning something new is [16]. Serious games are primarily intended to teach players something while, if at all possible, having enjoyment [16].

1.2 The importance of serious games

As co-founder of the Serious Gaming Project Ben Sawyer [16] has noted, "serious games" these days are something of a business. Digital gaming is an industry of $10 billion annually, whereas the market for serious games was projected to be around $20 million in 2006 [16, 17]. The market for serious games in education and training is expanding on a worldwide scale. For instance, the market was valued at $2 trillion in 2003 [17]. Games employed in cultural heritage, military operations and training, management and policy concerns, public engagement, health care, and managing change are a few examples of deployments [17, 18]. Serious online gaming has a great deal of potential for urban development, particularly in the stages where public input is required [18]. Although this field of study is still in its infancy, the research exhibits a lot of promise. It is based on the hypothesis that games could make learning easier and more pleasurable, as well as inject some playfulness into the process of public involvement, or playful involvement by the public [18]. This article [18] provides a summary of the planning-related games that can be played online right now.

1.3 Realistic urban design and urban planning games

The subject of urban design and urban planning is covered in a number of commercial games [18]. They were all created with fun in mind. The well-known game SimCity is among the mentioned examples of games, along with Plastic-City, Urban Plans, City Creator, and Super City [18, 19]. Other planning and development games that are not covered here are Face Your World, Urbis' "Create your own Super city," Geoponic, and Dump Town or Recycle metropolis. Probably the most well-known game about urban design is SimCity [19]. In this simulation the game, the user establishes and manages a city within the constraints of a predetermined budget that can be used for a range of activities [20]. The primary goal of the game is to construct and create a city. Before starting to develop, the player can modify the city's environment in the game's opening stages. She has the ability to designate specific areas of the terrain as various zones by marking them. In addition to developing transport networks and altering the amount of taxes, the player can add building and improve the city in a variety of other ways [19, 20]. Furthermore, by encouraging active citizen engagement in gaming while taking into account the consequences, and integrating environmental responsibility,

resilience, and liveability goals into the design of serious games, we may promote the growth of intelligent people and cities [21].

II.   Decision game groups centred on cities

There are various elements to the video game industry, and people are drawn to cities. Some of them are real and show the city or a neighbourhood in the city with accuracy. Some games also help spread knowledge, which means that particulars about a planning scenario are given. A large number of them merely seek to amuse the player [22]. Three types of games are distinguished in this paper: prevalent, digital, and non-digital/traditional games [20, 21]. Most games are covered by these three groups. These games can be played for fun or for serious purposes. Games that aren't digital or conventional can be played without computers or other electronic devices. This can include card and board games such as the applied education game "CLUG" [22] [21]. The influence and interpersonal connections of urban expansion are taught to the gamer. Digital games—which are played on computer and other electronic devices—have gained prominence in urban planning recently [21, 22].

SimCity and other PC games are hugely popular. The objective of this game is to build a prosperous, functional city. Pervasive games such as which have gained popularity since the internet's creation and their combination with GPS-capable mobile phones, are included in the third group [22]. In these games, the boundaries between the virtual and real worlds essentially disappear [22, 23]. According to Montola, there are many different types of pervasive video games, ranging from simple single-player games for smartphones to complex mixed reality events that incorporate both art and politics [23]. The game MOGI uses geocaching, for instance, to create entirely new playing environments made possible by recent technological advancements [23].

2.1 Traditional/Non-Digital games: Board and card games

This category comprises popular games as well as more recent releases [23, 24]. The following games' descriptions are included in the decision-making: Broken Cities, CLUG, Ginkgo polis, Pop-up Pest, Stadtspieler, Masterplan, Neue Heimat, and The Harbour Game [24]. A competitive city-building games called Broken Cities was released in 2011. The user must first decide whether he wants to be a profit-driven, polluted landlord or a conscientious real estate developer [24]. It is situated within a figurative real world. Real-time feedback on the decisions the player makes is available to him [23, 24]. Regardless of how their own team does, players

must cope with the consequences of other players' decisions during interaction. In 1965, the Community-Based Land Use Game (CLUG) was created as an educational game. It is based on a board with 144 squares, which stand in for large tracts of land. The mode of transportation is used on public roads [24, 25]. The game includes a port, a terminal, and a supply centre. One participant assumes the role of a teacher and moderator [24, 25]. As an impartial guest, he establishes the conditions of the game, ensures that they are followed, collects the transportation cost, and has the authority to declare unforeseen disasters [25]. This game is intended to demonstrate to the player the key relationships that impact urban growth [26].

During the game, players can use putty to construct the associated city. Establishing a superior environment for living is the aim of the game [26, 27]. Permanent roleplay is meant to achieve this goal [27]. Over the course of the game, the participants can establish a common language of expression, which is important for communication. It turns out that interaction involves producing, informing, managing, analysing, and assessing [27]. The intricacy of planning procedures is practical zed in this game. Each and every City Player event is a special illustration of social life. There is a relationship between experience and specialised knowledge [27], interconnections may be seen in the structure that forms on the game board, and advancement procedures can have beginning points that can be determined by condensing one's own values [27, 28]. A game has two outcomes: one that is personal and the other that is thematic/organizational [28]. In real life, the windows that the video game opens can eventually become doors. The players' inclination to switch from playing to acting is the deciding factor. Routes come into view. The narratives behind the figures on the game board are created by the participants [29].

Fig. 1 Stadtspieler competition at TRENDBÜRO Hamburg 2011.

(https://www.stadtspieler.com) [29]

2.2 Playing Games on Computer Systems

Universities conducted research and created the first computer games. As personal computers and gaming devices (later consoles) were more widely available, PC games gained popularity amongst the general public [29, 30]. Thanks to technological advancements, games in fictive 3D visualisations are now feasible [30]. The experience of being in the virtual environment can be felt by the player. PC game sales are now a mainstream market that cater to a variety of user bases with a wide range of games. We looked at games that address urban planning and came up with the following suggestions: Plasticity, Securing Sydney's Urban Planning, SimCity, Anno, City One, Civilization, [30, 31], Communities Plant, Green Sight City, and Minecraft/Block by Block. In 1998, Anno was created as a single-player game with the intention of simulating monetary systems. Initially, the player can settle an island, construct a city, and provide for the needs of the occupants. As the prerequisites increase, so do the missions the individual must do as they mature and the processes of civilization get more intricate.

2.3 International playing video games

Playing games in a city Games that are ubiquitous are also played on city-related themes. The ability to explore metropolitan regions is made possible by new technologies [32]. The widespread popularity and successful sales of urban games can be attributed to various factors, such as the accessibility of GPS technology and the online networking opportunities it offers. We have chosen to showcase three urban-themed games: Mogi, Pac Manhattan, and REXplorer. In 2000, Mogi was created as a multiplayer role-playing game that took place in real places [31, 32]. In the streets of Japan, it was utilised for geocache. The process is selecting geocaches from a list and inputting the geocaches location into the GPS device. In order to help others locate the hidden geocache, the player can utilise his GPS gadget. Once he locates it, he can sign the book of records and put it back where it belongs [32]. The player can then exchange his images and stories with other players at the conclusion. Because people can collaborate in groups to complete shared tasks, they feel more unified. This game integrates online and offline gameplay [32, 33].

III.   The comparative study

Our paper's goal is to evaluate various games based on predetermined standards. Participation, interactions, realistic visualisation, learning impact, and knowledge transmission are some of these requirements. We evaluated 22 games that were briefly explained in our study. We picked some of the most recently released titles in addition to the most well-liked ones. We provided

information on usage and exposure, and we made every effort to display a variety of content [33]. We extracted content from the various categories of prevalent digital, and non-digital/traditional games [33, 34]. Initially, we paired the games within each of their three categories and demonstrated how the games and criteria related to each other. For instance, we compared within one group the techniques, approaches, and involvement of social media in each game's engagement. Next, we assessed which one includes every criterion. We concluded by presenting the comparison's findings along with its advantages and drawbacks [34].

3.1 Comparing requirements

In our research, we emphasise engagement, communication, accurate visualisation, learning impact, and information sharing. "Participation" refers to the use of the game to involve locals and interested parties in the development procedures of physical locations. According to our definition, the game has a connection to a real-world scenario or planning endeavour [34]. The design and execution process can incorporate the needs and wishes of the user [35]. It is possible to create a clear connection between the game's content and the creation strategy inside the game environment. "Interaction" is defined as speaking, writing, or debating with one another. This may occur in a conversation with specialists or among the consumers. They can converse with each other and/or trade notes. They can share the outcomes of their interactions on social media platforms like Facebook and Twitter. "Realistic visualisation" assumes that the game's narrative takes place in an actual, functioning city. This city might merely serve as the backdrop for a made-up narrative. However, it may also involve an actual urban planning procedure [36]. This is contingent upon the specific circumstances. Players receive a "learning effect" when they learn about the city or find correlation and interdependence in the planning framework. Playing the game will teach them about detailed planning techniques.

3.2 Comparison's Results

We contrasted the games in the categories of card and board games, computer games, and games played in cities [35]. We created several graphs (Figures 2, 3, and 4) to visually portray each game in accordance with the requirements. The games that are analysed are displayed in the coloured fields. On the x-axis, the criteria are ordered [36]. Which game uses which criterion is displayed. The coloured fields adjust in size based on the amount of games played, thus it is not important. This makes it clear which criterion has a large number of games and which has fewer. We display the amount of every field.

3.3 Assessing card and board games

There are parallels and divergences among the eight card and game board games that are detailed. Four games were played with participation: Hafen Game, Pop-up Pest, Stadtspieler, and Broken Cities. Every game involves player interaction. The emphasis was on communications. The participant engaged with other players or experts in every game. Only three games—Pop-up Pest, Stadtspieler, and The Harbour Game—implemented realistic visualisation, as Figure 2[36] indicates [36, 37].
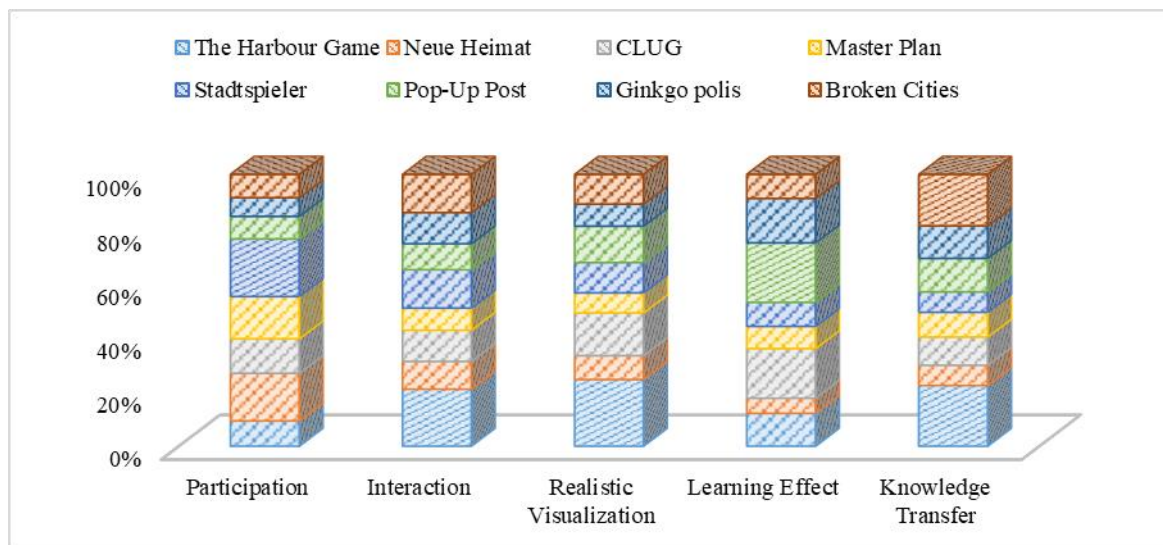

Fig. 2 The Rules for Card and Board Games

3.4 Comparing video games in urban environments

Since all of the games took place in the city and had nothing to do with planning procedures, there was zero participation. Figure 3. All three games shared the use of the metropolitan area as a board and were set in real-world locations. The player was reliant on interactions and had physical movement in [37] Real-Space. Interaction and mutual understanding were crucial for the game's participants.
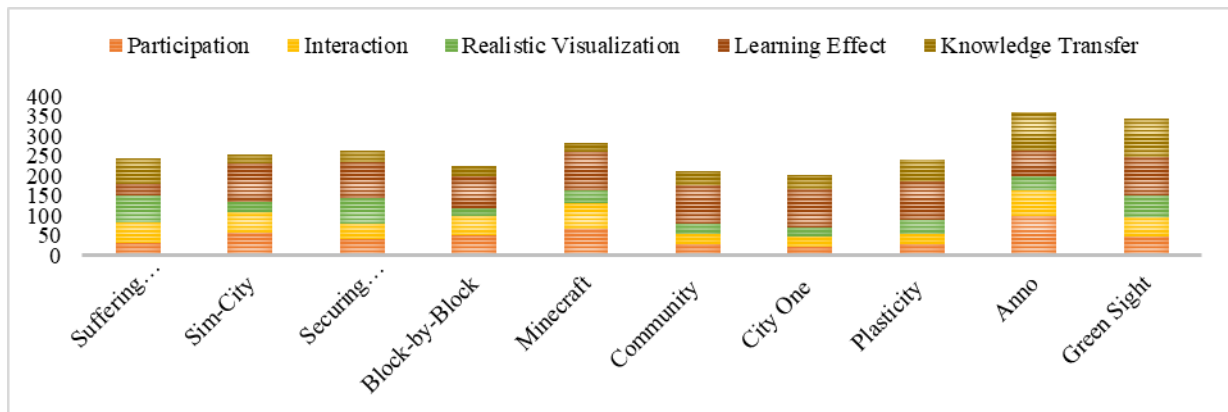
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Fig. 5 PC games and their requirements.

3.5 Exclusively Compare PC Games Block by block, the neighbourhood

Plant and Safeguarding Sydney's urban planning encouraged involvement. Individuals were able to participate in the real process, and their suggestions shaped its execution. Communes carried on processing the game's result. All of the interaction was gratuitous. Social networking sites like Facebook and Twitter can be easily exchanged with the help of online games [37]. As a result, networks were able to expand and communication opportunities increased. Expert conversations were a feature of several games [37]. It was evident that just the criterion interaction was covered by Minecraft, while all criteria were covered by the game that came from it (Block by Block). It became clear that a large number of PC games had an entertainment-focused approach. We may also showcase a few games that had realistic city visualisations as shown in Figure 4.
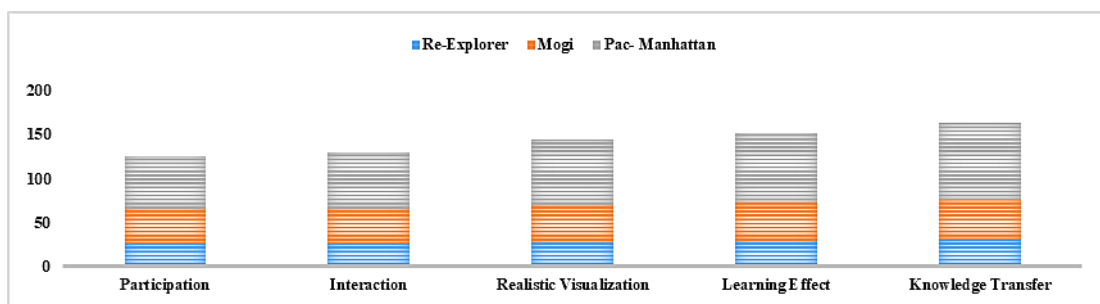

Fig. 4 Urban gaming environments and the standards they meet.

IV.   Discussion

Urban planning and urban design researchers explore the impact of advanced technology-based learning environments on students' understanding of ecological concepts [38, 39]. The

participants acquire knowledge in several ecology-related topics, refine their skills in public speaking and self-confidence, and develop a perspective similar to that of a diligent urban planner. These five games were developed to facilitate urban planning operations and successfully fulfilled all predefined criteria. Pop-up Pest assists children in understanding the dynamic transformations occurring in urban areas and facilitates their exploration and understanding of their immediate environment. The actions in question could exert a substantial impact on the current planning methods. They can be utilised for other initiatives and function as exemplars [39, 40]. The game Surfing Global Change was designed with the intention of providing education. The application does not provide a realistic visualisation but instead focuses on learning effects and interactivity. This game has a low amount of entertainment value [40]. Only a limited number of our criteria were fulfilled by games situated in urban environments, hence this group did not address our research topic. Although all three games were entertaining, they did not include participants in real planning processes. These games have recently emerged due to recent technological breakthroughs [40]. There were no games that provided players with the opportunity to join this group. The selected selection is limited in size, and there might be additional games accessible that enable players to engage in urban planning activities.

CONCLUSION

In this post, we initially provided definitions for games and serious games, and subsequently showcased several examples of online games that revolve around urban planning. Developing a serious game to promote public engagement in urban planning presents several complex concerns that cannot be adequately addressed with a superficial examination. Their level of determination depends on the potential user base, main goals, and public participation method of the game.

Urban planning games can foster engagement and interaction while comically illustrating the process of planning. We highlighted that games often face criticism for their limited focus on providing entertainment. Among the twenty-two games we studied, only five fulfilled our criteria in terms of their impact on learning, ability to transfer knowledge, realistic visualisation, active engagement, and interaction. Of the total of twenty-two games, only eight were characterised by pure pleasure. It can be inferred that there are both entertaining and very consequential games. The objective of this study was to ascertain games that fulfil our criteria. This work proved to be challenging. There is a wide variety of games in the gaming industry

that revolve around the concept of urban planning. During our inquiry, we encountered several games that necessitated players to construct thriving communities, similar to Sim-City. Obtaining thorough information about these games proved to be challenging. Each time, we were directed to the official game's homepage, which necessitated membership to access the information. In addition to the plethora of popular games, it proved challenging to find obscure board and card games. Games in communities were often clandestine. Obtaining trustworthy information about video games that showcase urban planning techniques proved to be difficult. By incorporating the use of games in urban planning, individuals can effectively identify their true needs within the urban environment. An instance of a personal computer game that enables anyone without expertise to enhance living conditions in an impoverished urban region is Block by Block. There are supplementary situations in which this game can be utilised. If there is a need to reconstruct a public area, users have the ability to place important objects such as street furniture in the virtual space. They possessed the ability to obtain budgets, planning documents, and administrative obstacles. They may acquire knowledge about unforeseen occurrences in a tangible undertaking. Engaging in PC gaming facilitates the replication of real-life scenarios with ease. Board games can be developed more expeditiously than PC games, however they also require a greater degree of ingenuity. The implementation of ideas focused on planning procedures has not yet been possible in the given context.

The advertising game sector is experiencing rapid growth. Upcoming game developments will render this comparison research as an initial draft. We propose that the creation of additional games that promote active participation in real-life activities could be facilitated through rapid development. We are specifically focused on developing a pervasive game that engages players in the process of planning. During our investigation, we found only one game called "Pop-up Pest" that was specifically designed for children. We will develop a game with the explicit aim of engaging marginalised communities. As an illustration, we are interested in collaborating with a commune to develop a game that motivates anxious migrants.

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