A New Framework of Urban Serious Game to Empower the Smartness of Citizens

IEREK PRESS Academic Research Community
http://www.press.ierek.com
ARChive
CrossMark
ISSN (Print: 2537-0154, online: 2537-0162)
International Journal on:
The Academic Research Community Publication
DOI: 10.21625/archive.v5i1.811

A New Framework of Urban Serious Game to Empower the Smartness of Citizens

Yang Lin[1], Chuanwei Lin[2]

[1] *Department of Architecture and Design, Politecnico di Torino, Torino, Italy*

[2] *School of Cyber Engineering, Aarhus University, Aarhus, Denmark*

Abstract

With the Smart City concept gaining momentum around the world in recent years, Information and Communication Technologies (ICTs) have become increasingly popular and indispensable. However, existing criticisms claim that, in addition to Technology, the smartness of citizens should also be emphasized. In other words, it is essential to enable citizens to become involved in their cities as stakeholders. In this paper, a game-based approach to facilitate the involvement of citizens in civic life is taken. By analyzing some popular digital video games, Augmented Reality (AR) and theories from socialists and psychologists, a new Urban-gaming framework is built, which could be used for data collection, decision-making and other urban issues.

Keywords

serious game; civic engagement; game design; smart citizen

1. Intoduction

The Smart City terminology was firstly used during the global economy phenomenon of 1992 (Gibson, Kozmetsky & Smilor). With the spread of this notion, various definitions have emerged over the last decades. Generally, the concept can be summarized in three main approaches: (1) A data-driven approach with a strong emphasis on "hardware". For example, Cisco defined Smart Cities as those adopting "scalable solutions that take advantage of information and communications technology (ICT) to increase efficiencies, reduce costs, and enhance the quality of life" (BIS, 2013). (2) A Citizen-focused approach that sheds a light on human capital, as announced by the Manchester Digital Development agency: "a 'Smart City' means 'smart citizens' – where citizens have all the information they need to make informed choices about their lifestyle, work, and travel options"[1] . (3) An integrated approach that puts the weight on both qualities, ensuring the integration between technology and social capital (Campbell, 2012).

However, in recent times, Smart city visions have received wide criticism (Greenfield, 2013; Hemment &Townsend, 2013). Citizens debate whether the city life and the urban experience are about control, efficiency, and predictability. The tech city, which uses CCTV and algorithms, has been turned into a place of pervasive control and surveillance (de Lange, 2015). It is worth noting that a human-focused approach is implied by the core definition of a Smart City and that the use of a technology that neglects the contribution of its citizens, viewing humanity only as data, could

[1] City Verve: Co-creating a Smart City blueprint, https://futureeverything.org/project/entry/co-creating-a-smart-city-blueprint/

inflict negative effects on urban life. To address this shortcoming, it is essential to enable citizens to become stakeholders. Habitants need to devise solutions, acquire new skills, through online learning, to become smarter citizens. As a result, a more direct form of local democracy shall exist (Willets D, 2014).

So, how can citizens become more engaged in civic life? In this paper, a game is proposed to address the problem as well as encourage people's enthusiasm. From a historical perspective, games represent an integral part of urban practices since ancient times. Ancient Romans, back in 80 AD in Italy, enjoyed nothing more than a day at the circus, watching chariot races, gladiator fights, and even miniature novel battles. The Roman Colosseum was one of the most famous, a giant amphitheater with an arena that hosted these games, demonstrates the inherent play-instinct in Homo sapiens for thousands of years. Huizinga (1939) suggests that play is a necessary condition of the generation of culture, further explaining that it "produces many of the fundamental forms of social life". Within the urban experience, play is an activity that is considered "fun, voluntary, intrinsically motivated, incorporates free choices/free will, offers escape, and is fundamentally exciting" (Flanagan, 2009). The form of play in an urban environment could be determined to be a mixed urban game that integrates, both, the physical and the virtual environment "within a comprehensibly experienced perceptual game world" (Walther 2005). Players hold the ability to transform how we live in cities and places.

2. Learning from the Digital Game

Digital games, an interactive entertainment program, is enjoyed by people as players get the chance to express themselves throughout the process. At the same time, games may influence human habitual behaviors and knowledge and have been discovered to have potential for future uses. Recently, more and more cases show that some digital games could contribute to process of Urban Planning alongside local governments and citizens.

One of these games is *SimCity*, first published by maxis in 1989, where players are given an map and are able to build their cities with the budget provided. This game has gained the government's attention in gathering ideas and making decisions during recent years. In October of 2019, the government of Takahama in Japan made a special announcement in association, with Spike Chunsoft[2] for *cities: skylines*, to celebrate the 50th anniversary of the local administration-system in 2020. They had hosted a competition, for participants aged 10 to 50 years old[3], with the theme of creating the ideal form of the city in a visual game. Similarly, the city of Hameenlinna in Finland held a City Planning Contest using this game, in 2016, to get citizens interested in seeking solutions for the Kantola and Katuman areas[4]. During that same year, the game helped bring forth new development in Stockholm, Sweden, by building a mock-up, within the game, of the royal seaport to let citizens contribute with their own ideas.[5] Another internationally known game is *Minecraft*, which was first created by Marcus Persson in May of 2009. It could be described as a creative "sandbox" game where the players build structures, using 1x1 meter cubes as building parts, in a Three-Dimensional (3D) world. This game was used, in 2012, by UN-habitat in the development of public space and is known as Block by Block workshop[6]. Held in different countries around the world, the workshop bridges the gap between citizens and policymakers and addresses problems such as the refugee crisis, climate change, safety etc.[7]

Moreover, these games, which had been useful for and collaborate with the local government, still have more potential and leave room for other possibilities when it comes to simulation and planning. Included in this list are games such as: *Animal Crossing*, *Tropico 6*, the *Settlers*, *Age of Empires*, and the *Sims* 4. To conclude, four different quadrants make up those digital games: A world map, architectural element, character (or a role) and community (relationship).

(1) A world map is represents a basic element and an essential part of most digital games. For example, the inspiration for *SimCity* came from a feature of the game *Raid on Bungeling Bay* [8] that allowed Will Wright[9] to create his own

[2] https://www.spike-chunsoft.co.jp/cities_skylines/
[3] https://doope.jp/2019/1095774.html
[4] https://www.rappler.com/technology/news/123474-finland-hameenlinna-cities-skylines-planning-contest
[5] https://www.bbc.com/news/av/39200838/video-game-cities-skylines-helps-plan-stockholm-development
[6] https://www.blockbyblock.org/
[7] https://news.un.org/en/story/2020/01/1056432
[8] A 2D game within the shooter subgenre in the action genre.
[9] An American video game designer and co-founder of the former game development company Maxis, and then part of

maps as part of the development process. Wright soon found that he enjoyed creating maps more than playing the actual game, and so the idea for *SimCity* was born[10]. In another game, the *Animal Crossing*, players are provided several maps of isolated lands to choose at the beginning, then, they could build their private house, museums and meet new characters in the game. Similarly, in *Tropico 6*, players are given the right to personalize their map, including the size of the island, shape, and its natural resources. In the *Edge of Chaos*, the map elements are more vibrant, where players could control the army, execute military development plans and strategize for battles.

(2) Architecture represents another necessary element for constructing a physical world in games. In *Minecraft*, players cannot only build a fantasy world in a free form, but they can also duplicate almost all famous buildings that exist in the real world. The game's rich architectural elements potentially make it a serious design tool. Even for architects, *Minecraft* could be used as a computer-aided design tool. In *Cities: Skylines*, a modern take of *SimCity*, more subtle options are available where players need to consider the arrangement of infrastructures such as electric wires and water pipes, the difference between high and low-density houses, and the use of various grades of roads. On the other hand, this game focuses on the concept of community in the sense that players can use the main roads as boundaries and branch roads, or small roads, to create smaller communities. This represents the main feature of the game and is considered Urban Planning that resembles that of the real world.

(3) The characters of the players represent a major determinant as to whether it would attract potential gamers or users. In *SimCity*, players can become mayors, build up a new city from scratch, or manage an existing city and save it from a natural disaster or a nuclear power plant accident. In another game, specifically *Sims* 4, the roles differ where players start their journeys by creating virtual characters, known as "sims", place them in houses and help improve their moods and satisfy their desires. In *Age of Empires*, a famous Microsoft game, players could choose to be soldiers, generals or even kings as well as experience historical events and ancient times, such as the Stone Age, and classical periods around Europe, Africa, and Asia.

(4) A connection between the players is essential in letting them the users stay in the game. Building a relationship between players and their characters in a common community will ensure that. However, the community could be created and represented in different forms. In *Settlers*, there are many unions players can be part of, share their experiences and exchange tasks. The connection is different in *Animal Crossing* where players are required to get the agreement of their friends in real life in order to be able to visit them in the game and fly over to the islands where they reside.

3. Learning from an AR game

In the field of Urban Design, Augmented Reality (AR) could contribute to improving public participation and social acceptance. According to a survey on AR, it was found that AR, as a system, has three characteristics (Azuma, 1997). First, it combines the real and virtual and users can choose to view the real world and virtual objects in their viewing. The second characteristic is that it is real-time interactive. Third, virtual objects are registered and viewed in three-dimension, similar to what is seen in the real world. With these characteristics and the popularization of smartphones, it is possible for governments and designers to involve more participants in tackling Urban Issues. Users can experience a virtual simulation identical to their real-life surroundings, acquire additional information through applications available on their personal devices, as well as give their feedback effectively.

There have been some cases that highlight the value of AR-based programs that make way for an effective and collaborative relationship between developers, governments, citizens, and other parties in urban design projects. For example, in a Wind Farm planning project, a 3D dynamic and interactive visualization platform that is AR-based was used, where wind energy planners were supported, and as new wind power projects became socially acceptable (Grassi, 2016). The platform helps users experience the visual impact of wind energy projects from different perspectives as well as gain a deeper understanding of the impact of wind energy projects on the landscape, enhance public support for the project, avoid direct conflicts due to limited access to information, and reduce development time and investment risk. Additionally, the developed platform can be applied to any area and to any scale of wind

Electronic Arts (EA).

[10] Geoff Keighley. "Simply Divine". Archived from the original on January 10, 2010. Retrieved June 7, 2008.

farms, hereby overcoming the preconceived image often used in producing visual effects and resulting from very limited perspectives. Moreover, this platform can also be widely used in the development of large-scale neighborhood facilities, specifically during phases where community participation is needed.

Aside from decision making, urban games that utilize AR could present people with a reason and opportunity to explore their cities and establish a unique relationship with their surroundings. In *Pokémon GO*, players can submit information on new locations to create new Pokéstops. These locations need to have a certain cultural, historic, or artistic significance, which is then recorded by GPS. This process allows players to consider the ways in which they are able to use public places such as streets and parks. The *Pokémon GO* game also creates a virtual online community that uses actual maps, which is practical and open in many ways. The same company that came up with *Pokémon GO*, Ingress Prime[11], created another Augmented Reality game known as *NIANTIC*[12], which also encourages players to go out and explore the city. This game is based on a science fiction story where a user can choose to become on either side of opposing groups. Consumers are usually walking or driving around the urban environment and try to hack Portals, representing public locations or buildings. These portals are owned by gamers on the same team and can be linked –under certain circumstances –to control fields, which represents the objective of the game. These activities can surely strengthen the relationship between the citizens and the urban environment.

We may conclude that AR not only holds the ability to enrich design stages, but they can also bring about the entertainment element to the citizen experience with their urban environments. The AR technology retains the ability to strengthen the interaction between humans and the physical world. A relationship that should be embraced to develop a new and comprehensive urban gaming system.

4. Designing a Serious Game for Civic Engagement

4.1. A New Framework for the Playful Civic Game

What can we learn from those digital and AR games? How can these principles be used to design a new game that empowers citizens and encourages their engagement? The posed questions leave behind an urgency to propose a serious game; a concept described by Abt (1970), "these games have an explicit and carefully thought out educational purpose and are not intended to be played primarily for amusement", but could also add to the government's and citizens' knowledge.

In order to create a dynamic civic life, we must strengthen the use of 3D and playable social activities to further encourage citizen participation, motivation and advocation (Schouten, 2015), which can be translated as the self, the us and the other (Valerio & Gabriele, 2020). According to Deci, Eggrari, Patrick and Leone, people can become naturally motivated if their needs are met (1994). Addressing their needs can stimulate the internalization of external activity, allowing them to become intrinsically motivated, and build up a sense of competence ("I can do it!"), autonomy ("I do it and I do it my own way"), and relatedness ("I can relate to the topic and I will do it with people I care about") (Connell and Wellborn, 1991). This indicates that games, and playful activities in general, should be designed carefully to satisfy human needs as they withhold the power of motivating a player to engage in activities and empower them in unpredictable ways. Another aspect is participation, which can be encouraged through a sense of belonging that can be established by living in an "Imaged Community" (Anderson, 1983). As portrayed in today's context, young people seek what intrinsically motivates them such as online communities (Gee, 2005). This imaged community is where they are able to share their knowledge and utilize their skills on topics of interest with other people across the globe. This participatory culture, is reflected in the worldview, or epistemic frame, of its community members (Shaffer, 2006). However, and beyond motivation and participation, why should it be pointed out and advocated for? As Schouten mentioned in his research (2015), the persuasive nature of play and games (Bogost, 2010) is an influential tool in encouraging an attitude change among citizens and encouraging engagement in social activities and civic life (Wouters, van der Spek & van Oostendorp, 2009). The use of games for persuasion and advocacy could

[11] https://ingress.com/game/

[12] Niantic, Inc. is an American software development company based in San Francisco, which is best known for developing the augmented reality mobile games.

provide designers and citizens, who present a different point of view on issues, with a platform that allows them to share their input in relation to the real world and in an effective and cost-free way.

In combination with the four elements facilitating Urban Design, with the help of digital games and technologies available today, a new type of playful urban game that focuses on functionality and entertainment could be created. The proposed model is illustrated in Figure 1, with a proposed name of "AMPEI" signifying, respectively: advocation, motivation, participation, environment, interaction. Advocation is the starting point to designing a game and it could determine its future results and performance. To further motivate citizens to join the game, an attractive role or intriguing storyline is necessary. If the government wants citizens to take part in it and provide valuable feedback, citizens must be able to develop a sense of belonging or community. Furthermore, geographical maps and architectural elements, both of which contribute to building a physical environment, could give a context discussions surrounding urban issues. Finally, the inclusion of AR technology could further support other essential elements.

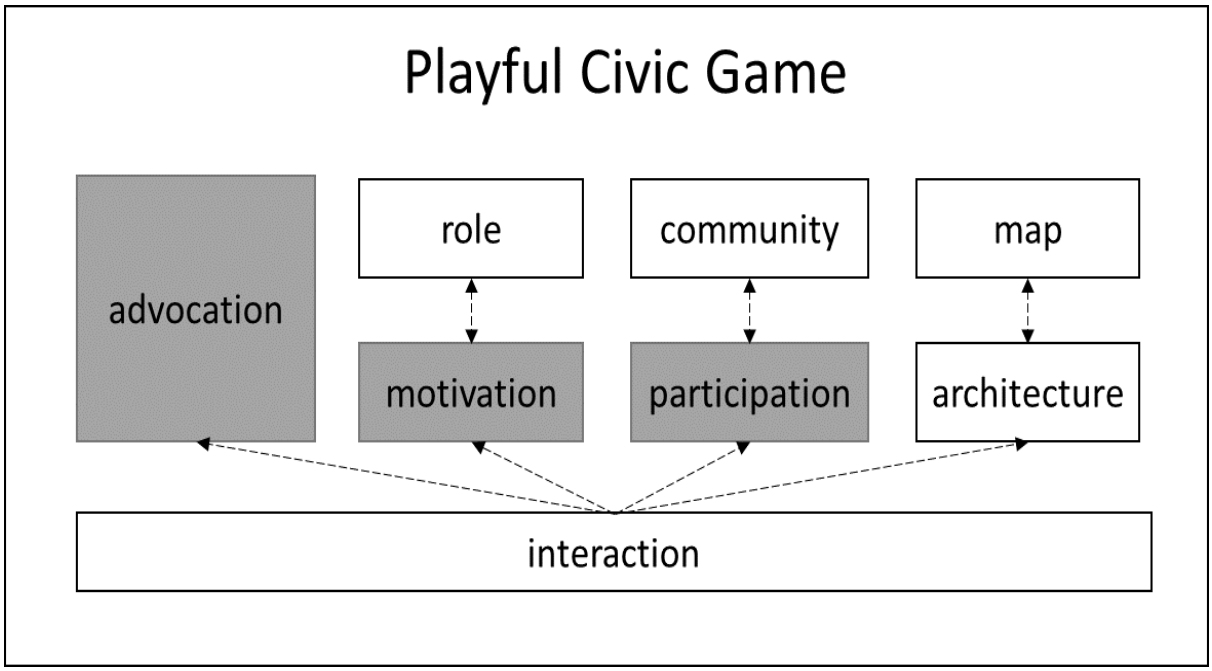

Figure 1. The framework of a playful civic game

4.2. An Analysis of Cases by the AMPEI Framework

Finding places (2016)[13]

Finding places (2016) is a Lego 3D game run by the CityScienceLab at Hafencity University of Hamburg in partnership with MIT and, their open-source program, CityScope. The objective of this game is to encourage citizens to find places that could be utilized or transformed into accommodation for refugees. The city of Hamburg is extensively used; housing, industrial and commercial areas, public spaces, all functions in the city require space. Therefore, finding suitable areas to house refugees is a challenge that all citizens can relate to. Thus, this platform was created to take in everyone's suggestions and ideas. Since the issue was common among all citizens, workshops were organized in all Hamburg districts in which participants could allocate and discuss suitable locations around their areas on an interactive urban model. By the end of it, 5 million citizens were able to contribute through the advertising and planning phases. Thirty-four workshops were held at HCU with 400 participants during which each group focused on one district.

In this serious game, citizens presented themselves and contributed to the urban planning process, which fit their roles and met their needs and objectives. Joining those workshops and sharing their proposals with other citizens who also shared their same concerns provided a sense of belonging. The city's environment was stimulated as a 2m x 2m board map was represented by colored-Legos. Interventions where Legos where either added, removed, or moved facilitated

[13] https://findingplaces.hamburg/hintergrund/index.html

the running of a real-time simulation that demonstrates the impact on the city. Using Lego enables anyone to participate in the building of the model without being intimidated by complex algorithms and interfaces. This makes it a great tool for community engagement, as well as for experts and professionals to collaborate on multidisciplinary urban problems using a common language.

Rezone the game (2012) [14]

Rezone the game (2012) was designed by the Bosch Architecture Initiative and Digital Workplace to address the vacancy issues within the city of Den Bosch. This game was similar to Finding Places. It is composed of a physical board game with some 3D printed iconic buildings that represent the neighborhood. Participants played this game during a physical workshop, where players take on one of four available stakeholder roles as follows: proprietor (owner of real estate), mayor (representing the municipality), engineer (urban designer), and citizen (neighbors). The challenge is for players to not simply pursue individual self-interests, but to strategically collaborate in order to defeat the system, which is programmed to let the city descent into decay. As for the interaction technology, a camera above the game board monitors QR codes in real-time and registers the players' moves, at the same time an augmented reality layer of real-time information about these buildings will be shown on a screen, and a computer algorithm would be programmed to induce vacancy.

Submerged (2017)[15]

Submerged (2017) is a cross-media project of the Lectoraat in Play & Civic Media at the Amsterdam University of Applied Sciences. The objective, or rather advocation, of this project is to reimagine public places for the future. In the first part of the game, the Interactive system uses a mobile application in leading participants in their experience of a story about time-travel. During the play, computer characters lead players to real places in Amsterdam, detected via geo-map. The characters, presenting themselves as humanity existing in 2032, talk players from 2017 in question of their surrounding environments and how they envision the future. They get to ask them to provide audio recordings or take photographs, both of which are primary forms of data collection. The second part of the game is based on a board game workshop that encourages participants to recreate their stories in public places in the year 2032. During this workshop, maps of the city are made available and participants are instructed to carefully pick places and neighborhoods for their stories. The interactive narrative and characterization of the protagonist, the main character, lead the participants to immerse themselves in the worlds created, providing emotional responses that are useful in urban design.

Detroit 24/7 (2012)

Detroit 24/7 is an online competition game utilizing the Community PlanIt[16] platform. The advocation of this game is gathering the feedback of citizens. Detroiters get to share their ideas online or face-to-face for a duration of 21-days, during which they are required to complete three missions. They compete to earn points, badges, and prizes. All ages are called on to participate in those challenges including Detroit Trivia, Community Mapping, and Role-Playing Exercises. During the procession, 1033 players registered on the platform and created over 8400 comments on their experience with the city. After the missions ended, a Game Finale meeting was conducted at the Central branch of the Detroit Public Library, where over 120 people showed up to celebrate players' accomplishments and to plan for the next steps.

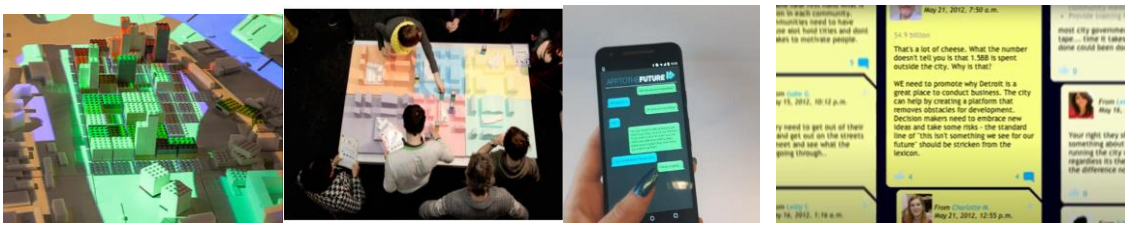

Figure 2. Various serious urban games

[14] https://rezonethegame.wordpress.com/
[15] https://submerged2017.wordpress.com/
[16] https://knightfoundation.org/grants/20114282/

4.3. Summary

Through these four cases, we could pinpoint a number of solutions for each of the 4 building-blocks required in designing a playful civic game. Usually, designers would not pay much attention to the role or storytelling aspect, as shown in Figure 3. When it came to participation or a sense of belonging, the standard method used was to organize a workshop, which we found required more imagery and visuals. As for creating an environment for the game, both simulated maps and Geo-based virtual maps were a possibility. Furthermore, the interaction system used, such as AR technology, could be further integrated and utilized, when establishing a real-time discussion, to enable more citizens to contribute (See Table 1).

Table 1.Different forms of designing the AMPEI framework

	advocation	motivation	participation	environment	interaction
Finding places	find places	citizen	workshop	Lego	real-time simulation
Rezone the game	deter vacancy	role play	workshop	3D print architecture	real-time simulation
Submerged	imagine future	role play	workshop	virtual - map	story telling & direction
Detroit 24/7	receive comment	citizen	online community	virtual - map	online - offline

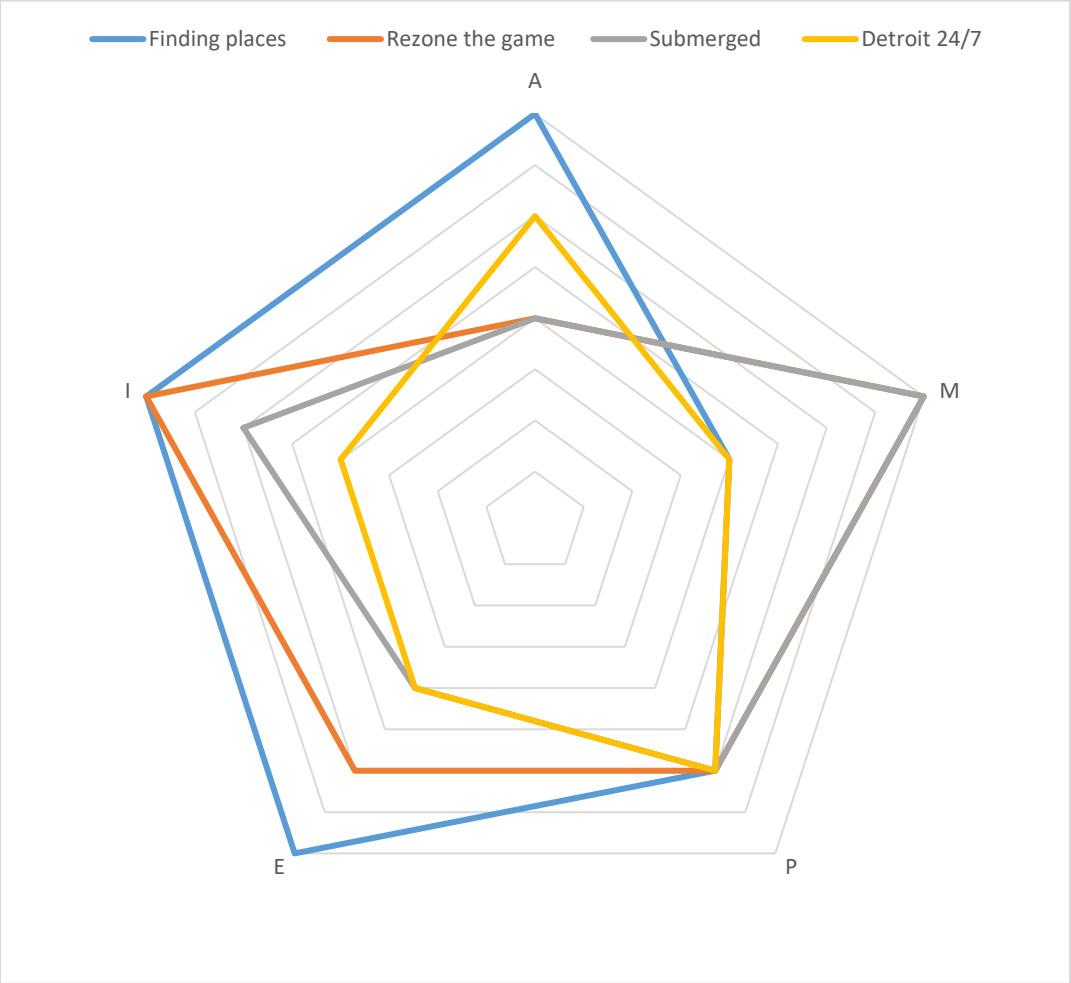

Figure 3. Weighs in cases for each element of the AMPEI

5. Conclusion

This paper criticized vital areas of the Smart City, such as the smartness of its citizens, which had been neglected in the past. To cultivate the Smartness of people, we approached it by learning from games. Since number of gaming companies have collaborated with governments and have gotten involved in the Urban Planning process, we could easily spot the potential of games in the field.

By analyzing several popular digital games that have appeared in recent years, such as *SimCity* and *Minecraft*, we could summarize four essential elements that make these digital games attractive as follows: A map, architecture, character, and community. In addition to Digital Games, AR games are also changing the behaviors of citizens, which could be further emphasized and utilized in future game for citizens and governments. Finally, we reform the framework of the serious game. The framework used is known as AMPEI, which has evolved from elements in digital games, AR technology and practical and social research. In the future, the framework used in this game could be applicable in the design of a serious game that raises awareness for, and improves, citizen participation, as well as helps them realize stakeholder responsibilities. It should be possible that the smartness of citizens is cultivated through a simple game.

References:

Anderson Benedict, I. C. (1983). Reflections on the Origin and Spread of Nationalism. In: Verso, London.

Azuma, R. T. (1997). A survey of augmented reality. Presence: Teleoperators & Virtual Environments, 6(4), 355-385.

BIS. (2013). Smart Cities Background Paper: London: Department for Business Innovation and Skills.

Bogost, I. (2010). Persuasive games: The expressive power of videogames: mit Press.

D, W. (2014). A driver of innovation and growth. Surveyor, Transport Network(January 2014 issues), 23-24

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. Journal of personality, 62(1), 119-142.

Gee, L., Smucker, D. R., Chin, M. H., & Curlin, F. A. (2005). Partnering together? Relationships between faith-based community health centers and neighborhood congregations. Southern Medical Journal, 98(12), 1245-1251.

Grassi, S., & Klein, T. M. (2016). 3D augmented reality for improving social acceptance and public participation in wind farms planning.

Huizinga, J. (1939). Homo Ludens Versuch Einer Bestimmung des Spielelementest der Kultur.

Kors, M., Van der Spek, E. D., & Schouten, B. A. M. (2015). A Foundation for the Persuasive Gameplay Experience.

Perna, V., & Ferri, G. (2020). In and out domains: Playful principles to in-form urban solutions; a dialogue between architects and game scholars. Paper presented at the Proceedings of the 23rd International Conference on Academic Mindtrek, Tampere, Finland. https://doi.org/10.1145/3377290.3377297

Shaffer, D. W. (2006). How computer games help children learn: Macmillan.

Walther, B. K. (2005). Atomic actions Molecular experience: theory of pervasive gaming. Computers in Entertainment (CIE). In Theoretical and Practical Computer Applications in Entertainment K. P. (Vol. Vol. 3 (3)).

Wouters, P., Van der Spek, E. D., & Van Oostendorp, H. (2009). Current practices in serious game research: A review from a learning outcomes perspective. In Games-based learning advancements for multi-sensory human computer interfaces: techniques and effective practices (pp. 232-250): IGI Global.