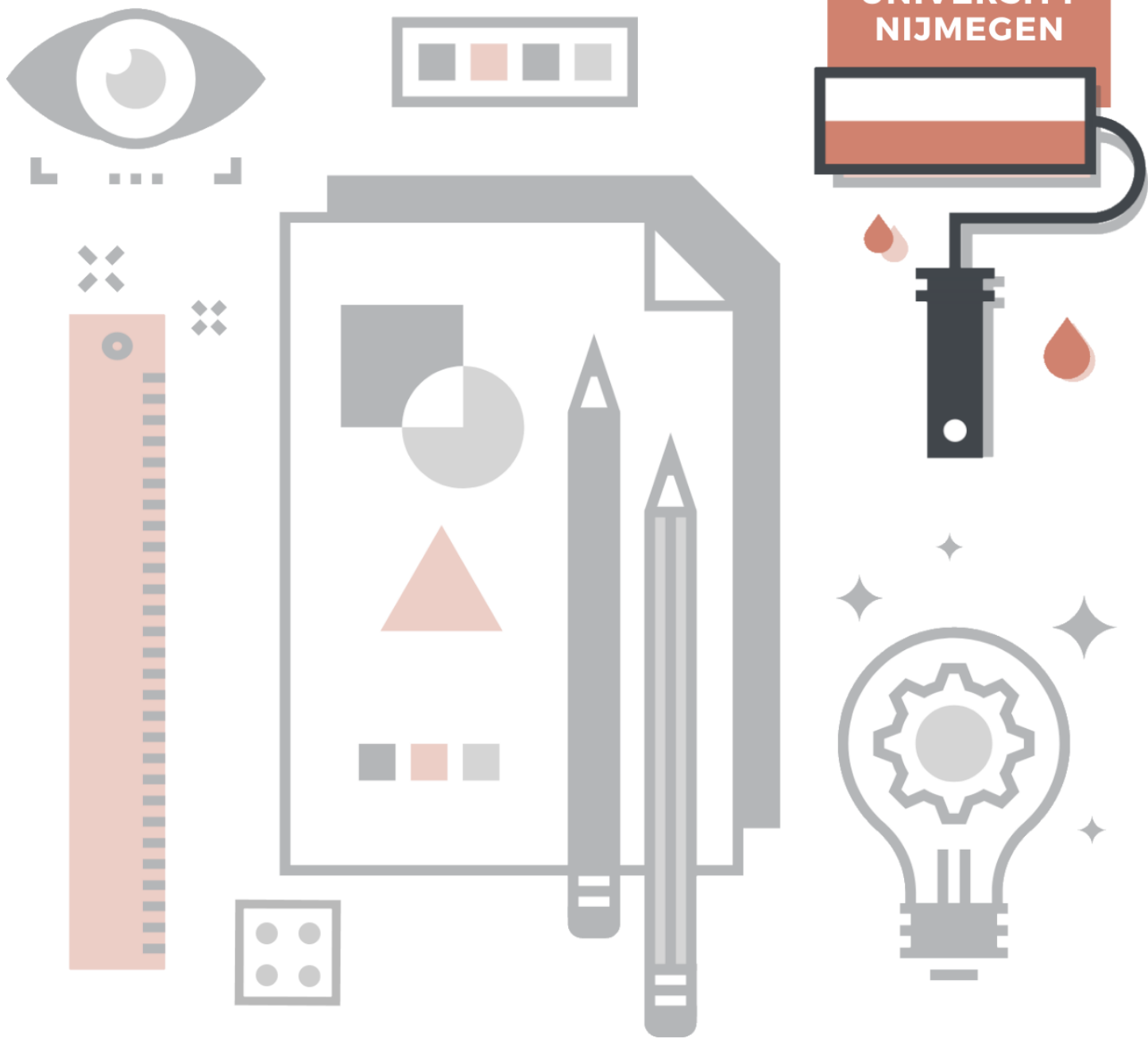# CIVIC ENAGAGEMENT & SPATIAL PLANNING

A serious gaming experiment

RADBOUD UNIVERSITY NIJMEGEN

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Summary

With the introduction of the Omgevingswet, participation has become more significative than ever. Creative ways to involve citizens, stakeholders and corporations are sought to come to supported decisions about the physical environment and to create room for new initiatives. However, a major challenge in setting up participation processes is making it appealing for citizens to take part in them. Rational ignorance may stand in the way: citizens weigh the benefits of partaking in relation to the action that has to be taken.

A quasi-experiment was conducted to investigate the effect of a participation process on someone's motivation to take civic action in the future and to see whether the rational ignorance gap is a predicator of one's civic engagement level. The participation process consisted of a serious game.

Between the pre-test and post-test results a significant raise in civic engagement levels of roughly 6% has been found. The index altered the most concerned citizens' trust in the local authority. No evidence was found that the rational ignorance gap and the experiences with the serious game were predictors for these levels (figure 1 – Summary). In conclusion: the serious game lead to higher trust in the local authority and more motivation to participate in the future, which is in line with the concept of social capital.

Research objectives & main question	Determining the effect that playing a serious game as participation process has on perceived citizen involvement and motivation to engage in civic participation		Testing to what extent the perception of the serious game impacted civic engagement
0-Hypotheses	1. Civic engagement has been altered positively after playing the serious game	2. A linear relation exists between the rational ignorance gap, and the change in civic engagement indicators	3. A linear relation exists between the perception of the serious game, and the change in civic engagement
Findings	The mean of civic engagement was roughly 6% higher. The significance was < 0.05, so it can be safely concluded this was no coincidental finding.	Though a small portion of 1 (out of 12) civic engagement indicator could be explained by rational ignorance, it could not be stated statistically that $\beta 1 \neq 0$.	A neglectable portion of variance in civic engagement levels could be explained by the total experience of the game (1.8%). Moreover, statistically it could not be stated that $\beta 1 \neq 0$.
Statement	H0 is accepted: civic engagement levels have grown after playing the serious game.	H0 is rejected: no linear relation exists between rational ignorance, and civic engagement.	H0 is rejected: no linear relation exists between the game experience, and changes found in civic engagement.

Figure 1 – Summary. Summary of research objectives and hypotheses. Source: Personal collection.
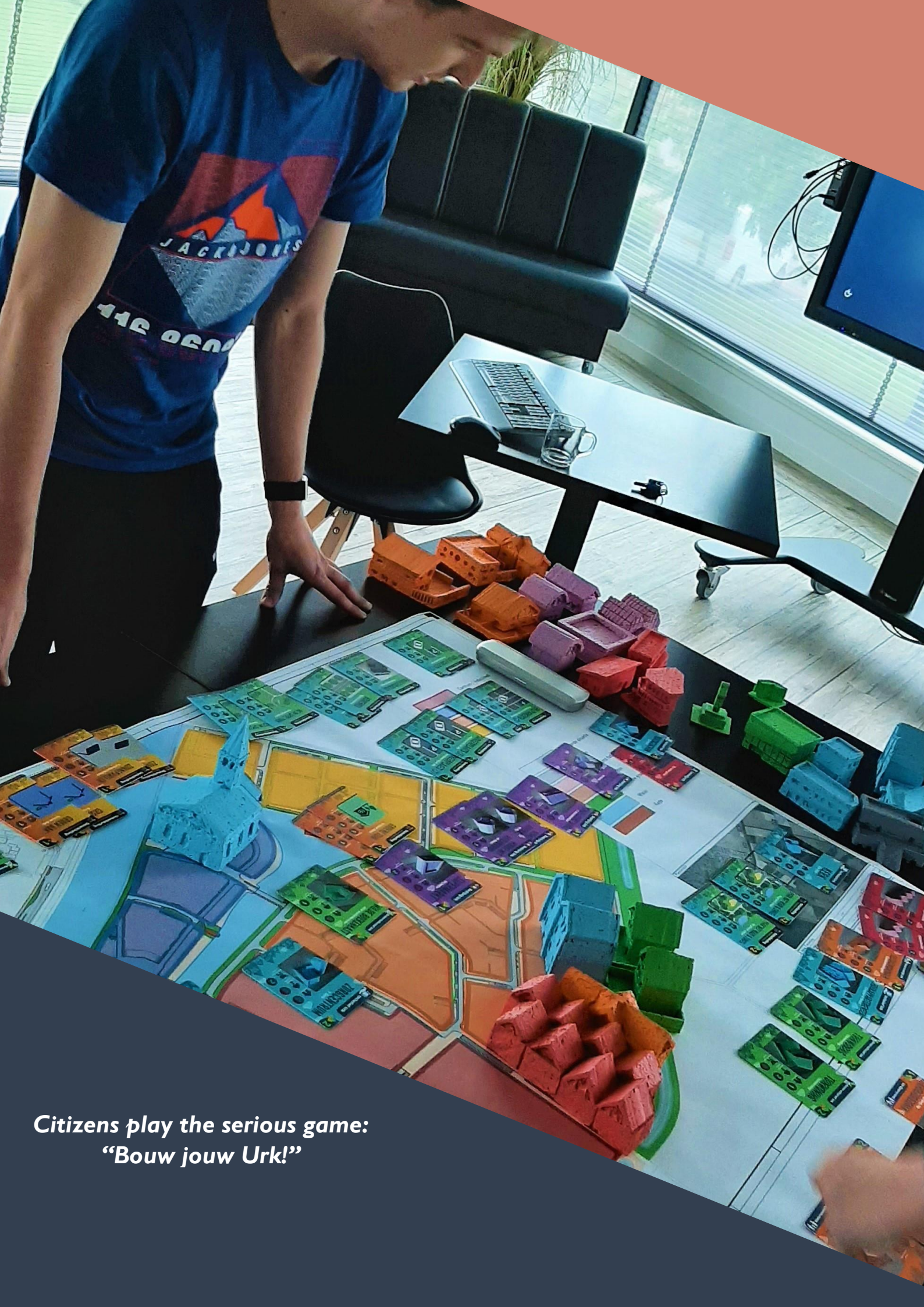
Table of contents

List of figures

List of tables

Citizens play the serious game:
"Bouw jouw Urk!"

1. Introduction

1.1 Research problem

In a techno-scientific developing society like the Dutch one, the need for expert knowledge and political actions based on this knowledge is growing. The focus on such experts -like scientists and consultants- poses a fundamental challenge to any attempt to involve the public in the specialised basis of such societies (Mitcham, 1997). Many opportunities concerning civil engagement and participation in spatial developments are lost, not just on a national level, but also on a municipal level. Incorporating participation matters in a project design can enlarge the effectiveness of implementation, play a role in cost recovery, and make up for any resource limitations of a national or local agency in handling programmes or projects (Bamberger, 1991). Moreover, involving citizens in the implementation of sustainable or technological urban advances has an informative function which proves to be a vital aspect of environmental adjustments by inhabitants. Citizens need to be informed about matters like energy saving options to willingly make adjustments to their behaviour or choices (Strong, 1995). In other words: though the knowledge of experts is often favoured in considering technological developments by authorities, the involvement of citizens themselves is the very basis for successful implementation of these.

The Omgevingswet, a legislative change in environmental and administrative law, explicitly endorses the importance of civic involvement. The law does not just oblige public bodies to involve corporations and citizens in the (strategic) choices they make make for the physical environment, but also stimulates private initiators to consult third parties and local residents in their developments. However, in implementing new policies and (re)developing areas, agencies are often struggling to translate the voices of their inhabitants into concrete desires. Hindress (1997) even speaks of a democratic deficit, as governing bodies within democracies seem to fail in connecting with their citizens, resulting in a crooked image of their aspirations. A lack in legitimacy behind decisions from a governmental perspective, and a perceived lack of civic engagement from a societal perspective, are imminent consequences of this insufficient contact. Putnam (1994) argues that a government stands or falls, not on the basis of social stability, ideology, or prosperity, but on the strong traditions of civic engagement. Taking these arguments into consideration, it is not surprising that the instruments of the Omgevingswet lawfully require a strong foundation in the form of civic engagement. The evident focus on participation in the Omgevingswet asks for creative ways to involve residents and corporations.

Unprecedented tools are making their debut to support the connection between authorities and inhabitants: serious games. This type of game has become a growing market in the video games industry, as well as a base for academic research (Breuer & Bente, 2010). Serious games connect entertainment with educational purposes. With the gamification of society, the interest and engagement of players are constantly sparked in new creative ways, like interactive camera apps, or gamified layers to academic courses (e.g. Codeacademy to teach ICT-students Java). A serious game can be used to share certain knowledge in an entertaining way, but it can also serve as a bridge between a governmental organisation and the inhabitants it is responsible for. With the right game design, a serious game could even be used as a type of questionnaire, so citizens can share their opinions and/or thoughts about a proposed spatial development interactively (Hamari, 2014).

With the creation of the new neighbourhood 'the Zeeheldenwijk', the municipality of Urk is pursuing the national 2050 deadline to become completely independent from natural gas. A collective heat system with one network operator would demand cooperation from every inhabitant, but an individual heating system grants inhabitants certain liberties and subsidies. Each alternative will impact the lives of the future inhabitants of the Zeeheldenwijk in financial terms, but also in their living comfort. The spatial planning department has commenced with the urban design of the neighbourhood, in which sustainable interventions like the latter will play an important role. The municipality wishes to involve citizens in this process by posing how this area should be designed according to them, keeping the sustainability ambitions in mind. Moreover, a participation process which entails an analysis of a citizen's proclivity for civic engagement will assist in setting up fitting participation policy to deal with the participation requirements imposed by the Omgevingswet. Methods on how to reach out to them on such complex matters in an efficient way remain undetermined though. The questions arise whether a participation programme in the form of a serious game could create this missing soundboard, and how this game would be designed.

Challenges lie in the creation of methods to overcome a rational ignorance gap, and scepticism from respondents towards the decision-making of the authority. High numbers of Urker inhabitants show protest towards energy transition measures like wind turbine parks (Urk Briest, 2019), and the votes for a political party rooted in reluctance towards energy transition have been high in the previous provincial elections. Deciding on the way a neighbourhood is set up is a complex matter in which personal interest plays a big role. However, the outcome cannot be determined by one party or the actor as an individual. Citizens and public bodies design neighbourhoods collectively. In order to come to a fitting urban design, information is needed from the conflicting interests and interaction between future inhabitants. This way, the values that matter to them the most can be distinguished and considered in the final plans.

With all this in mind, a game could serve as a useful tool to simulate this interaction, and test responses to the possible spatial interventions. A participation process like this could also provide insights in the way citizens feel connected to the local authority, and wish to be involved in participation processes. To be representative the game will need to reflect complex real-life elements of spatial planning and sustainability interventions, while remaining accessible, playable and understandable for inhabitants. Moreover, to overcome the rational ignorance gap, the participation process should entail incentives to stimulate inhabitants to partake. Maintaining a critical attitude toward the way the game is operating will allow for a thorough analysis of the way playing serious games and the inhabitant's perception of contact with governmental authorities correlate.

1.2 Research objective and question

The objective of this research was twofold.

Firstly, the objective was to set up a participation process, and to determine whether the participation experiment had changed the rate at which participants feel civically engaged with society and the municipality of Urk. This also entailed the question whether the participants' perceived civic engagement and motivation to get involved in governance participation in the future had been altered by the experiment. This input will be used by the municipality of Urk to set up participation policy, encompassing a framework on when, and how to consult citizens and corporations. A brief discussion of the cases in which a serious game can be used was also added to the analysis, in relation to Arnstein's ladder, and the instruments of the Omgevingswet.

The definition of 'civically engaged' and 'Arnstein's ladder' will be further elaborated on in the theoretical framework.

Secondly, the objective was to determine whether the players' perceptions of the serious game impacted these results. Changes civic engagement levels after the game might be due to a positive or negative experience with the serious game. This was a vital aspect to this research, because testing the relation between playing a serious game and perceived civic engagement is dependent on the functioning of the serious game. If the serious game was not at all playable, it seems logical that this will play out on civic engagement.

Lastly, from a municipal perspective it was of relevance to establish the personal (sustainable) preferences and values of the future inhabitants of the Zeeheldenwijk in order to set up an effective and legitimate decision-making process and gain ideas on the preferred urban design. Consult on these matters will be written in the form of an advisory report apart from this research trajectory, as the results of the game formally take no part in this research. The reason to not include these results in this research is to maintain a clear scope.

To support these objectives, the following question will be central in this research:

What effect does playing a serious game as participation process have on the perceived citizen involvement and motivation to engage in civic participation (rational ignorance gap, overcome negative attitudes towards government), and to what extent did the players' experiences with the serious game impact this effect?

Several subquestions have been formulated. Section A evolved around the first objective, whereas section B served the second objective.

A. Participation and civic engagement

These questions have been based on theory presented in the theoretical framework (Ch. 2.1-2.4)

- What differences can be found in civic engagement levels before and after the game?
- Which components of civic engagement have been significantly altered the most after the game?
- To what extent does a linear relationship exist between the rational ignorance gap and civic engagement (rational ignorance higher = lower civic engagement level)?

B. Perceptions of the serious game

These questions have been based on theory presented in the theoretical framework (Ch. 2.5).

- How did the players experience the game's elements (content, mechanics, narrative, graphics, framing)?
- To what extent does a linear relationship exist between the way players perceived the game, and the differences found in civic engagement?

1.3 Scientific and societal relevance

Finding answers to the questions stated previously found relevance in both scientific and societal fields.

Scientifically, serious games are an upcoming subject in scientific literature. The possibilities and effectiveness of such games are still being analysed -while games are internally developing at a high speed- and this is done increasingly in a setting of governmentally organised public participation. However, studies on the effects of serious games in such contexts seem rare. Subjects of the studies done vary from the use of serious game simulations in sports (Göbel et al., 2010), healthcare (McCallum, 2012), courses in formal school settings (Backlund & Hendrix, 2013), and military or governmental training (Susi et al., 2007). Moreover, no cases can be found which test the interdependence between serious gaming and civic engagement levels, though it is suggested as a yield from serious gaming (Poplin, 2013). Creighton (2005) also argues that the development of civil society is a direct effect of participation. Researching the decision-making process on the spatial interventions in the Zeeheldenwijk provided insights in the effects of a participation process on civic engagement and those of a serious game as a participation programme. One goal of participation may be to enhance civic engagement. This research was utilised as a method to test whether a participation process really lead to higher levels of civic enaggement.
The effectiveness of the game in this case was analysed afterwards, meaning some factors turned out to be more relevant than others for the practice of public participation. By establishing which factors lead to a more successful serious game participation process, a practical contribution can be made to the scientific literature as well. This knowledge can be used in further research or participation designs to guarantee more successful evaluations or studies on the serious gaming.

On a societal level, serious games can be powerful tools in order to establish communication between the city authority and its inhabitants. In a society in which the Omgevingswet nudges both public bodies (omgevingsplan/omgevingsvisie) and developers (omgevingsvergunning) to involve the public, tools like this are highly necessary. According to Dahl (1971), one of the core stones of a democracy is the belief in the possibility and desirability of governmental cooperation, meaning consulting with the public is vital to a healthy democracy. Gibson (1989) adds to that that the level of legitimacy underlies public judgements about the actions of authorities. Participative processes will highly add to societal support and agreement for policies and decisions, and the perceived fairness of the decision-making procedures behind it. Involving the public in the decision-making for the Zeeheldenwijk did not just contribute to the transparency and legitimacy of the decision-making process, but also provided the playing field for the use of serious games as a tool to do so. Serious games are an interactive way to inform the public about spatial developments. Moreover, this research took into account the motivation of citizens to partake in participation processes, and the effect of a participant's rational ignorance gap on their civic engagement levels. What drove citizens to visit a participation session? Establishing to what extent a citizen wished to get involved in decision making in the first place will carve the way for a more integrated and adjusted participation process, which fits the target audience. By testing the effectiveness of a serious game in relation to the target group, it can be established whether it is a useful method for participation. By pointing out the usefulness of serious games, they can become a versatile approach for other authorities to inquire about the inhabitants' needs and desires. This will not just lead to fortified democratic handholds (which are indispensable under the Omgevingswet regime), but also to an easier implementation phase to any spatial policy or development (Creighton, 2015)

2. Theoretical framework

In order to understand and describe the to be empirically observed phenomena (levels of civic engagement after a participation process), a theoretical framework was essential. A theoretical framework positions the research in a certain tradition, validity of the concepts used are strengthened, and theory will simply guide the empirical research (Cupchik, 2001). To establish the effect of participation in the form of a serious game on civic engagement, it had to be clear which aspects must be investigated for each of these variables.

The chapter will commence with the broader theoretical concepts, and an argumentation behind the choice to use these as the foundation for this research. Establishing which macro theories correspond with the research questions will allow for a mindful structuration of the research inquiry: it will add the theoretical demarcation. The assumptions were broken down into specific theories in order to accurately make sense of the observed practice (which follows from the empirical data).

Theoretical structure

Research objectives & main question	Determining the effect that playing a serious game as participation process has on perceived citizen involvement and motivation to engage in civic participation			Testing to what extent the perception of the serious game impacted civic engagement
Overarching concepts	2.1 Macro theory - Social Capital			
Theoretical underpinning	2.2 Public participation, rational ignorance	2.3 Serious gaming	2.4 Operationalising civic engagement	2.4 Evaluating the serious game as participation tool
Main authors	Creighton, 2005 Arnstein, 1969 Krek, 2008	Mayer et. al, 2014	Campbell, 2009 Flanagan et. al, 2007	Mitgutsch & Alvarado, 2012

Figure 1. Theoretical Structure. Source: personal collection.

Paragraph 2.1 holds a critical investigation of the theory of social capital. This macro theory will be leading for the hypotheses. The reader will find that the social capital theory predicts a rise in civic engagement levels after engaging in a serious game participation process.

In paragraph 2.2 the concepts of public participation and rational ignorance are analysed. Arnstein's ladder will be introduced, and the place of rational ignorance in public participation processes will be established.

Paragraph 2.3 combines the insight in public participation with serious gaming. A theoretical and practical inquiry is done on serious games. The place of the serious game on Arnstein's ladder will be explained. Finally, the concepts of public participation and serious gaming are combined in an encompassing framework by Mayer et. al (2014).

Paragraph 2.4 operationalises civic engagement. The paragraph provides handholds to test the effect of a participation process in the form of a serious game on the perceived civic engagement of the respondents.

Paragraph 2.5 serves the second research objective: determining to what extent the experience of the serious game can be held accountable for the changes in civic engagement. The way a serious game is designed and played may have a big impact on changes found in civic engagement after.

The serious game was set up prior to the research. Answers to the question 'which decision will the serious game evolve around' or 'what type of game fits the decision-making process at hand' have been added to the Appendix, though the theoretical and methodological foundations needed to answer those questions were mentioned in the theoretical framework and later in the methodology.

2.1 Macro Theory – Social Capital

<u>Introducing social capital</u>

When looking at the main question, one macro theory most definitely comes to mind: the theory of social capital by, among others, Bourdieu.

"Social capital is the aggregate of the actual or potential resources which is linked to the possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition (Bourdieu, 1986)."

In other words: social organisation, such as trust, norms and networks, can improve the efficiency of society by facilitating coordinated actions (Putnam, 1993). These relationships and networks create *structures* that facilitate certain *action*. "Relationships invested in, whether consciously or unconsciously provide indirect benefits as a facilitator or means of producing a consumable good (Glanville, 2009)." These benefits are where the concept of *capital* comes from.
An example has been brought forward by Coleman (1987), who concluded that school dropout levels had been reduced after the investment in family relations. In the studies, the social development of children has been found dependant on the structure in which it inheres: a family.

A participation process can be seen of one of those social structures. It can be described as a group that comes together for some mutual interest, which, in turn, facilitates coordination and cooperation for the mutual benefit and the benefit of the community (Claridge, 2004). Such processes may lead to the societal resource in the form of more perceived civic engagement, and therefore e.g. more access to the means to influence decision-making on higher political levels. This clear cause-effect relation would fit the positivist paradigm. In this research the choice has been made to focus merely on the civic bonds between the participant and the municipality.

Conceptualising social capital

Definitions of social capital seem to conflict, yet to comply with each other. It must be kept in mind how social capital theory has often been criticised for its variability. One peek into literature on social capital, and one will have seen articles in which social capital is seen as a miracle concept to connect social phenomena to societal pay off or even economic resources, as well as articles in which it is called ill-defined or fundamentally flawed (Fine, 2002; Sobel, 2002). It is for this reason the operationalisation of the concept must be well considered in this particular setting, and why lessons must be drawn from these critics. One of the prime lessons by Sobel (2002) and (Mayer 2003) is that there must be a clear differentiation between the identification of social capital and the resources obtained from, or through it. Moreover, Clardige (2018) has analysed the statements of various critics and created a list on mistakes to avoid while using social capital in research. Among these are that 1) the context where social capital is investigated mustn't be forgotten (fitting the interpretive constructivist paradigm), and 2) an existing instrument or definition has to be used when possible. These lessons have been taken into account throughout the theoretical frame.

The empirical inquiry will take place in the context of government-citizen relation. Where *bonding social capital* would fit an investigation of horizontal ties -strong norms, close local communities-, this setting asks for an analysis of *external linking social capital.* This type describes "norms of respect and networks of trusting relationships between people who are interacting across explicit, formal or institutionalised power or authority gradients in society" (Claridge, 2018). The addition of *external* means that the interconnection between community and government, rather than the internal heterogeneity within social communities is sought. A study by Wollebaek & Selle (2002) explores similar norms and networks, but gained from voluntary associations rather than a participation experiment. The same concept used in the article is true for this research. Being that providing a real-life practice in what it takes to make collectively binding decisions in a small scale setting, becomes an asset in taking civic action outside the organisational environment. Social organisations, or rather, participation experiments yield returns in human capital, given that personal skills and capacities to enable civic action can be gained from them.

From this perspective, one can conclude that a participation process in the form of a game (a small scale setting in which collectively binding decisions have to be made) will lead to linking social capital, being norms of respect and networks of trusting relationship between citizen and government. This investment in these relationships will yield returns in human capital, being personal skills and capacities to enable civic action or: higher levels of civic engagement.

Now that overarching concepts have been determined, each concept has to be broken down in empirically investigable variables, starting with the concept of social organisation, or participation.

2.2 Public participation – Climbing Arnstein's ladder

Definitions of public participation

The definition of public participation is contested in the literature, though Creighton (2005) comes forth with a definition containing several returning elements.

Public participation applies to administrative decisions, typically made by agencies, private organisations, non-elected officials or judges. An interactive process is set up between the organisation which has to decide upon a certain matter, and people who wish to participate. This is an organised process; not accidental or coincidental, and will impact the decision being made to a certain extent.

Public participation can be beneficial for both authorities and participants. From the experience gained from three hundred participation cases, Creighton (2005) could set out the following advantages:

- ❖ *The quality of decisions improves*. Seeing as the public holds valuable information on contemporary conditions in their environment, or how a plan should be implemented, consulting can clarify objectives and requirements for a policy. Hidden assumptions which come to light might be crucial for the governing body to overthink elements of the decision or plan at hand, leading to a more effective solution.
- ❖ *Costs and delays are minimised.* Unilateral decisions are quicker to make compared to a decision with public participation, as (often time consuming) methods of public consultations are not included. However, a unilateral decision may become tied up in controversy, delays, or litigation because of the lack of societal support, and the insufficient knowledge base on conditions and values in a certain neighbourhood. A decision with public participation often leads to a confident and hudder-proof implementation phase (figure 2). Moreover, with unilateral decisions and a stiff implementation phase, the community impacted by a decision may be reluctant towards future projects.
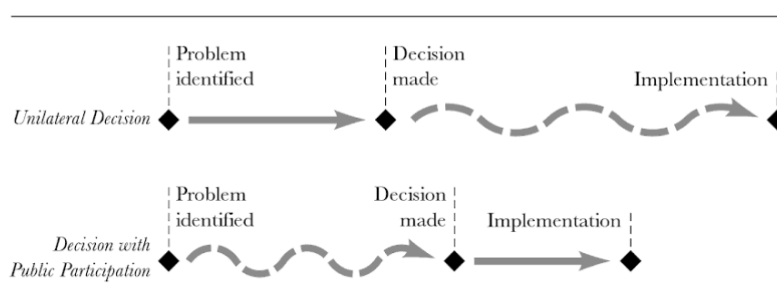
Figure 2. Comparison of length of time: unilateral decision versus public participation. Source: Creighton (2005).

- ❖ *Consensus building* is done via public participation programmes, leading to understanding, agreement, networking, and commitment between (otherwise divergent) parties.
- ❖ *Increased ease of implementation* is a logical result from consulting with the public. By involving citizens, a part of the responsibility for the decision-making is put in their hands, and they will more likely want to see it work. It will give the decision a political bias, but individuals and groups may wish to assist in the effort of implementing it too.

- ❖ *Worst-case confrontations* are more likely to be avoided. Public participation can be a tool to connect parties, without animosity, because they are each invited to share their concerns and needs.
- ❖ *Credibility and legitimacy* will be maintained. A visible and credible decision-making process will not only inform the public on the reasoning behind it, but also create a legitimate pedestal for final decisions.
- ❖ *Anticipation on public concerns and attitudes* will be enabled by public participation. The staff of the authority at hand will commerce with the public, which allows them to become more sensitised to public concerns and feelings towards the agency's (future) pursuits.
- ❖ *Civil society will be developed.* By involving citizens in societal/spatial issues, they will be educated on the subject, and learn why and how certain decisions are made. Coalition-building and working together efficiently/effectively in such programmes will leave citizens with core leadership abilities, which allows them to step up to represent groups or interests in the future.

However affirmative contemporary literature may be of public participation, one must take less favourable effects or unintended consequences into consideration. Take the bullet *consensus building* above as posed before by Creighton for example. Mansuri and Rao (2013) report on participatory projects which failed to build cohesive organisations. Incentives and material rewards nudge people to participate and network, though these mechanisms have dissolved in several cases as soon as these pay offs are taken from the project. As a result, the spark for taking collective action and civic engagement beyond the participatory project will disappear as well. This aspect made it all the more intriguing to investigate the effects on civic engagement of a participation experiment *after* it had come to its conclusion. That aside, when inspected properly, the advantages above may serve as positive outcomes to participation and can thus be described as social capital. In paragraph 2.3, these concepts will return in a workable form for the empirical inquiry.

Practice of participation

An interactive process of public participation can have different levels of involvement for the citizens partaking in it, varying from direct democracy to informal consultation (Bishop & Davis, 2002). This infilling of participation is what has an effect on how a serious game and/or its players turn out. In various scientific studies (Rocha, 1997; Wondolleck et. al, 1996) and among different authorities (Gemeente Schiedam, 2020; Gemeente Ijsselstein, 2011) a widely used figure to define these distinctions, is one created by Arnstein (1969). Figure 3 provides an overview of the possible power distributions in public participation as intended by her.
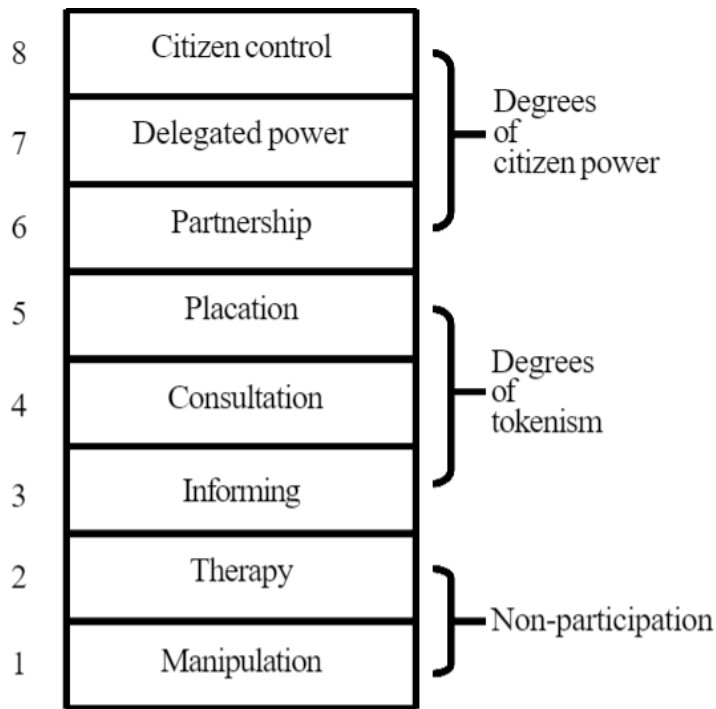
Figure 3. Eight rungs of citizen participation. Source: Arnstein (1969).

The bottom rungs (1) Manipulation and (2) Therapy describe a scenario in which powerholders attempt to educate or 'cure' the participants, rather than enabling them to impact the decision-making process. These are followed by (3) Informing, and (4) Consultation, in which citizens may hear and be heard, but lack the tools or power to influence the decision-making process. Placation (5) involves slightly more ground rules for citizens to share their opinion, though no guarantee is given by the authority that these will be taken into consideration. From then, citizens gain an increasing amount of power on the ladder. In a (6) Partnership, participants are allowed to negotiate and engage in trade-offs with authorities, whereas (7) and (8) set out a scenario in which the majority or all of the decision-making is done by the citizens (Arnstein, 1969).

It is important to recognise that this hierarchical structure suggests citizen control as a goal of participation. Something that was criticised by Tritter and McCallum (2006). Arnstein took on a critical pose from a citizen activist background in the creation of these rungs, implying failure or deligitimisation when the top rungs have not been achieved. In contrast, Haywood et al argue that citizens may be content with the attainment of lower levels. Bishop and Davis (2002) add to this that the uniqueness of many policy problems may require different levels of participation. In conclusion: lower levels of citizen participation may not necessarily be disadvantageous or a form of failure, as was initially suggested by Arnstein (1969), though it may have an effect on the eventual pay off or gained social resources of a participation process.

Determining which level of citizen participation is preferred will allow the distinction of particular instruments and setting out the implementation of the participation programme. In finding handholds to set up the process, a decision-based approach can be taken on. Thomas (1990) comes forth with five decision making types which will influence the way such a process is built up:

- Autonomous managerial decision - without public involvement
- Modified autonomous managerial decision - information is sought, but the decision may not reflect group influence
- Segmented public consultation - problems are shared among segments of the public for ideas and suggestions, and the decision reflects group influence
- Unitary public consultation - the problem is shared among the public as a single assembled group, and the decision reflects group influence
- Public decision - the assembled public and the decision-maker attempt to reach agreement on a solution

As will be seen in the paragraphs to come, a key factor for the outcome of a participation process is the place on Arnstein's ladder. If the decision making mandate is on the side of the inhabitants, there is a higher chance they will feel more concerned about partaking in a participation process in the first place (with its effects on the levels of civic engagement). In this case, this means that the outcome of the serious game is dependable on where the participation process belongs on the ladder. Moreover, the outcome depends on some other participation process factors, which will be broached next.

Rational ignorance

A players' situation before and after the game is influenced by several factors, among which the motivation to play the game (Mayer et. al, 2014). Following up on that, Krek (2008) brought forward the theory of rational ignorance, similar to Gunning's (2002) public choice theory. These theories are based on the idea that citizens will often make a rational choice -often leading to ignoring a participatory process-, based on the investment of effort/time that they have to put into the planning situation. Citizens weigh these factors against the assurance that their wish will be granted, and against other activities that they will be able to invest their time and energy in (Krek, 2005; Gunning, 2002). A further distinction can be made between rational ignorance, and two other types of ignorance which may play a role in public participation as well: inadvertent ignorance and irrational ignorance.

Inadvertent ignorance may occur when an individual has no knowledge of the existence of a type of information, meaning that actions evolving around this information will never come to mind. An example of this ignorance has been drawn by Somin (2015), who sketches a scenario of a woman struggling with a psychological trauma. She never heard of psychotherapy, and therefore is ignorant towards this possibility for alleviation of the trauma. This type of ignorance can be avoided to some extent by thoroughly informing citizens partaking in public participation on the relevant subjects. Irrational ignorance is more complex to tackle. This arises when an individual consciously avoids learning about a certain subject, because it is a counter to his/her own goals or beliefs (Somin, 2015). Someone might avoid information on the yields of wind turbines, because he/she is against the placation of them for reasons like horizon pollution.

Restraints for the public party in the form of time, energy and cognitive capacity will be present in every public participation process, regardless of the implemented methods (Krek, 2005). Whereas rational ignorance is not necessarily wrong –every individual principally attempts to maximise own objectives, regardless of whether those are good, bad, or indifferent-, it can stand in the way of creating groups which are representative of the envisioned population. This has an effect on the structure that is built through participation.

Though this rational ignorance gap will always occur, measures can be taken to minimise its effects. In order to do so, the authority making any decisions can choose to make the participation process more innovative and attractive for participants (Krek, 2005). One could ask themselves whether a serious game would classify as more innovative and attractive. This, as well as the applicability of the rational ignorance gap for this particular participation will be taken into account.

It has been established that the way the process is set up (or where it belongs on Arnstein's ladder), as well as the rational ignorance gap are factors which influence the eventual changes a player experiences in attitude, knowledge, skills or behaviour (Mayer et. al, 2014). Player properties addressed in this research were, among other things, changes in knowledge on particular energy transition heat interventions, and changes in civic engagement in the form of *external linking social capital* (bonds between people and government). What made this participation process stand out from most other types, however, is that inhabitants are not consulted by means of a survey or citizen meeting, but a serious game. This gives rise to a few questions. What is a serious game exactly? What are motives to choose for a serious game as participation process? And what is the relation between a serious game and the concepts investigated, being participation, and civic engagement?

2.3 Gaming – Participating in all seriousness

<u>The serious game as a participation tool</u>

Harris & Weiner (2002) were two early authors to analyse an integration of applications or games into participatory processes. In the field of spatial planning, these tools or serious games can be made in order to attract citizens to discuss interventions in their direct environment. Applications or games allow communication through different channels. Moreover, plans and ideas become clearer from smart visualisations, and borders of time and place fade when digital games are used (Moody, 2007). Not just applications can be applied to participation processes. For example board games, too, can be used as a tool to simulate a collective decision-making process:

"Reduced to its formal essence, a game is an activity among two or more independent decision-makers seeking to achieve their objectives in some limiting context. A more conventional definition would say that a game is a context with rules among adversaries trying to win objectives" (Abt, 1970).

This definition does not yet hold an operationalisation of a game, though one is published by Littlejohn (1989). He argues a game can be seen as a system with the following defined parts:
- objects as parts, elements, or variables within the system,
- attributes, constituting the properties of these objects,
- relationships among the objects and,
- environments, in which the objects exist and interact.

Each of these parts make up the way the game is designed and played, the infilling being dependent on the type of game. Appendix B (game information) follows up on this with a brief consideration between types of games, and reasons why a particular type was chosen for this research.

The technical approach by Littlejohn seems to match the portraying of games in contemporary literature, in which games are often mathematically analysed like structures which assimilate strategic behaviour. This is done by means of game theory. Game theory defines the structure of possible actions/outcomes of decision makers with conflicting preferences. Game theory is based on the idea that actors examine the others' strategies and try to adjust theirs to it to optimise the pay-off. Multiple dimensions can be added to this structure: a certain number of stakeholders, forms of interaction between them, or the availability of information during the game can greatly alter the outcome of the players' activities (Lenferink et al, 2016). It changes the players' interdependence. This is what makes serious games stand out from other participation tools. A serious game can be shaped in such a way that it offers the right environment or playing field to simulate interaction between citizens, each with their own stakes. Some participation processes evolve around finding an outcome to certain societal issues in a jungle of conflicting interests. An individual survey cannot encompass the way citizens respond to each other in times of conflict. During a focus group interview it may also be hard to create the right environment to provoke a well-grounded discussion. With a serious game, however, the researcher is able to create the circumstances needed to light a discussion, and push players to find a collective (visually shown) solution. Moreover, playing a game stimulates different parts of the brain, enabling players to learn by means of links or associations otherwise not made (Wait & Frazer, 2017). During the creation of a serious game one must, however, keep in mind that the alterability of serious games also makes it harder to apply to more complex real life situations. After all, a game must be seen as a simplified model of reality (Dixit & Skeath, 2004).

It may also be a shortcoming that a game, simple as it may be, may not be technically or practically accessible for some participants (Backlund & Hendrix, 2013).

In the light of these shortcomings, the question rises which place a serious game could have on Arnstein's ladder. Within the top two rungs the authority at hand completely leaves citizens in control of the final decision, or delegates a part of its power to citizens. Would it be possible to design a serious game, to be played by the citizens in control, with which a final decision can be made?

Two things are striking when analysing contamporary literature. Firstly: existing studies on serious games often regard games which are used as a helping tool to support the final decision made (McCacllum, 2012; Poplin, 2012; Lenferink et. al, 2016; Göbel et. al, 2010). The results of serious games are not used as the 'final call', which is logical, taking into consideration that a game can never contain every aspect of reality. It will always be a fictitious or artificial situation in which the players are expected to perform.

Secondly: serious games are often used by authorities or companies to achieve certain goals with their citizens or employees (f.e. getting input on certain subjects, or for educational purposes). If a government or company would design the serious game, it will always be biased because it contains premade paths that can be taken by the players. A serious game will always have a limited amount of outcomes. In fact, this would happen with every serious game, even if it was designed by citizens themselves. This means the range of a serious game as a participation tool in itself is limited on Arnstein's ladder. A decision based on the results of a serious game will always need support from other participation methods, or expert knowledge in order to fully capture a case's essence. Practically, this would mean that a game in itself would only maximally form a consult (row 4 of Arnstein's ladder). As seen in the case of Lenferink et. al (2016), the actual value of their serious game lied in getting insight in the processes behind the eventual outcomes, rather than the outcomes themselves: how did players interact, and respond to certain circumstances?

Participation, civic engagement, and the serious game

Mayer et. al (2014) created one encompassing conceptual framework which visualises the exact links between a serious game in a participative setting and pay off for the players (figure 4). Breaking down the figure, a few basic concepts can be derived which prove especially useful within the scope of this research. These will be elaborated on in the paragraphs to come.

- Players, every one with their own backgrounds (1, 2), exist in a pre-game condition (3) which may be altered by playing a serious game. *Insights were ideally gained by the players during the game.

- The impact on their initial knowledge, skills, or attitudes (5) is dependent on the design of the serious game (4). *If a game is not at all understandable, it will have an impact on a players' ability to learn from it.

- Overarching organisational, institutional, and/or social characteristics influence the participant's pre-game situation (6). *If a player does not feel they can alter the decision making process, the outcome of the game in terms of learning and/or change in behaviour will turn out differently. As stated by Bowler & Donovan (2002), citizens that are exposed to democracy are more likely to perceive that they are capable of participation and that the government will be responsive to them. If the citizen has the means and clear tools to influence the decision-making process for a spatial intervention, they are more likely to participate in processes and democratic practices.

- The possible gain in knowledge, skills or attitudes of the participant, in turn may influence this organisational, institutional, or social structure. Noteworthy is how this concept portraits the social capital theory. * The structure benefits (or suffers, in a bad scenario!) from the change in knowledge, skills or attitudes. *A game on energy transition may educate players in such a way that they will be more open to energy interventions in the future.
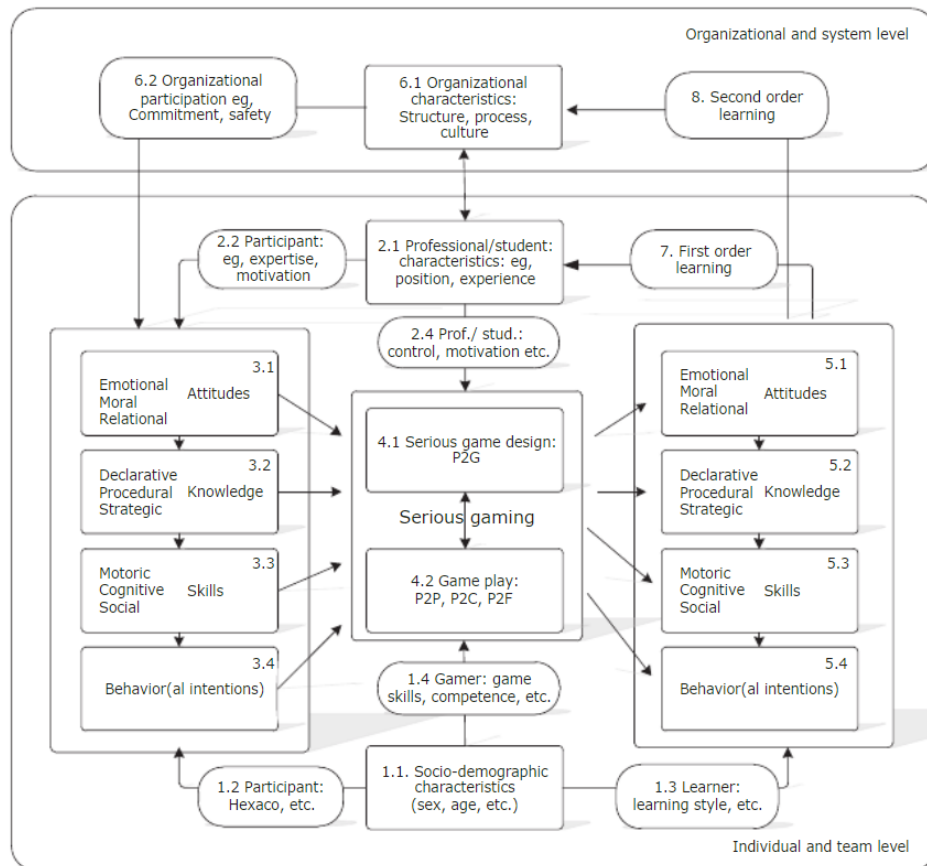

Figure 4. Conceptual Framework for evaluating serious games. Source: Mayer et al. (2014)

The last theoretical footstep in order to formulate answers to the first part of the main question, will be to investigate how to measure civic engagement.

2.4 Operationalising civic engagement

There is no universally agreed upon definition for civic engagement. One striking definition has been given by Adler & Goggin (2005).

"Civic engagement refers to the ways in which citizens participate in the life of a community in order to improve conditions for others or to help shape the community's future."

It is true that participation overlaps in definition with that of civic engagement (Flanagan et. al, 2007; Campbell, 2009), which may a hint of suggest circular reasoning in the main question. However, as can be seen in the table with civic engagement indicators below: civic engagement is much more than just participation. Participation is mostly defined as an indicator of civic engagement in contemporary literature. The question remains whether this one aspect of civic engagement leads to a change in other parts of civic engagement as well. Also: is a partaking citizen more likely to get involved in participation processes in the future? It can be concluded that overlapping definitions do not pose a problem in this case.

An index covering a broad range of aspects conceptualising civic engagement has been created by Campbell (2009) on the basis of the US National Civic Engagement Study. The index holds four classifying forms of engagement, as shown in the table below. Indicators have been added from the adolescent civic engagement study by Flanagan et. al (2007). Note that one classifying form of civic engagement does not necessarily exclude the other or exist independently of another (Campbell 2009). It is for this reason all indicators have been derived from multiple existing engagement studies to enlarge the research reliability. This way, the investigation of indicators after carrying out the experiment stays closest to existing scientific practice. Moreover, indicators have been adjusted to the local situation and to the focus on linking social capital (relationships between citizen and government).

(Table shown on the next page.)

Operationalisation of civic engagement

Classifying form	Indicators	Ability or urge to…
Electoral Index	Trustworthiness of officials	Trust an official
		Believe that officials listen to the citizens they represent
		Believe that officials give a lot of their time to make the community a better place
		Believe that officials are concerned with serving their fellow citizens
	Government responsiveness to citizens	Believe that the government cares about her citizens
		Believe that government affairs are for the elite or rich
		Believe that government cares for him/her personally
		Believe that citizens should have more influence in government affairs
Expressive index	Competence for civic action	Create a plan to address a community problem
		Get other people to care about the problem
		Organise and run a meeting
		Express views in front of a group of people
		Identify individuals or groups who could help with the problem
		Write an opinion letter to a local newspaper
		Call someone never met before to get their help with the problem
		Contact print or broadcast media about the problem
		Contact an elected official about the problem
		Organise a petition
	Political interest	Enjoy talking about politics and political issues
		Be interested in a career in politics and/or government.
	Critical consumer of information *Processing of media items has been brought forward as component of civic engagement by Lee, Shah & Mcleod (2012)	Listen to people talk about politics even though one already disagrees with them
		When seeing or reading a news story about an issue, try to figure out if they are telling one side of the story
		Think about underlying principles behind news
	Support for government policies	Believe that newspapers should not criticise the government.
		Support government rules and laws.
		Believe it is wrong to criticise the government.
	Protesting civic engagement	Participate in a boycott against a company.
		Refuse to buy certain clothes.
		Participate in activities such as protests, marches or demonstrations.
	Expressing personal voice	Talk to people to explain why they should vote for or against one of the parties or candidates during an election.
		Express personal views on a website, blog or chatroom.
		Work as canvasser (someone who goes door to door) for a political party or social group.
		Display stickers, posters or buttons for a certain cause.
	Media consumption	Watch the local news on TV for information on politics/municipality and current events.
		Listen to the radio for information on politics/ municipality and current events.

		Read internet articles for information on politics/ municipality and current events.
		Read the local newspaper for information on politics/municipality and current events.
Civic Index	Participation	Participate in governmental processes
		Visit a neighbourhood/governmental information session
		Believe participating will make a difference for the decision on the issue at hand by government.
		Believe input from citizens in participation processes is taken into consideration by the government.
	Volunteering	Volunteer for a political party or organisation
		Contribute to a campaign
		Volunteer to help needy people
		Volunteer in a group to solve a community problem
	Civic accountability	Believe that if one cares about their environment/place of residence, one should notice its problems and work to correct them
		Oppose a policy because of care for their environment/place of residence and the wish to improve it.
		See it as responsibility to be actively involved in community issues.
		Believe that being concerned about state and local issues is an important responsibility for everybody
	Political efficacy	Believe a difference can be made in his/her community by him/her.
Voting	Engagement in electoral politics	Vote in local elections
		Vote in provincial/waterschap elections
		Vote in national elections

Table 1. Civic engagement operationalisation. Source: Adjusted from Campbell (2009) and Flannagan et al. (2007).

Returning to the conceptual model by Mayer et. al (2014), the changes in knowledge, skills or attitudes for participants' will be measured by means of these indicators.

2.5 Evaluating the serious game as a participation tool

The serious game was a vital aspect of the research. It determined the eventual research results for a great deal. This underscores the indispensability of an evaluation of the serious game.
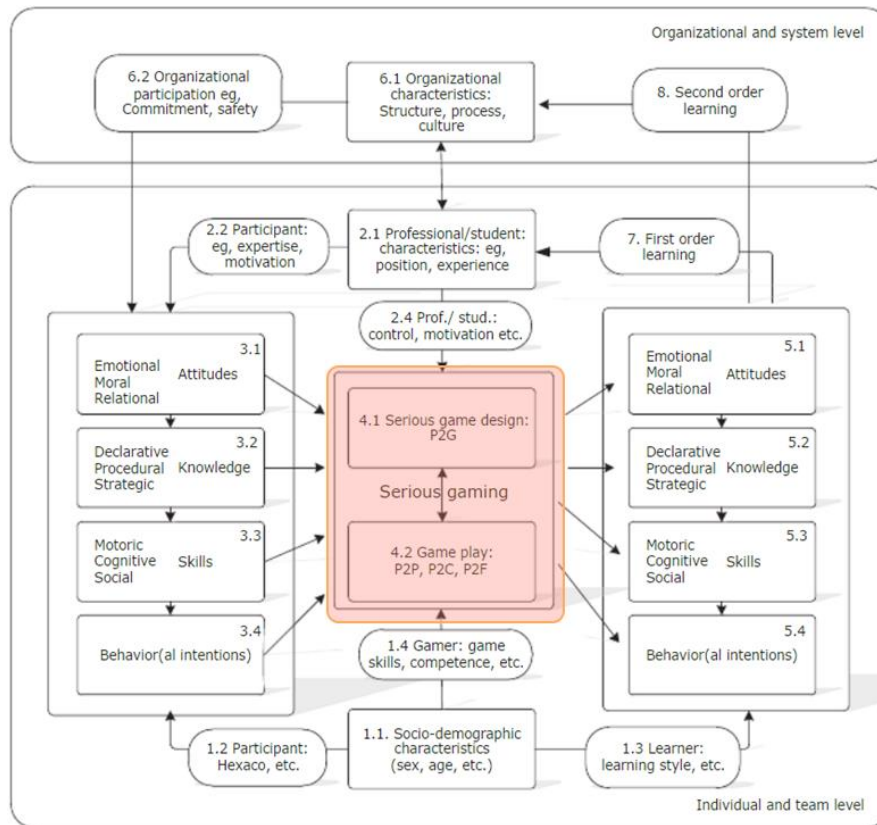
Figure 5 (repetition). Conceptual Framework for evaluating serious games. Source: Mayer et al. (2014)

With this research an attempt was made to determine whether the participant has learned from playing the serious game, and whether a change in attitude has occurred (civic engagement, attitude towards government). With this aim, the previously addressed literature provided enough handholds for testing the pregame and postgame conditions, as well as the participant's characteristics. Moreover, the organisational structure (figure 5) in which the game operates was derived by noting where the participation process belongs on Arnstein's ladder.

What was left, was the game design and game play, shown in the middle of the framework. Mayer's article provides no insight in what should be researched or evaluated within these concepts (4.1, 4.2). Learning from previously conducted serious game projects, like Poplin's NextCampus game, storytelling is one vital aspect to make a game more attractive to play. Moreover, a creative effort such as sketching, drawing or building is said to be "particularly well-suited to capturing objects and situations in a spatial environment". Though statements like seem to be the foundation to building a successful serious game, literature on particular serious game projects often merely portrait their game before proceeding to state the results (Alonso-Fernandez et al., 2019). In doing so, they miss an evaluation of the serious game used, even though the design and mechanics of a serious game is defining for the results.

Mitgutsch and Alvarado (2012) picked up on a lack in sufficiently encompassing assessment or tools to do so in the first place, and created the means to establish whether a serious game truly goes 'beyond entertainment'; whether it is a game which is 'purposeful by design'.

Figure 6. Framework to analyse the game's design in relation to its purpose. Source: Mitgutsch & Alvarado (2012)

Shown above is an holistic framework to analyse the game's design in relation to its purpose. The reason why this assessment tool was chosen for this study among others (Winn, 2007; Annetta & Bronack, 2011) was because it holds the means to differentiate between the game's design and the play experience. This model enables the investigator to approach the game elements both objectively (in relation to the intended aim/purpose), and subjectively (in relation to the designer and player experience).

The purpose of the game should be reflected in all the elements which support the game system, shown in the black circles. The purpose of the game is what should be defined first. A serious game is explicitly designed to reach a specific purpose beyond the game itself. The purpose has to be reflected in the aim, topic, the designer's intentions, and his/her intention to impact players in a specific way. If the game had no impact on the player in a real life context, it missed its pivotal purpose.

It was established before that players, each with their own conditions, bring their own intentions and purposes to the gameplay experience. A game might be understood differently than intended by the designers. However, the configuration of the game system influences how players read and experience the game. The aspects shown in black make up the cohesiveness (connection between game elements) and coherence (logicality and consistency) of the game.

Combining these concepts, the following questions can be formulated in order to evaluate a serious game.

- To what extent were the players impacted (in real life), taking the game's purpose and aim into consideration?
- To what extent was the content/information well presented, correct, and easy to access?
- To what extent did the game mechanics fit the purpose of the game, and how did the players experience this way of playing?
- To what extent did the narrative fit the purpose of the game, and how did the players experience this story?
- To what extent did the graphics/aesthetics fit the purpose of the game, and how did the players experience these aesthetics & graphics?
- To what extent did the framing of game elements fit the game's purpose, and how did the players experience the framing of the game? (Did they have enough skills to play the game, was it easy to learn from the game?).

The evaluation of the serious game can be found in Appendix C.

2.6 Conceptual model and hypotheses

Conceptual model

What follows from the examined literature is the following conceptual model. Involvement in a participation process is portraited as the independent variable. Partaking in such processes has a certain effect on the level of civic engagement – the dependable variable. Note how civic engagement consists of the four categories, shaping civic engagement into a compound variable (Ch 3.5). The dependency between partaking and civic engagement is influenced by three covariables, being the participation setting, the rational ignorance gap, and the game factors.
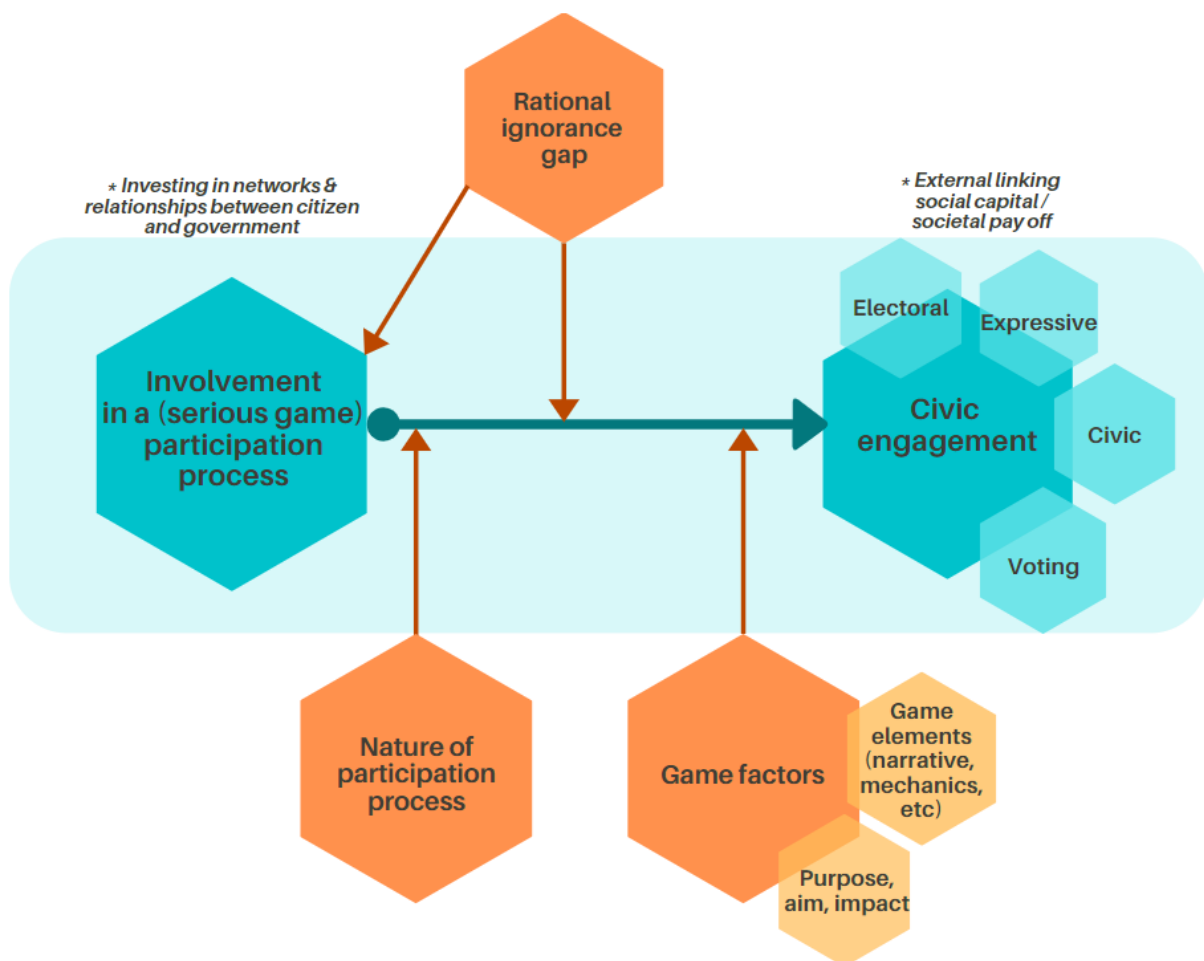
Figure 7. Conceptual research framework. Source: personal collection.

As established, the type of participation process in terms of where the process belongs on Arnstein's participation ladder has an influence on the outcome of it. Eventual input as well as output will depend on how much the citizen can influence the decision at hand. If the purpose of the serious game is merely to inform citizens, partaking in a participation process has a smaller chance to lead to higher levels of civic engagement. After all, their input would seem less valuable to the municipality, and their motivation to partake in the future may shrink.

The rational ignorance gap can occur at two moments in time: before getting involved in a participation process and during the process, which explains the double dependency. Before partaking at all the citizen will consider the effort or time they have to invest into participating against other activities. The rational ignorance gap may also occur when the citizen (un)deliberately chooses to not get involved into such activities because the process is against his/her belief or he/she is simply not interested in sharing input for the sake of government affairs. During the process a citizen may also encounter subjects he/she is not interested in or which he/she principally opposes (investing in energy transition, for example). This may influence the eventual differences in the civic engagement levels.

The final covariable is shown in the conceptual model as 'game factors'. If a serious game is not at all understandable, accessible, or citizens have not been told properly what purpose the game serves for the municipality, this may alter the civic engagement levels as well.

<u>Hypotheses</u>

The chapter commenced with a scrutiny of social capital. The theory poses that investment in relationships or networks between government and citizen will lead to external linking social capital or societal pay off. This suggests that a participation process in which the bonds between citizen and government are addressed, will have a positive causal effect on civic engagement. The first hypothesis tested was therefore: getting involved in a participation process will significantly lead to higher levels of civic engagement in either one or multiple operational categories. H0 represents the scenario in which social capital is evident. H1 represents the scenario in which civic engagement levels are lower, or stay the same after playing the game.

H0: Pre-test civic engagement < Post-test civic engagement
Ha: Pre-test civic engagement ≥ Post-test civic engagement

The second hypothesis concerns the rational ignorance gap. It is suggested that if the rational ignorance gap is tested higher for the participant, the civic engagement levels will turn out lower. A linear relation is suggested. Therefore the null hypothesis states that the predictor (rational ignorance) has a statistical significant relationship with the response variable (civic engagement). If this is the case, the regression coefficients in the linear model are not equal to zero. If no significant relationship exists, the coefficients in the linear model are zero.

H0: $\beta_1 \neq 0$
Ha: $\beta_1 = 0$

The third hypothesis concerns the experiences the players had with the serious game and the possible changes seen in civic engagement levels. Another linear relationship is suggested. When the total experience of the serious game is tested higher for the participant, the change in civic engagement may have been positively altered by this. Hypotheses are therefore:

H0: $\beta_1 \neq 0$
Ha: $\beta_1 = 0$

The societal and scientific relevance of testing an hypothesis concerning the predictability of civic engagement among different types of participation processes could be very well substantiated. For example: playing a serious game leads to a higher gain in terms of civic engagement than a survey (with the same aim). Note, however, that the scope of this research goes no further than the effect on civic engagement of the particular serious game treated in this experiment (Ch. 5).

3. Methodology

This chapter will be based on the research-onion (figure 8) as posed by Saunders (2007). Saunders argues that a research process is made up out of layers, which narrow down the research process as more are peeled off.
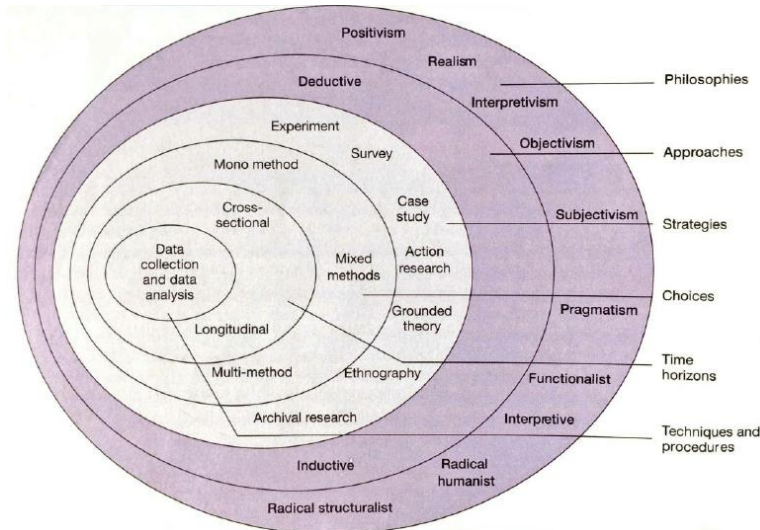
Figure 8. The Research Onion. Source: Saunders (2007).

3.1 Research philosophy and approach

The research commences with the adoption of a general philosophy, relating to the development of knowledge and the nature of that knowledge. The philosophy forms a basis for the definition of research questions and methods. Choices made on methods can be justified through the philosophy, and the research as a whole can later be evaluated on the basis of it as well (Cupchik, 2001).

One particularly useful article which holds an examination of possible theoretical research underpinnings is written by Habermas (1968). The type of human interest which is taken on in a research, as well as the kind of knowledge which the author is pursuing to collect are fundamental to the choice of research philosophy (table 2). Research methods follow from the choice of philosophy, though these will be further elaborated on in the methodology chapter.

Type of human interest	Type of knowledge	Research methods
Technical (prediction)	Instrumental (causal explanation)	Positivist Sciences (emperical-analytic methods)
Practical (interpretation and understanding)	Practical (understanding)	Interpretive Research (hermeneutical methods)
Emancipatory (criticism and liberation)	Emancipation (reflection)	Critical social sciences (critical theory methods)

Table 2. Examination of theoretical research underpinnings. Source: Adjusted from Habermas (1968).

One could argue that the interest and knowledge sought in this research leans towards a technical and instrumental nature. By asking the question what effect a serious game as participation process has on civic engagement, a causality is suggested between both variables. The researcher seeks generalisation: a serious game as participation process would lead to higher levels of civic engagement in more cases than just the observed one. What follows from these statements would be to take on a *positivist* point of view; its ontological stance that there is but one reality, its epistemological infilling that this reality can always be measured as long as this happens validly. By carefully and objectively collecting data on a social phenomenon -in this case levels of civic engagement- a lawlike statement can be made on human behaviour in terms of cause and effect. "Significantly, engaging in participation in the form of a serious game, leads to higher levels of civic engagement."

What must be noted, however, is that the main question also seems to require a deeper understanding for the world of lived reality and situation-specific meanings as well. What factors of a participation process change levels of civic engagement for the participants? This would nudge the research more towards an *interpretive constructivist* point of view. The constructivist ontology that the philosophy builds upon maintains that meaning is generated by individuals and groups (Cupchik, 2001), rather than the sturdy reality suggested by positivists. Particular actors are studied, with their own language and history, in defined places and times. This much is true for this research. After all, the phenomenon studied will be levels of civic engagement in the village of Urk. By attempting to measure *perceived* civic engagement, focus is put on the way actors construct reality themselves (on the basis of factors like place and/or time). The inquirer must determine how their meanings are embodied in their language and actions (Schwandt, 1998). The purpose of the interpretivist-constructivist perspective is to understand a particular phenomenon under unique circumstances, rather than generalising a population (Palic & Vignali, 2016). Among the lessons learned from several critics around working with social capital as a leading concept, was that the context where it is investigated mustn't be forgotten. This fits seamlessly with an interpretive constructivist paradigm. Results of any related inquiry will lead to results that are bound to location, characteristics of the actor, and treats of the serious game.

Seeing as both scientific paradigms have an apparent connection to the main question, both were leading for the research inquiry, as will be justified throughout the methodology.

A deductive method for the analysis was used. Whereas deriving a theory from observed data is central for an inductive method, deductive reasoning allows the investigator to test an existing theory or hypothesis. As argued in the theoretical frame, the concept of social capital allegedly predicts that participation would lead to higher levels of civic engagement. This was formulated in the form of a syllogistic hypothesis: from A follows B. When testing an assumption made on the basis of a theory, deductive reasoning is justifiably the most logical method for the analysis (Bradford, 2017).

3.2 Research strategy

The research strategy used is that of a *quasi-experiment* with a pretest-posttest design. The dependent variable (civic engagement) was measured once before the sample took part in the participation process, and once after. The goal of the experimental research strategy was to investigate cause and effect relationships between variables. The sample was manipulated in some way to determine the effects on the dependant variable (civic engagement). This nature is also in accordance with the chosen research paradigm (positivist) and the deductive method used in the research.

Whereas a true experiment would concern randomly sampled populations for both the operational population, a quasi-experiment evolves around a non-random sampled population, and may include a control group comparable to the operational population (Price, Jhangiani & Chang, 2015). The choice for a quasi-experiment therefore lies in the following two reasons:

1. There is a high probability that citizens who participate in the serious game experiment have higher levels of civic engagement from the start. As seen in the operationalisation of civic engagement, likeliness to participate in government processes or feeling that citizens can influence governmental decision-making are two examples of predicting factors for civic engagement which can play a role in this case. This means a randomised control group from, say, the citizens of Urk would not live up to the same initial level of civic engagement. It is for this reason the same group will analysed before and after playing the game, and the choice has been made not to consult a control group.
2. Due to corona measures it was not possible to organise a participation process at the town hall. This would have not only been detrimental for the municipality's reputation -which has to encourage citizens to remain prudent-, but it would have also been hard to play a maquette serious game while keeping at a 1.5 meter distance. Because of this, the initial idea to promote the game in the newspaper and create a sample on the basis of the group that enrolled could not be executed. Instead, the sampling was carried out for people in the same network or household. This suggests non-random sampling (see also Ch. 3.4).

With such a research design, the degree of certainty that the dependable variable truly altered as a result of the independent variable may be jeopardised by what happens between the pre-test and post-test. Factors like history -for example events which have influence over the imaging of the municipality occurred- or maturation -the respondents have changed personally- may be of influence on the dependable variable. This has negative influence over the internal validity of the research as the claims made on cause and effect may no longer be justifiable by the found evidence. By conducting the tests and playing the serious game on the same day, these alternative causes for changes in the dependant variable were excluded, and the effects on the internal validity were minimised.

A case study like structure was used beside quantitative methods to find answers to the second part of the main questions: '*to what extent did the players' experiences with the serious game impact this effect*?'. The case studied was the participation process in the form of a serious game. The reason why an alternate research strategy has been chosen to find answers to this part lies in the fact that experiences around the participation process cannot be captured in unambiguous survey questions alone. This methodological choice also relies on the interpretive component of the research.

3.3 Research time scale

The nature of the experiment was *longitudinal*. According to Jessor (1977), a longitudinal study 'plots trajectories of change over time in personality, social environment, and behaviour (Jessor, 1977)'. The intention of this study was learning whether the participant feels more or less nudged towards engaging civically after taking part in the participation process. As mentioned, the investigation took place before the participant played the serious game, and after, so any changes in the behaviour of the participant could be detected.

3.4 Setting up a participation process and game

<u>General preparation for the participation process</u>

In order to set up a successful participation process, it had to be established that the public can have useful influence on the decision(s) at hand. Moreover, though a clear deductive cause relation design is adopted, several situation-specific factors were taken into consideration so the type of participation could be adjusted accordingly. Going by the interpretive constructivist research philosophy as stated in <u>Ch. 3.1</u>, means these location-, time-, and actor bound conditions were indispensable. It underscored the need to define these, before setting up the game and experiment, so the participation could become a fully integrated part of the decision-making.

An approach to entail all the issues at hand, was by going through three stages of public participation planning, a model (figure 9-11) posed by Creighton (2005).
Firstly, the specific context of the decision-making around the issue has to be defined thoroughly. This decision analysis-stage is about setting out whether public participation is really necessary in this case. In the decision analysis, the theory as posed previously in <u>Ch. 2.3</u> on types of decisions will be used. Secondly, suitable activities of participation must be found that fits the decision-making. It must be set out what the authority wishes to gain from consulting with the public, and which groups or individuals are needed for the most successful consultation. In this stage too, the theory in 2.3 will be used, specifically the citizen rungs by Arnstein (1969) and the public involvement matrix by Thomas (1990). When these stages have been finished, planning the implementation is the final step. In this stage, one has to decide upon the specific methods to involve the public, like setting up workshops, facilitating meetings, the frequency of these, et cetera (Creighton, 2005). Below, these stages are depicted generally, though each stage had a more defined plan which was elaborated upon later in the methodology, and appendix A. <u>Appendix A</u> sets out the scope of the participation process, followed up by <u>Appendix B</u> with the aim and infilling of the serious game.
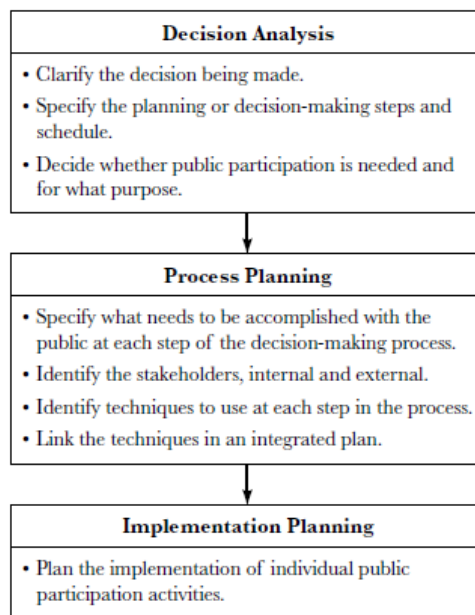
Figure 9. Three stages of public participation. Source: Creighton (2005).

The decision analysis was done on the basis of the following figure (10):
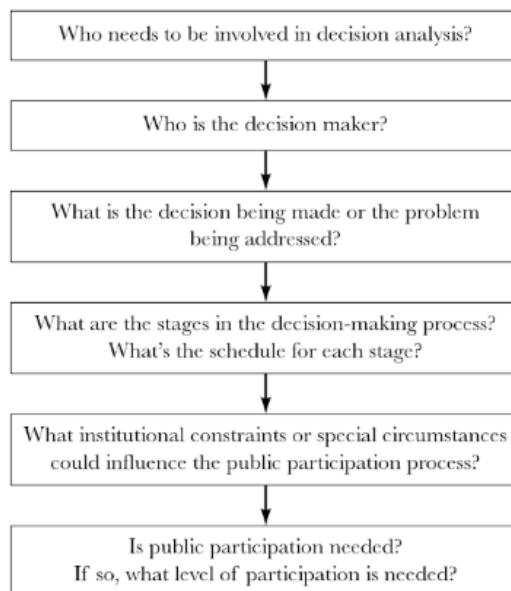
Figure 10. Decision analysis steps. Source: Creighton (2005).

After the decision analysis was carried out (Appendix A), the process planning could be commenced with (figure 11). The process planning will not be treated separately, as the components posed by Creighton were already treated in the theoretical framework, methodology, the decision analysis, and below.
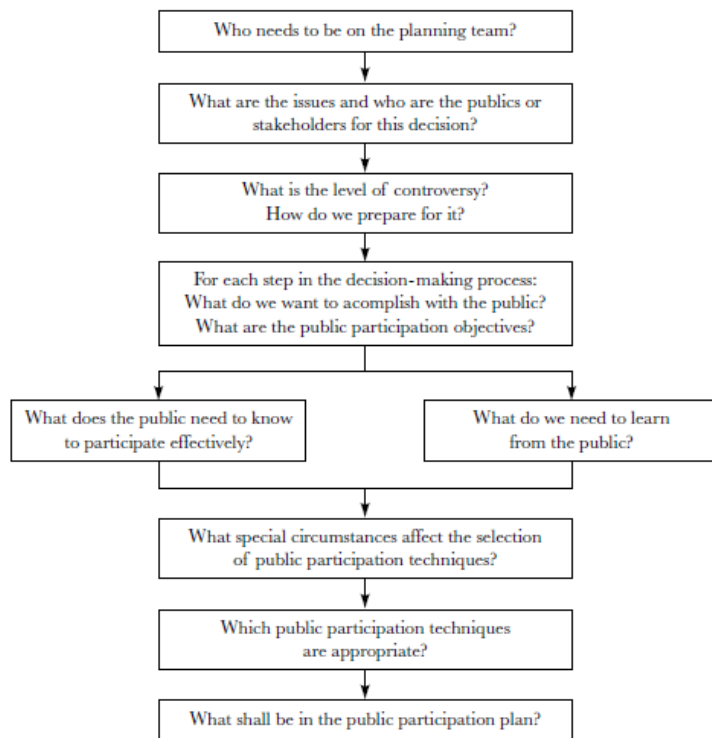
Figure 11. Process planning steps. Source: Creighton (2005).

Using a serious game as participation process

In Ch. 2.3 several advantages and disadvantages were given for serious games. Though it forms an excellent opportunity to gain insight in the way players would act under certain circumstances, it will always be a simplified model of reality. To analyse the usefulness of a serious game in this particular participation process, an investigation was done of what should be achieved with it in the first place.

As was posed in the decision analysis, the participation process primarily served to get input from citizens on their vision for the new neighbourhood. It was vital that it was made clear to citizens that there are existing (planning) frameworks, and that not everything is possible in a neighbourhood. There were certain constraints which citizens had to take into consideration, like a minimum amount of homes and parking spaces. Moreover, a neighbourhood cannot be designed alone. There will always be other citizens who wish for a completely different spatial infilling. Clashing interests were at hand in this participation process. The question was why and how players had decided between buildings and developments, rather than which exact infilling was chosen during the participation process. After all, citizens will never be able to decide on parcel level what they wish to see in the neighbourhood: spatial planning is simply too dynamic, interdependent and complex. As seen in Ch. 2.3, this aim of the serious game and these considered aspects seemed to match with what cán be achieved with a serious game and what cannot. Another viable option would have been a focus group. This way, multiple citizens could be invited at the same time, and an open dialogue could have been entered. However, a serious game had better options to truly make visible how choices affect each other. If players would build multiple parks, but did not pay attention to the housing demand, it could immediately be shown in a serious game what shortcomings their neighbourhood might have.

This was just one goal of the participation process. Another aim was to inform citizens about possible heat systems for the Zeeheldenwijk, and developments which have already been planned. A game could encompass this as well. On the map it could be shown which developments were already planned, and during the game explanation beforehand the context of the Zeeheldenwijk could be shared with the participants.

For the research, the game was a tool to see whether civic engagement levels have changed after playing the game. A game made up an interesting research case to test civic engagement levels. As mentioned in the relevance: other studies mention higher civic engagement as yield from serious games (Poplin, 2013), but no studies could be found which actually test this interdependence.

Earlier, Arnstein's ladder was mentioned in which different levels of participation were shown. It was established that a serious game can either be used as a component of the higher rows, supported by other expertise or participation methods, or be used as a consult in decision making. This was due to the fact a game will always be a simplification. In the light of this, the row on Arnstein's ladder pursued in this participation process was row 4. The motives of the players to choose certain developments formed a consultation for the spatial planning department in designing the Zeeheldenwijk.

3.5 Data collection and procedures

<u>Sampling</u>

Twenty respondents were chosen to play the game.

To create research results which are more generalisable and reliable, respondents from different age groups were approached. If a possible respondent preferred not to partake (the non-response), the question was asked why he/she referred from partaking. This data will contribute to the knowledge gained with this research on when citizens wish to participate (rational ignorance). Note that the investigation will be done by means of a quasi-experimental design, in which selection of respondents is non-random. This was not just because of the time efficiency that this type of sampling brings, but also because an active participation process is not possible during the corona pandemic. Compared to random sampling, unknown proportions of the entire population cannot be included in the sample group. This had an effect on the representation of the population, which was taken into consideration during the processing of the results, and will be treated later in the discussion chapter.

<u>Data collection</u>

As shown, the research adopted a positivist/experimental like approach in pursuance of finding the effect of a serious game as participation process on civic engagement levels. The quasi-experimental pre-test post-test design by means of survey will be the leading empirical inquiry.
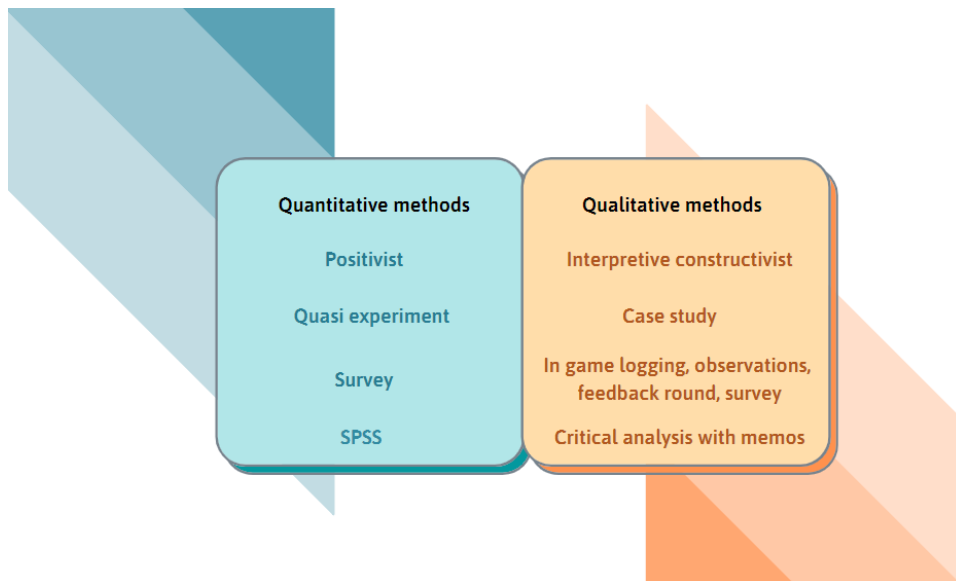
Figure 12. Research procedures. Source: Personal collection.

To gain insight in the dynamic process of gaming and motives of players to participate, a qualitative aspect was added as well. This part of the research had a case study like structure based on the interpretive constructivist paradigm. Data collection happened by means of in game logging, observations during the game, the survey, and a feedback round after the game. Participants were asked whether the game was understandable or accessible, how they experienced the elements of play, and whether they believed they learned from playing the game (based on the framework in Ch. 2.4). Answers to these questions were logged. Again: if the game or the purpose of playing it was unclear, this will most likely has its effects on civic engagement. This is why a qualitative evaluation was added in Appendix D. The following methodology as posed by Mayer et. al (2013) will be leading for this data collection procedure. The data will be put opposite each other to detect any matches and clashes

O1 = Observation 1 Learning objectives, context
O1 = Observation 2 pregame measurement
X_1 = Intervention = gaming session
O3 = Observation 3 post game measurement
$O_{x1...n}$ = In game observations / measurements
O4 = Observation 4 Learning objectives, context

Figure 13. Methodology for evaluating a serious game. Source: Mayer et. al (2014).

Before and after playing the game, each participant was asked to fill in a survey individually. The reason for carrying out two surveys is to determine whether any changes occurred in what inhabitants perceive to be the most im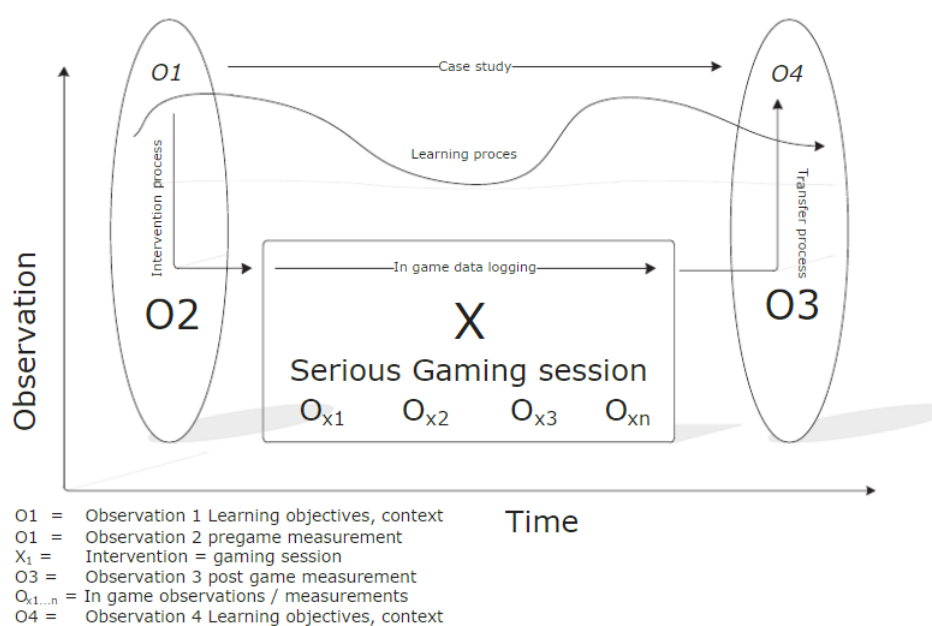portant values after playing the game. If some values had shifted, it would mean playing the game brought a change in civic engagement levels. These results were analysed in SPSS to see whether changes have occurred significantly.

Before handing out the survey, the participant was informed fully on the game and how the results were processed. Afterwards, they were asked to fill in questions about the serious game as well.

Playing the game

Initially, the game would be played with groups of five participants. However, the choice has been made to invite two players at a time, so corona measures could be followed.

The game was hosted at convenient hours for the respondents (e.g. not at times that children are picked up from school, outside lunch/dinner times). After the game, a report was set up with the results of the game and behaviour during the game. This information was the most valuable information to the municipality of Urk, and concerned the preferences of citizens on energy related measures, as well as urban design and spatial planning matters.

The choices made by the players in the serious game were recorded in a coherent report, and shared with the municipality. Before issuing this, the respondents were asked about their privacy preferences, and whether they wish to stay anonymous or not.

The game was never adjusted between rounds to keep a uniform measurement of civic engagement. Possible shortcomings along the way were noted, but the game stayed the same. The host also refrained from influencing decisions made by players during the game, so pristine results could be collected.

3.6 Data analyses

Analyses carried out with survey results

SPSS played a role in the measurement on civic engagement and the extent to which the serious game was accountable for these results. Below are the types of calculations, and the analysis path taken in relation to the associated hypotheses. A significance level of 0.05 (or 5%) has been used for each of the calculations; a general standard in this field of research.
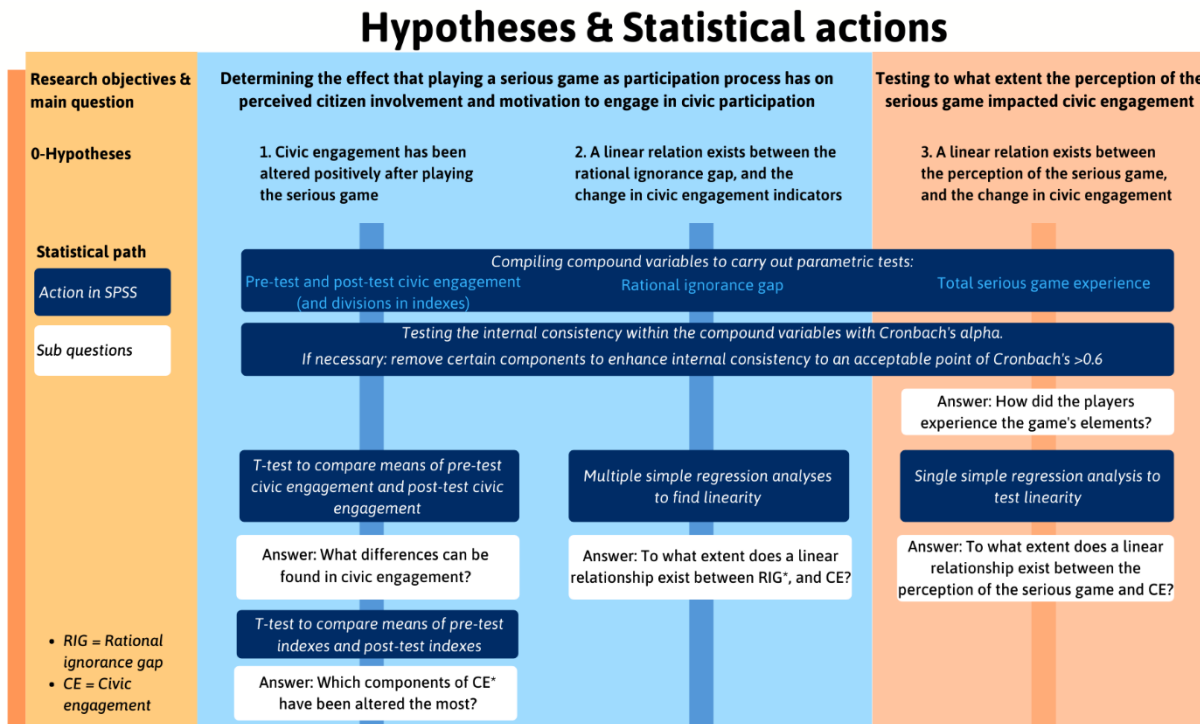
Figure 14. Hypotheses & Statistical actions. Source: personal collection.

Compound variables and Cronbach's alpha

As seen in figure 14, the first statistical action was the compilation of compound variables. Likert scale survey questions as used in this research originally produce ordinal data. The intervals between the categories (strongly disagree – strongly agree) are supposed to be handled as monotonic data. After all, it is not possible to numerically state 'strongly disagree' is less or more than 'disagree'. In this case, however, the variables were treated as interval variables in SPSS. The survey questions were designed on the notion that the civic engagement level is higher, the further up the Likert scale the respondent answers.

To treat Likert scale data as interval data, one must, however, calculate Cronbach's alpha to measure the internal consistency between items. The compound variables were only used if Cronbach's alpha is higher than 0.6. This means that the several survey items which propose to measure the same general construct (the compound variables like civic engagement) also sufficiently produce similar scores among the research group (McClave, Sincich & Knypstra, 2016). It was found in this research that the Cronbach's Alphas of each of the necessary compound variables were >0.6, and therefore acceptable. The output of these calculations has been added to Appendix C. Results were discussed in the research results chapter (Ch 4).

<u>T-tests to compare means</u>

T-tests were ran in order to measure the differences between the total civic engagement means of the pre-test and post-test. The T-test was based on paired samples, as the means of both variables are dependent. The significance was taken into consideration to exclude any coincidental results. After these calculations, the different indexes of civic engagement were investigated to see whether the changes found in civic engagement originate from changed voting, civic action, expressive or electoral behaviour (Ch.2.4). This was also done by means of an independent T-test.

<u>Regression analyses and the rational ignorance gap</u>
To test whether a linear relationship exists between the rational ignorance gap levels and civic engagement, a few methodological choices had to be made. Though a considerable amount of literature exists on the application of rational ignorance to participation processes, ways to calculate someone's rational ignorance gap are missing. It is for this reason that this research contains an unprecedented calculation of the rational ignorance gap on the basis of the theories by Krek (2005) and Gunning (2002):

These theories are based on the idea that citizens will often make a rational choice -often leading to ignoring a participatory process-, based on the investment of effort/time that they have to put into the planning situation. Citizens weigh these factors against the assurance that their wish will be granted, and against other activities that they will be able to invest their time and energy in (Krek, 2005; Gunning, 2002). (Ch. 2.2)

The theories have been woven into the calculation as follows:
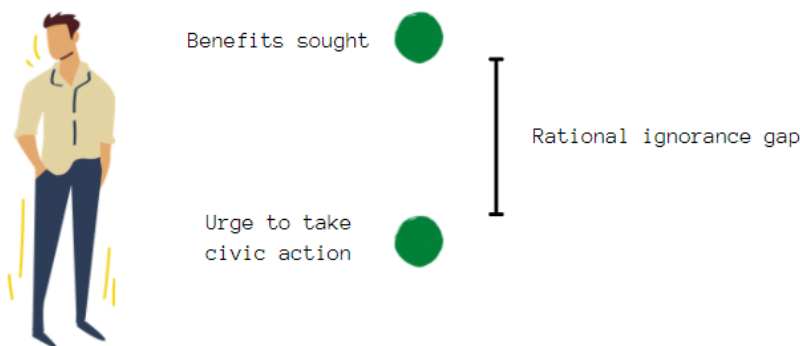
Figure 15. Rational ignorance as interpreted from Krek (2005) and Gunning (2002). Source: personal collection.

What is being calculated is the urge of someone to invest time and resources to take civic action, compared to the benefit they gain from, in this case, partaking in a participation process. More detailed information on the exact indicators used in this calculation is added in Appendix C. The mean of the rational ignorance gaps before and after the game has been taken to carry out the regression analyses to level out any inconsistencies between the two measurements.

In short:
[((Benefits sought A) + (Benefits Sought B)) / 2] - [((Urge to take Civic action A) + (Urge to take Civic Action B)) / 2] = Rational ignorance gap

A positive rational ignorance gap means that the respondent wishes for benefits more than he or she would take civic action to achieve these benefits. This would be in line with the theories of Krek (2005) and Gunning (2002).

Several regression analyses were carried out between rational ignorance gap and a variety of indicators of civic engagement to see which were impacted by the rational ignorance gap. Because an attempt is made to see in general if the rational ignorance gap impacts civic engagement, the means of the pre-test and post-test results are taken for the indicators also. To avoid circular reasoning, the indicators which were also used to create the variable Rational_Ignorance, were excluded from the dependent variables used in the regression analyses. Moreover, only the regression analyses with > 20% of variance explained by rational ignorance will be added in the results.

Irrational ignorance was not added to the eventual compound variable of rational ignorance. This is because it concerns another type of rational ignorance which cannot be practically compared to original rational ignorance. Irrational ignorance has to do with learning about certain subjects (like news on energy transition), even if it is against one's beliefs or not in that person's interest. Rational ignorance is more about weighing time and resources before doing something, rather than weighing the interest in a certain subject.

Perception of the serious game

To gain insight in the complete experience of the serious game, several indicators have been added together in a compound variable which have been based on the figure by Mitgutsch & Alvarado (2012):

- Accessibility of the serious game (framing)
- New knowledge and insights (impact on the player & aim)
- Clear purpose of the serious game (framing)
- Understanding of information during the serious game (mechanics, content)
- Design of the serious game (aesthetics/graphics)
- Fun during the serious game (fiction/narrative & mechanics)

A regression analysis will be carried out between this compound variable and the change in civic engagement levels to see whether the perception of the game had impact on the players' civic engagement levels.

Figure 6 (repetition).
Source: Mitgutsch & Alvarado (2012)

43

Critical analysis of in game loggings

The analysis of the observations before and during the game was done by means of a critical review. This part of the analysis was done on the basis of the following sources:
- Pre game notes
- Game reports with behaviour during the serious game and game/participation related comments
- Oral opinions on the survey and survey results
- A list of the non-response and why they chose not to participate

The reason why this research was not supported by solely survey results, is that playing a serious game is a dynamic process. Not every aspect can be captured in structured survey questions due to its unforeseeable nature. It was found highly likely that part of the conclusions, as well as recommendations which follow from this research are dependent on what is being said during the serious game, and after.

The survey data analysis with SPSS were orientated on explaining the causal relationship between playing a serious game and civic engagement. However, the analysis of the sources above were exploratory of nature, so previously unknown relationships could be detected. Common ground with the survey questions was expected. Whereas the survey pointed out numerical information on civic engagement, opinions by participants often clarified the reason why this is the case. It was found important to keep in mind during this process that correlation does not automatically imply causation, especially with an holistic analysis like this one.

The analysis was a process of registration and transcription. The amount of data is often vast with a qualitative approach. This is why the researcher has distinguish the usable material from the redundant data (registration). During the transcription, data was made ready to analyse. An iterative process of interpreting and coding of the data sources followed. With coding, memos and keywords were assigned to phrases or words. This way, patterns and relationships could be derived from the data sources. Coding was done in Atlas.ti, by means of pattern coding. Moreover, it was done in an inductive way, meaning codes were assigned openly and dynamically, rather than operating from a set of codes set up beforehand. Common themes were derived first, after which codes were assigned and analysed in more detail.

To alter the data as little as possible, literal notes were taken from what is being said and observed during the serious game. The observation reports were derived in four categories:
- behaviour during the game;
- substantive comments on the Zeeheldenwijk;
- game related comments and;
- participation process related comments.

The qualitative data was used to detect any changes and similarities between the survey results and what was actually said during the gaming sessions. This data has been processed in Appendix D – The evaluation of the serious game, and will be treated in the discussion in Chapter 4.

4. Research results

4.1 Results outline

As sketched before, the research practically consisted of two components, as is evident from the formulation of the main question and the hypotheses. Below the outline of the research results is shown.
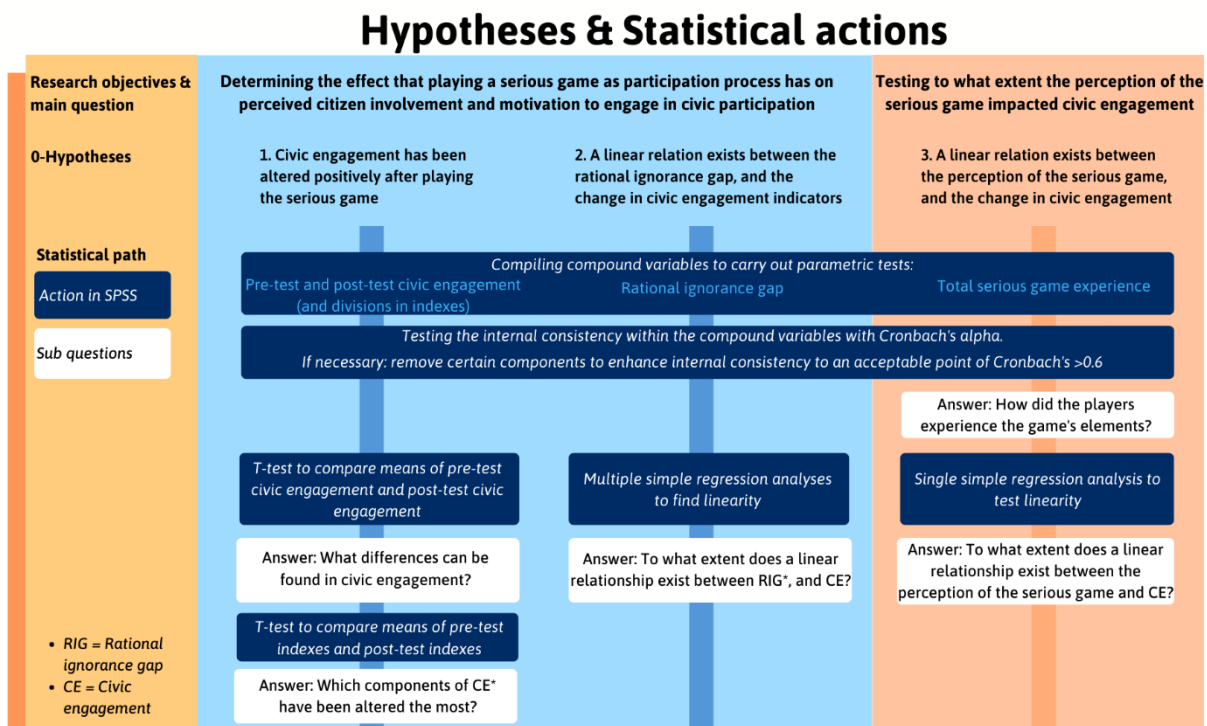
Figure 16 (repetition). Hypotheses & Statistical actions. Source: personal collection.

A. Participation and civic engagement
These questions have been based on theory presented in the theoretical framework (Ch. 2.1-2.4)

- What differences can be found in civic engagement levels before and after the game?
- Which components of civic engagement have been significantly altered the most after the game?
- To what extent does a linear relationship exist between the rational ignorance gap and civic engagement (rational ignorance higher = lower civic engagement level)?

B. Perceptions of the serious game
These questions have been based on theory presented in the theoretical framework (Ch. 2.5).

- What differences can be found in civic engagement levels before and after the game?
- Which components of civic engagement have been significantly altered the most after the game?
- To what extent does a linear relationship exist between the rational ignorance gap and civic engagement (rational ignorance higher = lower civic engagement level)?

4.2 Participation and civic engagement

What differences can be found in civic engagement levels before and after the game?

The definition or operationalisation used of civic engagement in this research was derived from Flanagan et. al (2007) and Campbell (2009).

With Cronbach's Alpha values of 0.717, and 0,835, the variables A_Civic_Engagement (pre-test) and B_Civic_Engagament (post-test) were utilisable. No cases had to be deleted in order to ameliorate Cronbach's Alpha. More details can be found in Appendix C.

The statistics of the Paired Samples T-Test are as follows. The mean for civic engagement levels before playing the game was 3,0550. After playing the game the mean was 3,2475.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	A_Civic_Engagement	3,0550	16	,35803	,08951
	B_Civic_Engagement	3,2475	16	,43456	,10864

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	A_Civic_Engagement &	16	,799	,000
	B_Civic_Engagement			

The differences between means is -0,19250. This means the respondents have shown slightly higher civic engagement levels than before they engaged in the participation process (roughly 6% higher). As shown, the significance level (2 tailed) is 0,010. This significance level falls within the determined α of 0.05.

It can be concluded that there is enough evidence to suggest civic engagement levels are significantly higher for this sample. In this case playing a serious game significantly lead to higher civic engagement levels.

Therefore H0 of the first hypothesis cannot be rejected. The data favours the 0-hypothesis.
H0: Pre-test civic engagement < Post-test civic engagement

Paired Samples Test
Paired Differences

		Mean	Std. Deviation	Std. Error Mean	95% confidence interval of the difference		T	Df	Sig (2 tailed)
					Lower	Upper			
Pair 1	A_Civic_Engagement - B_Civic_Engagement	-,19250	,26178	,06544	-,33199	-,05301	-2,941	15	,010

As was presented in Chapter 2.4, in a research on American civic engagement by Campbell (2009) four indicators of civic engagement were used. Again, it is important to notice that these components do not exclude one another, or exist independently from one another. For the sake of the analysis, however, they were treated as if they were independent.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	A.Voting_Index_Mean	3,3958	16	1,08333	,27083
	B.Voting_Index_Mean	3,5625	16	1,04505	,26126
Pair 2	A.Expressive_Index_Mean	3,2847	16	,36733	,09183
	B.Expressive_Index_Mean	3,2625	16	,39644	,09911
Pair 3	A.Civic_Index_Mean	2,8047	16	,50408	,12602
	B.Civic_Index_Mean	2,9766	16	,45465	,11366
Pair 4	A.Electoral_Index_Mean	3,1875	16	,71005	,17751
	B.Electoral_Index_Mean	3,5156	16	,73297	,18324

Paired Samples Test pt. 1

		Paired Differences			95% Confidence Interval of the Difference	
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper
Pair 1	A.Voting_Index_Mean - B.Voting_Index_Mean	-,16667	,42164	,10541	-,39134	,05801
Pair 2	A.Expressive_Index_Mean - B.Expressive_Index_Mean	,02222	,23026	,05757	-,10048	,14492
Pair 3	A.Civic_Index_Mean - B.Civic_Index_Mean	-,17187	,42787	,10697	-,39987	,05612
Pair 4	A.Electoral_Index_Mean - B.Electoral_Index_Mean	-,32812	,56065	,14016	-,62687	-,02938

Striking from this dependent paired samples T-Test are the means of each classifying form of civic engagement. At first glance they appear to be very close to another, suggesting the means between the pre-test and post-test measurements do not differ much. In the second table an anomaly has been marked in orange. Earlier it was discovered that there is a significant rise in civic engagement levels before and after playing the serious game. This seems to be true for all indicators, except the expressive index, concerning one's urge to learn about new subjects, and share ideas with others. The most impact is seen for the electoral index, concerning the bonds between citizens and the municipality. It seems, in this case, playing the serious game lead to more trust from the citizens in their local authority.

The significance of each difference is shown below, indicating the chances that the deviation in means was coincidental. For the expressive index, a high significance of 0.705 can be seen, meaning it can be practically concluded that the difference in means has a high chance of being coincidental. This is possibly due to a low consistency between the indicators used in this index. On the other side of the spectrum, the electoral index shows a low significance level. An interesting result for serious gaming proponents: playing the game also *significantly* lead to more trust in the local authority. This is only true for the electoral index, taking the α of 0.05.

Paired Samples Test pt. 2

		t	df	Sig. (2-tailed)
Pair 1	A.Voting_Index_Mean - B.Voting_Index_Mean	-1,581	15	,135
Pair 2	A.Expressive_Index_Mean - B.Expressive_Index_Mean	,386	15	,705
Pair 3	A.Civic_Index_Mean - B.Civic_Index_Mean	-1,607	15	,129
Pair 4	A.Electoral_Index_Mean - B.Electoral_Index_Mean	-2,341	15	,033

Zooming in on some specific indicators which might be relevant, taking the societal relevance in consideration, the following results have been found.

Citizens were more urged to participate in information sessions about their direct environment after taking part in a participation process in the form of a serious game (sig. < 0.05). This could however, not be concluded for sessions which were explicitly organised by the municipality (sig > 0.05).

Paired Samples T-Test – Future participation

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Likes to parttake in information sessions about environment - Likes to parttake in information sessions about environment	-,687	1,138	,285	-1,294	-,081	-2,416	15	,029
Pair 2	Likes to parttake in information sessions organised by muni - Likes to parttake in information sessions organised by muni	-,375	,885	,221	-,847	,097	-1,695	15	,111

Moreover, the trust in officials and believe that the municipality listens to its inhabitants has grown between the pre-test and post-test measurements. This can be safely concluded, looking at the significance levels in green below (< 0.05).

Paired Samples Test – Trust in municipality

| | | | | Paired Differences | | | | | |
| | | | | | 95% Confidence Interval of the Difference | | | | Sig. (2-tailed) |
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	
Pair 1	Trusts officials in doing what is right for Urk - Trusts officials in doing what is right for Urk	-,500	1,033	,258	-1,050	,050	-1,936	15	,072
Pair 2	Believes the municipality listens to its inhabitants - Believes the municipality listens to its inhabitants	-,437	,727	,182	-,825	-,050	-2,406	15	,029
Pair 3	Believes he/she can contact municipality with a problem - Believes he/she can contact municipality with a problem	-,312	,793	,198	-,735	,110	-1,576	15	,136
Pair 4	Believes inhabitants should have more influence in decisionmaking - Believes inhabitants should have more influence in decisionmaking	-,062	,998	,249	-,594	,469	-,251	15	,806

To what extent does a linear relationship exists between the rational ignorance gap and civic engagement (rational ignorance higher = lower civic engagement level on other indicators)?

This question has been based on the theories as posed by Gunning (2002) and Krek (2008).

Again, a Cronbach's alpha test was ran to see whether this compound data is utilisable for parametric tests. The cases for the urge to take civic action and benefits sought have high internal consistency, as shown by the Cronbach's Alphas of 0,788 and 0,714. These variables form rational ignorance together, showing a Cronbach's Alpha of 0,732 (Appendix C).

Rational_Ignorance
2,04
4,49
1,44
1,46
1,38
,88
1,88
2,31
1,53
2,17
2,64
2,58
3,81
2,65
1,24
,82

A positive rational ignorance gap means that the respondent wishes for benefits more than he or she would take civic action to achieve these benefits. As can be seen, every respondent scores a positive rational ignorance gap. It is evident that Gunning's theory on rational ignorance gap is also applicable to the research sample. Note that the levels of rational ignorance mean little. The calculations carried out in this research are incomparable to any existing research. There is no existing framework to 'score' rational ignorance as a variable. The compound variable is solely made for the purpose of predicting other factors of civic engagement in the data set.

Regression analyses

A linear relation between the rational ignorance gap and civic engagement was suggested with the hypothesis. It was suggested that if the rational ignorance gap was tested higher for the participant, indicators of civic engagement levels would turn out lower.

Below the regression analysis can be found between the rational ignorance gap and the most impacted indicator of civic engagement. Only the indicators which show an R square (or explained variance) of > 20% would be added. For only one indicator out of 12 this was the case: learning on about subjects even if ideas or opinions were opposed.

Below, an R square of 0.261 (26%) is shown, marked in yellow. This means a small portion of this indicator can be explained by the rational ignorance gap. Seeing as only one indicator of civic engagement seems to have a slight linearity with rational ignorance gap -and this one indicator also has a small R-square- , it would be safe to conclude that the rational ignorance gap as calculated in this research has no visible impact on civic engagement. Nonetheless, the results of the regression analysis are shared below.

An F can be found in the ANOVA table, with a H0 that no relation exists between rational ignorance and the urge to learn about subjects even if the players' ideas were opposed. With a significance of 0.043 (<0.05) this hypothesis is unlikely, so a relation is likely to exist.

In the third table, containing the coefficients, the intercept (constant) of 2.844 can be found. This means that someone with a rational ignorance gap of 0 would score 2.844 on the question whether they are urged to learn about subjects even if their ideas/opinions were opposed. There is no way to score rational ignorance gap, so practically no conclusions can be drawn from this intercept.

The slope, seen under the intercept is 0.436. This would practically mean that the score of the respondent to the learning indicator would rise with 0.436, for every rise in rational ignorance of 1. The bigger the rational ignorance gap, the higher the urge becomes to learn about subjects even if ideas or opinions are opposed. The high t-value of 2.221 and significance of 0.043 suggest the chance that this b-coefficient of 0.436 is truly 0 in the population is low. Though this small portion of linearity seems significant, these numbers are not in line with the theories of Gunning and Krek. It would seem logical that someone with a high rational ignorance gap, seeking more benefits than accounted for with their civic action, would refuse to learn about subjects which are not in line with their own ideas or opinions.

Only a small portion of one indicator showed linearity with rational ignorance. It could only be stated statistically that $\beta1 \neq 0$ for this one indicator. It can be concluded that there is not enough evidence to ascertain a general linear relation between rational ignorance and civic engagement.

Therefore H0 is of the second hypothesis is rejected. The data favours the alternative hypothesis. Ha: β1 = 0

Learns about subjects even if ideas or opinions are opposed

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,510[a]	,261	,208	,76225

a. Predictors: (Constant), Rational_Ignorance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2,866	1	2,866	4,932	,043[b]
	Residual	8,134	14	,581		
	Total	11,000	15			

a. Dependent Variable: Mean_Learning_Oppose_Ideas

b. Predictors: (Constant), Rational_Ignorance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,844	,450		6,315	,000
	Rational_Ignorance	,436	,196	,510	2,221	,043

a. Dependent Variable: Mean_Learning_Oppose_Ideas

4.3 Perception of the serious game and civic engagement

How did the players experience the game's elements (content, mechanics, narrative, graphics, framing)?

Below, the means of each of the indicators used in the total experience variable are depicted:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Finds a serious game more accessible than an information session	16	2,0	5,0	4,688	,7932
Has gained new knowledge or insights	16	3,0	5,0	4,312	,6021
Thinks purpose was clear of the game	16	4,0	5,0	4,500	,5164
Understood information shared	16	4,0	5,0	4,625	,5000
Thinks the way the SG was designed helped playing it	16	4,0	5,0	4,563	,5123
Thought playing the SG was a fun activity	16	4,0	5,0	4,875	,3416
Valid N (listwise)	16				

Evident are the high means for each of the indicators. In all cases these are higher than 4. The overall perception of the serious game is therefore positive. The qualitative analysis later in this chapter shows more information on the origin of these numbers.

To what extent does a linear relationship exist between the way players perceived the game, and the differences found in civic engagement?

Below are the results of the regression analysis, with the total serious game experience as independent variable, and the difference between the pre- and post-test civic engagement results as dependent variable. A neglectable amount of variance in civic engagement change (1.8%) can be explained by the total experience of the serious game. The F-test -with H0 being there is no relation- holds a significance of 0.616, suggesting this hypothesis is likely.

The slope of 0.088 suggests that the change in civic engagement would rise with 0.088 for each 1 rise in serious game experience. Taking into consideration that the change in civic engagement should get *lower* (because Civic Engagement A – Civic Engagement B is the calculation done) the more positive the experience becomes, this number is not in line with the hypothesis. The significance (in yellow) of the slope can also not be proven -the B-coefficient might be factually 0 for the population-.

Taking into account the R-square, the results to the F-test, and the slope, it can be concluded that insufficient linearity exists between the perception of the serious game, and the change in civic engagement levels between the pre-test and post-test. It cannot be stated statistically that $\beta 1 \neq 0$.

Therefore H0 of the third hypothesis is rejected. The data favours the alternative hypothesis. Ha: $\beta 1 = 0$

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,136[a]	,018	-,052	,26845

a. Predictors: (Constant), Tot_Experience_Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,019	1	,019	,264	,616[b]
	Residual	1,009	14	,072		
	Total	1,028	15			

a. Dependent Variable: Difference_CE

b. Predictors: (Constant), Tot_Experience_Mean

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,598	,792		-,755	,463
	Tot_Experience_Mean	,088	,172	,136	,513	,616

a. Dependent Variable: Difference_CE

4.4 Discussion on research results and data processing

<u>Civic engagement</u>

The research data is in line with the core theory of this research: that of social capital. It was already suggested in Chapter 2.1 that investing in bonds between citizen and government by means of a participation process would likely lead to social capital (in the form of higher levels of civic engagement).

From the qualitative data, some explanations for the results on a more detailed scale can be derived. Before playing the game, one duo mentioned how visiting the town hall and getting an idea of the different departments helped them to get better associated with the municipality. It seemed like a good idea to them to host participation processes at the town hall, as citizens might be more likely to participate in the future if they have a clearer image of the municipality (Michel Visser, Benjamin van Urk, personal communication, 10th of June 2021). Eagerness to participate in sessions is one of the indicators of civic engagement used in the research. Moreover, players made clear new knowledge and insights were gained on the Zeeheldenwijk, and the dilemmas the municipality may encounter with designing a neighbourhood (figure 2, Appendix D). From the game reports, other possible explanations can be seen as well. Two players agreed on how important it is that the municipality shows citizens how their input is processed, and later how it is seen back in the actual decisions. It makes citizens feel heard and taken seriously. Almost every duo mentioned in the feedback round that it was clear to them what was done with their input, which may have lead to a higher trust in the municipality. Moreover, every duo made clear they thought the game was fun to play. It is likely that the rusty image of traditional participation processes has changed for the citizens. This statement is endorsed by multiple quotes from the game reports (translated):

"If this is representative for other participation sessions, and it concerned my neighbourhood, I would visit such sessions in the future." (Round 1)
"A serious game is a lot more fun than a regular information session." (Round 2)
"A serious game is an awesome way to think about your environment." (Round 7)

Interesting to see is how the one older respondent (age group 46-55) in the research scored the lowest change in civic engagement. Conclusions cannot be drawn on the basis of this one respondent, though the question arises whether older age groups are less prone or malleable to change their behaviour after taking part in a participation process.

<u>Rational ignorance</u>

The way rational ignorance was calculated in this research might be incomplete. Though an attempt was made to stay as close to the theories on rational ignorance as possible (benefits minus civic action taken to gain these benefits), some practical interpretations may have been faulty. A shortcoming might be the benefits which have been addressed in the survey (making my town a better place, influencing the decision-making process, etc.). Other benefits could be reasons for citizens to attend the participation process which have not been included in the calculations. Though none have been mentioned in the qualitative data, hidden benefits or objectives might have played a considerable role. Another possible reason for the fact no linearity could be found is the small sample that was used: significance is more difficult to prove for small data samples.

Another possible shortcoming might have been that the mean has been taken of the pre- and post-test results. In the methodology it was argued that the goal of the sub-question was to give a general image of the impact of rational ignorance on civic engagement. However: the rational ignorance after the game might have been higher. Separate calculations of the 0 and 1 measurements could have given a more complete, or different image. Nonetheless, the calculation used can be perfected in the future, and might give different results for different research samples.

Serious game experience & civic engagement

The outcomes of the serious game perception regression analysis are possibly due to the fact that the population showed monotonous results: the experiences were positive overall, and changes in civic engagement were only small. With a more scattered, or bigger data set results might have been different.

Differences in qualitative and quantitative data

It is clear from the research results and Appendix D, containing the qualitative data on the serious game, that no differences can be found between in the conclusions of the survey data and the game reports. The quantitative data seems to reinforce the qualitative data, and vice versa.

On a final note: though the game reports were set up as literal as possible, the game sessions haven't been recorded and 1 to 1 transcribed. This means some interpretive differences may exist between the noted data and what was truly said during the game. Nonetheless, it is unlikely that possible interpretive differences lead to different conclusions: the qualitative and quantitative show the same red thread evidently. What could have been of influence, however, is possible influencing of the game by the host. The evaluation of the serious game (appendix D) showed that, despite some points of improvement, the serious game functioned well. Moreover, the host refrained from intervening as much as possible. Yet, the results of research on serious gaming will always be dependent on how the game was designed, framed and presented.

5. Conclusions

Following up on the research results above, a few conclusions can be drawn.

5.1 Hypotheses overview

Research objectives & main question	Determining the effect that playing a serious game as participation process has on perceived citizen involvement and motivation to engage in civic participation		Testing to what extent the perception of the serious game impacted civic engagement
0-Hypotheses	1. Civic engagement has been altered positively after playing the serious game	2. A linear relation exists between the rational ignorance gap, and the change in civic engagement indicators	3. A linear relation exists between the perception of the serious game, and the change in civic engagement
Findings	The mean of civic engagement was roughly 6% higher. The significance was < 0.05, so it can be safely concluded this was no coincidental finding.	Though a small portion of 1 (out of 12) civic engagement indicator could be explained by rational ignorance, it could not be stated statistically that $\beta 1 \neq 0$.	A neglectable portion of variance in civic engagement levels could be explained by the total experience of the game (1.8%). Moreover, statistically it could not be stated that $\beta 1 \neq 0$.
Statement	H0 is accepted: civic engagement levels have grown after playing the serious game.	H0 is rejected: no linear relation exists between rational ignorance, and civic engagement.	H0 is rejected: no linear relation exists between the game experience, and changes found in civic engagement.

Figure 17. Overview of hypothesis statements. Source: personal collection.

An overview is shown of the final statements which could be formulated in relation to the hypotheses. These findings are the basis for answering the sub- and main questions. The first objective was to determine the effect that playing a serious game has on perceived citizen involvement and motivation to engage in civic participation. The second objective evolved around testing to what extent the perception of the serious game impacted possible changes in civic engagement.

5.2 Research questions

The sub questions have been treated separately in the previous chapter. The analyses done were sufficient to answer the main research question:

What effect does playing a serious game as participation process have on the perceived citizen involvement and motivation to engage in civic participation, and to what extent did the players' experiences of the serious game impact this effect?

The effect of playing a serious game on perceived citizen involvement and motivation to engage in civic participation

The foundation of this research was the theory of social capital by Bourdieu (1986). Investing in more or less institutionalised relationships (social structures) would bring about social capital: resources, or higher efficiency of society by the facilitation of coordinated actions (Putnam, 1993). Citizens visiting a participation process could be be described as a group that comes together for some mutual interest, which, in turn, facilitates coordination and cooperation for the mutual benefit and the benefit of the community (Claridge, 2004). In the light of this theory, it was suggested that investing in the relationship between citizens and their authority (in the form of a participation process) would bring about higher levels of civic engagement.

This suggestion was confirmed for the participation process carried out in this research. A raise of 6.3% in all civic engagement indicators together was found after the game compared to the 0-measurement. It could be safely concluded that this was no coincidental finding. Therefore a slight raise in civic engagement has occurred while playing the game. In this case, partaking in a participation process in the form of a serious game lead to higher civic engagement levels.

The biggest changes were found in the electoral index. The electoral index holds the civic engagement indicators on the bonds/trust between citizens and their authority, in this case the municipality of Urk. With the chance excluded that the changes found were coincidental, it can be concluded that citizens' perception of their authority ameliorated after taking part in the participation process. Zooming in on particular indicators altered within this index: the trust in officials to do what is right for Urk, and the perception that the municipality listens to its inhabitants has grown in the post-test measurements. Moreover, citizens showed more eagerness to take part in participation processes like information sessions on their direct environment in the future. This could only be statistically concluded for participation processes in general, rather than the ones explicitly organised by the municipality.

Several indicators of civic engagement were investigated in relation to rational ignorance. This was to find out whether a higher rational ignorance gap would lead to lower civic engagement levels. A small portion (26%) of only 1 indicator out of 12, "learning on subjects which oppose personal opinions/ideas", seemed to show linearity with rational ignorance. From the data a higher rational ignorance gap would mean citizens were more eager to learn about certain subjects, even if they opposed their opinions. However, it could not be statistically established that this was no coincidental finding. Moreover: the practical explanation was not in line with the theories as posed by Krek (2002) and Gunning (2012). If the rational ignorance gap is higher, one would say that citizens were less eager to learn about subjects which oppose their personal ideas, because the short-term benefits would be less. In conclusion: the rational ignorance gap is no predictor of a person's civic engagement levels.

In the discussion (Ch. 4.4) it was mentioned that the way rational ignorance gap was calculated in this research was unprecedented, and therefore it might have been incomplete or faulty. Different types of calculations in further research might lead to other results.

It can be established with these conclusions that the first aim of the research has been achieved. Though rational ignorance might be incomplete, the results of the other tests form a sufficient answer to this part of the main question.

<u>The impact of the experiences with the serious game on civic engagement</u>
Seeing as serious gaming is a dynamic process, this question was added to see whether positive/bad experiences with the serious game influenced the measurements of civic engagement. The experiences were evidently positive for each of the game's elements (graphics, mechanics, framing, content, narrative). Striking was the fun players experienced during the game. The question was whether these high numbers would also lead to higher civic engagement levels. The data showed this was not the case. Statistically no linear relation could be found between the experiences players had, and their changes in civic engagement levels. This could be explained by the facts that all experiences were positive overall, and changes in civic engagement were only small. With this conclusion, the second objective has also been achieved.

5.3 Relevance of this study

A scientific contribution was made with this research. The hypotheses in this research were composed with great care, taking into account currently prevailing theoretical concepts. To each, outcomes have been found. Civic engagement had not yet been studied as a dependent variable in relation to serious gaming. It is now found that this serious game did have an impact on civic engagement, paving the path for more considerations on effects of other participation methods. Moreover, no methods existed on how to calculate the rational ignorance gap, even though it is a long adopted concept in political and spatial sciences. With this research, a new method has been added to the scientific toolbox. The methods posed to calculate rational ignorance can be used in further research, and possibly perfected.

Municipalities can use this information to shape the participation policies and processes required by the Omgevingswet. Municipalities seeking to invest in the involvement of citizens in their decision-making, now know that there is a prominent yield in doing so. This was previously suggested on the basis of social capital, but with this research social capital got a more detailed application. Citizens showed more trust in their local authority, and were more urged to participate in sessions in the future. Moreover, with the qualitative deepening, insights were gained on the further yields of a serious game, and on what urges people to visit a participation process like this one.

Serious games like this one seem a useful addition to light discussions at the 'Omgevingstafel'. Here, conflicting interests come together to come to a development which is accepted collectively. This is exactly what was done with this serious game: shaping a certain location in a visual and dynamic way with co-players. A similar type of game can also be used for the Omgevingsvisie, though it would not be focused on the particular buildings and dilemmas in a neighbourhood, but on the strategic choices made for the whole town. Example given: should the municipality focus on creating a safe environment for children, on enhancing green urban landscapes, or on creating appealing industrial zones? Choices can be processed in a serious game.

5.4 Representativeness, reliability, validity

<u>Representativeness</u>
The used research sample -apart from one respondent- consisted of 16 citizens within the age group of 18-25. The non-response consisted of quite some older citizens, who thought a game would be too complicated, or more reserved for young people. It seems logical that a serious game is more accessible to those who grew up with games, and like to play them. It does, however, mean that this research is not generalisable. The sample was small, and the age groups were unilateral. This makes it hard to draw conclusions for the full population of Urk. The non-random sampling applied to this research might have been partly responsible for the unilateral sample as well. The question which could be asked is whether the research can say something about 18-25 years old youth from Urk in particular, but seeing as results were also actor-, and game dependent, it is safe to say this is not the case.

<u>Reliability</u>
To enhance reliability of the research, the 0- and 1 measurements were taken right before playing the game, and right after to exclude any external influence in the meantime. Moreover, the host refrained from intervening as much as possible to create independent results. Again, it must be noted that results were actor- and game dependent. Most respondents were acquainted with the host in some way, which might have lead to influenced or biased survey results.

<u>Validity</u>

Within this research, an attempt was made to stay as close to existing frameworks from contemporary literature as possible. This was done for the indicators of civic engagement used to shape the survey questions. The eventual results were also in line with the sources used on social capital and participation. However, the validity of results evolving around rational ignorance is questionable. Though existing theories were used, it is not clear whether the statistic methods eventually measured rational ignorance accordingly.

5.5 Suggestions for further research

Some suggestions arise from this study for further research.

Different types of participation processes can be ran to test changes in civic engagement levels. All conclusions in this research were derived from one particular serious game. The yield from other ways to reach out to citizens, like focus groups, might lead to different results. Testing which participation process leads to the highest rise in civic engagement can help authorities in deciding which methods to use when input is needed from society. After all, higher civic engagement levels nudged citizens to partake in future participation processes in this study. Knowing which processes are most appealing to citizens can be especially useful to set up procedures for the participation required by the Omgevingswet. It might be interesting to see what happens when smart marketing is applied, to see what really draws people to participation processes. A study on differences in civic engagement levels between age groups can also be useful to ameliorate the targeting of different groups.

Appendix A – Decision analysis

This analysis was carried out before commencing with the participation process, hence the present future tense.
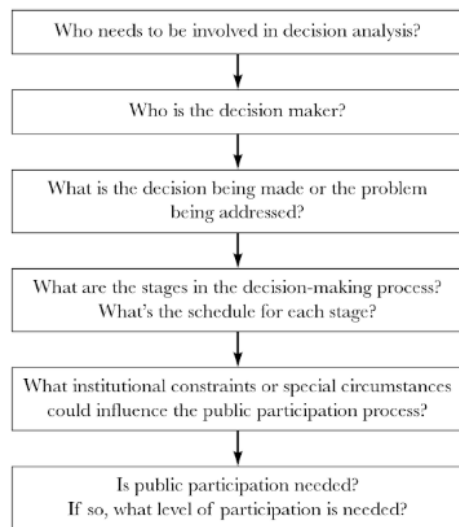

Figure 10 (repetition). Decision analysis steps. Source: Creighton (2005).

The first step towards a successful participation process is carrying out a decision analysis. This will help to pinpoint the decision being made, the decision-maker, and if/how a public participation process is needed.

Preparing the analysis

As depicted above, the first question is: *Who needs to be involved in the decision analysis.* Seeing as the research is carried out for the municipality of Urk, spokespersons are needed to voice their demands and needs. Willem Jan Wakker, manager of the spatial development department, as well as Kees van Wieringen, project lead of the Zeeheldenwijk, have shared their ideas on consulting the public. On one hand, a choice needs to be made between an all-electric neighbourhood or a heat network. On the other, the Zeeheldenwijk contains various areas which are to be elaborated by the spatial planning department and the college of the mayor and aldermen. The particular infilling of these areas is yet to be decided on, and citizens are welcome to share their ideas for these areas. However, the options presented during a participation process have to be realistic (W.J. Wakker, personal communication, 6th of May 2019; Kees van Wieringen, personal communication, 10th of June 2019).

During the interview with Willem Jan he posed the challenge to choose between all-electric heat in the new neighbourhood Zeeheldenwijk or a heat network. For this decision, they need the knowledge whether there is social support for either of these types of heating, and how the inhabitants of the Zeeheldenwijk would prefer to apply one of these networks (W.J. Wakker, personal communication, 6th of May 2019). The following figure was created during this interview, as a first impression of the decision.
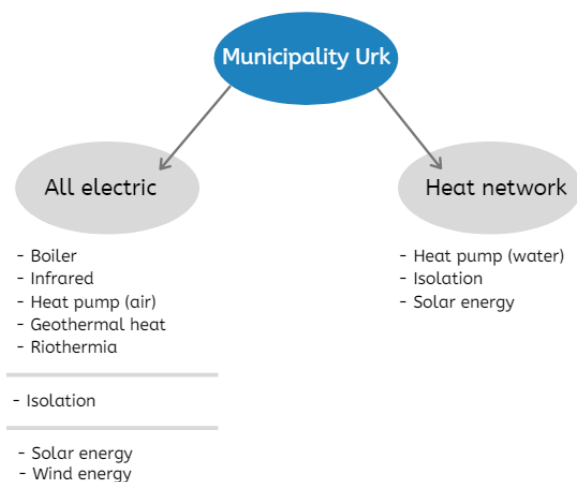
Figure 1 - Appendix A. Early decision analysis based upon interview with the spatial planning manager.

The decision to be made for the municipality lies in the grey areas. In each of the options stated below these grey bubbles there is some form of freedom of choice guaranteed for the inhabitants of the Zeeheldenwijk. However, in order to define possible participation elements, these options have to be defined carefully. How much do they cost? How much energy do they save on a yearly basis? For this reason, some other parties need to be involved in the decision analysis. Access to the sustainability meetings has been arranged, in which further infilling is given to societal aspect of the decision (f.e. communication with inhabitants). Moreover, civil engineers are needed to set out the technical specifications of each of the options. For this, contacts like Bert van Veen and Dick van der Snee (civil department) are required. Lastly, the meetings of the technical department 'Omgevingswarmte' will be attended.

The second decision has a wider scope. The planning options for this area must be determined before they can be processed in a participation tool. For this, contact has been sought with urban planner Angela de Vries, and Linda Hakvoort, land matters advisor.

Decision 1 – Heat network

The final decision lies with the political body of the municipality: the municipal council, and the college of B&W. However, many advising bodies are involved before the energy proposals reach the council. Advice will be given by the Omgevingswarmte project group before the 9th of July (2019) in the form of a decision-making matrix. They set up the table as shown below, which sets out the decision being made in full detail.

	Individueel WP lucht	Individueel WP bodem	Individueel/collectief Wp bronnet	collectief MT 70/40 TEO	collectief MT 70/40 Restwarmte	collectief LT 50/30 TEO	collectief LT 50/30 Restwarmte
eenmalige investering bouwer	€ 9,000	€ 10,500	€ 11,800	€ 9,000	€ 10,200	€ 10,160	€ 11,300
Total Cost of Ownership (TCO)	€ 2,408	€ 2,411	€ 2,567	€ 2,472	€ 2,550	€ 2,760	€ 2,834
Co2 emmie (kg/jaar)	2,658	2,889	2,696	2,650	2,594	3,073	3,031
COP / rendement techniek	3,5/2,2	5,0/2,5	6,4/4	3,5/3,5	3,6/3,6	4,0/4,0	4,1/4,1
benutten restwarmte	nee	nee	ja	nee	ja	nee	ja
ruimtevraag in woning	ca. 2 m2	ca. 2 m3	ca. 2 m4	gering	gering	gering	gering
legionella bestendig	ja	ja	ja	ja	ja	ntb	ntb
koeling	nee/ja	ja	ja	nee	nee	nee	nee
geluid	ja	geen	geen	geen	geen	geen	geen
onafhankelijk	ja	ja	ja	nee	nee	nee	nee
uitbreidbaar naar bestaande bouw	ja	ja	ja	ja	ja	ja	ja
uitbreidbaar naar binnendijks bedrijventerrein	nee	nee	ja	ja	ja	ja	ja

Table 1 – Appendix A. Provisional infilling to each heat system for Zeeheldenwijk (HVC consultancy, 2019).

The decision making process will be integrated in the spatial plans of the Zeeheldenwijk, which means the regular area development procedures will apply. Expected is that the neighbourhood will be ready for construction at the end of 2021, and the start of the building will take place in 2022. Before that time, a final decision on which source the Zeeheldenwijk will be heated with has to be made. During the 9th of July 2019 a directory board will decide which choices from the Omgevingswarmte project group to pass on to the municipal council. Expected is that an LT 50/30 system will not be feasible on the basis of the red and orange factors in the matrix. Moreover, some technical difficulties stand in the way of implementing such a network. With a 50/30 network water needs to be heated again when it reaches the building, which makes it too big an investment, and not efficient. When water of 50 degrees is already available (like in Roosendaal), this option would be more logical (Projectgroep Omgevingswarmte, personal communication, 3rd of July). The distribution of decision-makers and their part in this process has been depicted below.
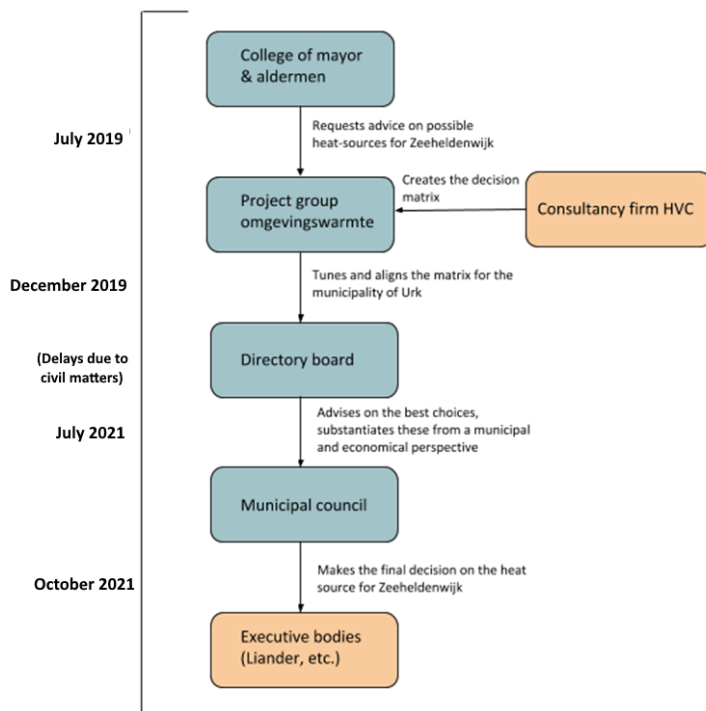

Figure 2 – Appendix A. Parties involved in the decision. Source: personal collection. Note: Add where the advisory report fits in.

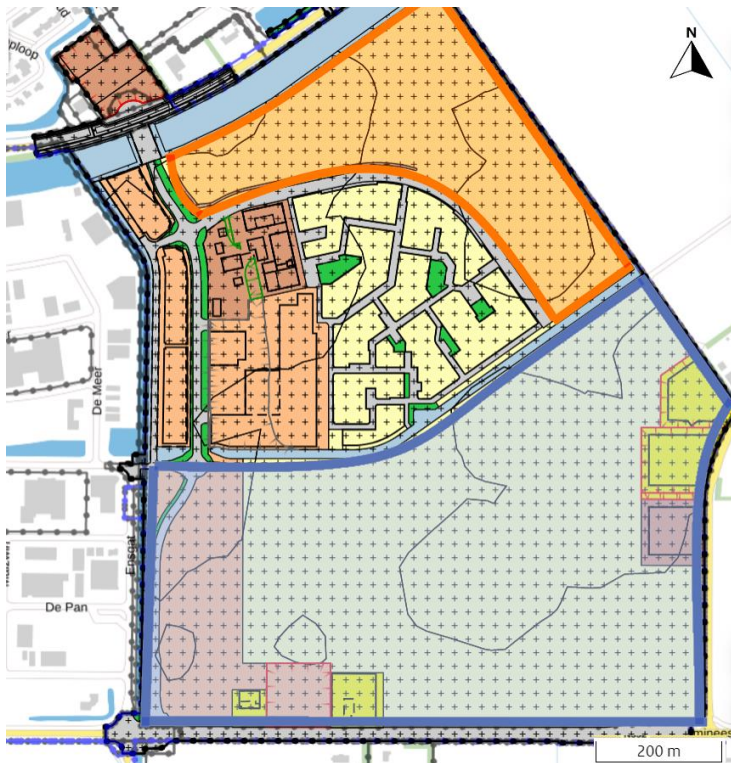*Decision 2 – Spatial infilling of undetermined areas*

Figure 3 – Appendix A. Zones yet to be planned. Source: Altered from Ruimtelijke plannen.nl, July 2021

Shown above is the zoning plan of the Zeeheldenwijk. The development of the Zeeheldenwijk is divided in two phases: the north and south. The spatial plans of phase 1 have been completed for the lion share of phase 1. The north-eastern part, shown in orange, has not been zoned yet. Though some spatial guidelines have been set up, this part still has room for input. The same goes for the area in blue, phase 2. By December 2021 the plans for the whole of phase 1 should be ready (Angela de Vries, personal communication, 30th of July 2021). In 2022 plans will be made for the second phase.

The Zeeheldenwijk is a Crisis and Herstelwet plan. This means the scope of the plan is broader, and similar to that of an Omgevingsplan. Rather than the original legal ground of 'good spatial planning' under the Wro regime, both a CHW plan and an Omgevingsplan rely on 'maintaining a safe and healthy physical environment'. A CHW plan as the basis of a participation process forms an interesting testing ground for participation after the Omgevingswet has come into force. More options might be possible for participation due to its broader nature, and the greater possibilities for referring to policies rather than spatial rules.

Within these areas, the following buildings were discussed as possibilities. An elaboration on how this has been used in the participation process can be found in Appendix B. Citizens can choose for one or multiple (with housing) of these buildings.

Theme	Building
Child friendly Urk	Family housing
	Primary school
	Day care
	Petting zoo
Industrious Urk	Shop with upstairs apartment
	Garden centre
	Fishing shop
	Supermarket
Lively Urk	Terraced homes
	Association building
	Coffeehouse
	Gym
Inclusive Urk	Rent apartments
	Youth centre
	Church
	Care centre
Green – Cultural Urk	Detached garden homes
	"Wild bookcase" (small exchange library)
	Monument
	Archeologic museum

Table 2 – Appendix A. Possible buildings for the Zeeheldenwijk. Source: personal collection.

Constraints

In setting up a participation process there are a few constraints. Firstly, the issues are technically complex. A participation process needs to be accessible and understandable for every inhabitant. A way to minimise technical details was thought through. Though it would lead to less detailed input from inhabitants on their energy preferences, it was necessary to make these adjustments to the process. Moreover, the neighbourhood is still unbuilt. This means particular inhabitants of the neighbourhood have not been determined yet. In a sense, this would be a constraint in conducting this experiment. Willem Jan Wakker mentioned a way to overcome this barrier. By focusing on the specific age groups which will be settling in the Zeeheldenwijk in a few years, a representation can be made of the population. As the Zeeheldenwijk will be focused on young families and starters, the age groups 20-30 will be most relevant to involve in the research. Urker inhabitants are urged to stay in the town when choosing a place to live (Letteboer & Reijers, 2020), which means it is likely to find the actual future inhabitants among a sample within these age groups (W.J. Wakker, personal communication, 6th of May 2019).

A constraint which had great impact on the eventual product was the following. As can be seen in figure 2 (Appendix A), the final decision has been delayed by a great deal. Delays due to civil matters have occurred and jeopardised the construction of the Zeeheldenwijk. Moreover, the results of the advice by HVC consultants were no longer be topical at the moment the participation process was being set up. During a conversation with the sustainability department about these matters (and the effect of this on this research), the conclusion was that we had insufficient information on the costs and benefits of each of the heat systems at the time. An attempt was made to set up a document in which we still made an estimation of the advantages and disadvantages to every system. However, though external expertise was utilised, the document formed no sufficient basis to create a participation process. The negotiations with possible heat network operators were still running during this research. Information shared during these negotiations could not be shared publicly yet. We did not want to share insufficient or inaccurate information with citizens, and to enable citizens to make a thorough decision we had to get the specific financial, comfort, biospheric and societal (dis)advantages on the table. The choice was made to only inform citizens about the possible systems, and orally discuss citizens' ideas on each of the systems. Christophe Meijer from the sustainability department brought forward that there is always a possibility citizens do not connect their systems to a heat network, as a municipality cannot compel them to do this when there are other viable alternatives. According to him, it would already be a big gain if we could take oral feedback into consideration in our risk analysis.

Another constraint is the rational ignorance gap, and the possible controversy around energy transition measures treated in the participation process (Ch. 2.2). To minimise these effects, Krek (2005) suggested to make the participation process as attractive as possible for citizens. This will be taken into consideration in the game design. Moreover, invitations will be adjusted to the age groups targeted.

<u>Importance and level of participation</u>

Though the concrete choice between an all-electric neighbourhood or a heat network cannot be fully fit into a participation process, participation can also be done to inform citizens about certain choices they have to make in the future. For the first decision, this is the path which will be taken. This information is important for inhabitants as the Wet VET (Wet voortgang energietransitie) forbids traditional forms of heating (gas) in modern neighbourhoods. Moreover, by 2050 every neighbourhood has to be gasless (Ministerie van Economische Zaken, 2016), meaning every inhabitant will run into this energy transition at some point. Learning about energy transition will allow for a smoother change of a life style. After all, 'energy' in the word *energy transition* refers to technical solutions, but 'transition' purely means making changes to human behaviour (Jan Rotmans, 2021). As said, citizens will also be asked to share their thoughts on each of the systems, and this will be recorded. This feedback will be taken into consideration in the risk analysis of the heat transition vision. The relevance of a participation process in this case is certainly present for these reasons.

As for the second decision concerning the infilling of the Zeeheldenwijk: interesting ideas may follow from a participation process. The questions are what neighbourhood will follow when citizens have to make collective decisions about their ideal living environment, and why? This information will be taken into consideration during the planning process, and will be put into the perspective of the existing spatial guidelines. The aim is to make decisions which are tailored to inhabitant's demands. Innovative and fitting ideas may arise during a participation process. From the theory as posed in Ch. 2.2, this means the decision will be a modified autonomous managerial decision. Information is sought, but the decision may not reflect group influence (Thomas, 1990). Citizen input will be a consult (Arnstein's ladder) to the municipality of Urk.

The level of participation will be determined on the basis of Arnstein's ladder of participation. Taking into consideration that lower rungs of participation have not been necessarily found wrong in contemporary literature, the level of participation which will be pursued in this experiment will be 'consultation'. This means that the municipality will determine the participation method, and how the opinions/results will be used in the final decision. However, within these rows it is certain that the results of the process will be taken into consideration.

A serious game has been chosen as a participation method in this case for reasons stated in the Methodology (Ch. 3.2). Moreover, in Ch 2.3 some considerations can be found on the positioning of the serious game on Arnstein's ladder

Appendix B – Game sheets & information

Serious game: Bouw jouw Urk!

To give a general image of the serious game, the game rules have been set out in figures 1 and 2. These sheets have also been shared with the citizens playing the serious game. The game will be briefly explained on the basis of the game design framework figure by Mitgusch and Alvarado (2012).

Figure 1 – Appendix B. Game Sheet pt. 1. Source: Personal collection.

PUNTENTELLING

Elke kaart levert binnen bepaalde categorieën punten op.

Opbrengsten en uitgaven

Gebouwen leveren geld op in het spel, net als in het echt. In werkelijkheid komen deze opbrengsten vaak voort uit het verkopen van grond.
Opbrengsten geef je als spelersduo vervolgens weer uit aan ontwikkelingen, net zoals de gemeente dat zou doen.

Ruimtelijke kwaliteit

Ruimtelijke kwaliteit geeft aan hoe goed jouw wijk er uit ziet. De kaarten die veel ruimtelijke kwaliteit punten opleveren zijn dan ook de parken, en de voorzieningen die jouw wijk een speciale uitstraling geven.

Duurzaamheid

Sommige ontwikkelingen zijn duurzaam. Zo kan je bijvoorbeeld een groene tuin of een groen dak aanleggen voor jouw gebouwen. Dit zorgt niet alleen voor minder wateroverlast in de straten bij een flinke regenbui, maar helpt ook de natuur een handje.

Woonvraag

Op Urk hebben wij een enorme woonvraag! Er zijn veel Urkers die op dit moment een huis willen kopen. Kaarten die dit icoon aangeven zorgen voor woonruimte in jouw wijk.

Voorzieningenniveau

In een wijk wil je kunnen wandelen, sporten, leren en winkelen. Elke kaart die dit icoon aangeeft zorgt voor die levendigheid.

Bouwen voor punten of bouwen uit voorkeur?

Bouw tijdens de serious game niet iets wat jullie niet terug willen zien in jullie ideale wijk. Je kunt op veel verschillende manieren een mooi puntenaantal scoren. Binnen elke categorie gebouwen en ontwikkelingen zijn genoeg keuzes. Hier een aantal tips die ervoor gaan zorgen dat jullie als beste wijkenbouwers uit de verf komen!

Bonuspunten

Diversiteit in de wijk
Een diverse wijk met veel verschillende soorten gebouwen zorgt voor hoge leefbaarheidscijfers. Het betekent dat men zich thuis voelt in de wijk, en dat verschillende doelgroepen zich er kunnen vestigen. Wanneer er uit 4 verschillende gebouw categorieën is gebouwd, krijgt het duo hierom 5 bonuspunten.

Gebouwen die elkaar versterken
Het is belangrijk dat gebouwen en ontwikkelingen binnen een wijk bij elkaar passen. Een basisschool en en een kinderboerderij gaan natuurlijk goed samen. Wanneer je als duo uit een bepaalde gebouwen categorie minstens 3 gebouwen bouwt, krijg je hierom 2 bonuspunten (per categorie).

Punten aftrek

Onvoldoende huizen in de wijk
Het vinden van een woning is momenteel op Urk een flinke uitdaging. Het is belangrijk dat er voldoende ruimte is voor wonen in jullie wijk! Het puntenaantal van jullie kaarten bij 'woonvraag' moet hierom minstens 10 zijn. Zo niet, dan zullen er 5 punten afgetrokken worden van jullie puntenaantal.

Onvoldoende parkeerruimte
Ontzettend leuk, die sportschool, dat tuincentrum, en die huizenblokken die jullie gebouwd hebben. Maar: waar kunnen jouw inwoners hun auto kwijt? Hou er rekening mee dat elk gebouw die voorziet in de woonvraag en het voorzieningenniveau opkrikt, gepaard moet gaan met parkeerruimte.

De parkeervraag bereken je door van jouw kaarten de punten van 'woonvraag' en 'voorzieningenniveau' op te tellen. Deel dit getal door 3. En? Heb je nog genoeg parkeerruimte?

Figure 2 – Appendix B. Game sheet pt. 2. Source: Personal collection.

(Repetition) Figure 8. Framework to analyse the game's design in relation to its purpose. Source: Mitgutsch & Alvarado (2012)

Aims, purposes and envisioned impact

There are three purposes to the game. The first two purposes are line with the aims of the participation process named in the methodology: to get input on how citizens wish for the Zeeheldenwijk to be designed, and to inform citizens on the already planned developments (including the possible methods to heat the neighbourhood). The third purpose is to give citizen insight in the complexity of building a neighbourhood, and dilemmas which can be encountered along the way. This purpose exists to give citizens an image of the issues a municipality deals with on a daily basis. (Naturally, the serious game will also serve as a tool to measure differences in civic engagement.)

The envisioned impact on the citizens is therefore that they gain new insight in the context of the Zeeheldenwijk, the municipality's role in developing the neighbourhood, and spatial planning dilemma's which can be encountered along the way. Moreover, it is suggested that a serious game will lead to higher civic engagement levels (see hypotheses Ch. 2.6) .

Aesthetics/graphics

The game is a maquette game. This is not just because it was too costly (in time and resources) and complex to create an application. It is also the fact that a tabletop game helps in the negotiations between citizens during the game. Being able to freely move buildings from one place to another, sort out cards and buildings to own liking, and having a full view of possibilities during the game helps to comprehend the opportunities in buildings/development. It also allows for more creativity from the players.

Cards are designed in such a way that it is clear to which category they belong. Moreover, the associated maquette buildings/developments and yields are displayed on the cards, so players can easily see which buildings they can put on the map of the Zeeheldenwijk, and what benefits each card gives.

Fiction/Narrative

During the game explanation, players are told that they are put in charge of the spatial planning department for the hour to come. They are allowed to build whatever they want, and how they want it in the Zeeheldenwijk. The new area has to be designed to function as a transition area from industrial estate to living and retail destinations. Approximately 1600 homes have to be realised, along with a shopping centre.

Mechanics

There are 18 turns in which players can build their ideal neighbourhood. Each turn, as far as the players' money pool allows it, three actions are possible
- To build one building (homes are approximately equal to 60 homes in reality)
- To implement sustainable measures
- To develop public space

Figure 3 – Appendix B. Types of cards. Source: personal collection

Going through each of the 18 turns, players will have to come to a collective solution on which action to take next. Personal interest will give ground to conflicts among players, but solutions can be found in many different ways. Players can get points for the following things:

GREX   Sustainability   Spatial quality   Facilities   Housing demand

Unity   Diversity

Figure 4 – Appendix B. Points given out. Source: Personal collection.

Players lose points if they did not accommodate for enough parking space, or housing (see the point sheet after the game design explanation).

At the end of the game, a feedback round will be done on the basis of their ideal neighbourhood, and some uniform questions asked every round. Motives to take certain actions will be noted during and after the game. A picture will be taken of each final neighbourhood.

Framing - audiences
The game was designed to be playable by all adult age groups. There is no right or wrong during the game: points can be gained in many different ways. This means foreknowledge on how to play games is not necessary: anyone can participate. As many different age groups as possible were invited via social media, orally, and via text. The invitations differed per age group accordingly.

Content/Information
Beforehand, a presentation is given on the contexts of the research, the participation process, the planned developments within the Zeeheldenwijk, and the possible energy transition measures within the neighbourhood.

PLANPUNTEN

NAMEN DUO

PUNTENAANTAL

De opbrengst
Het aantal muntstukken dat over is.

Ruimtelijke kwaliteit
Tel alle 'ruimtelijke kwaliteit' punten van de kaarten bij elkaar op.

Bonuspunten - eenheid & diversiteit

Voor elke categorie waaruit minstens 3 gebouwen zijn gebouwd +2 punten

Als uit 4 verschillende categorieën is gebouwd +5 punten

$+$

$+$

Duurzaamheid
Tel alle 'duurzaamheid' punten van de kaarten bij elkaar op.

Woonvraag
Tel alle 'woonvraag' punten van de kaarten bij elkaar op.

Punten aftrek - Onvoldoende huizen in de wijk

Wanneer het totaal lager is dan 10, reken -5 punten

$-$

Voorzieningenniveau
Tel alle 'voorzieningenniveau' punten van de kaarten bij elkaar op.

Punten aftrek - Onvoldoende parkeerruimte in de wijk

Tel woonvraag + voorzieningenniveau bij elkaar op. Deel dit door 3. Noteer in het oranje vlak. Dit is de totale parkeerruimte die in jullie wijk aanwezig zou moeten zijn voor de huizen en de voorzieningen. Halen jullie dit niet, reken -5 punten.

$-$

TOTAAL AANTAL PLANPUNTEN

Figure 5 – Appendix B. Point sheet serious game: build your Urk! Source: Personal collection.

<u>Justification of choices made setting up the serious game</u>

In Chapter 2.3, it was mentioned that many different games exist, depending on the players, the strategies which can be taken, and the possible outcomes. In figure 6, several distinctions are shown which are made by a variety of authors. By means of this figure, the choices made for this serious game will be justified.
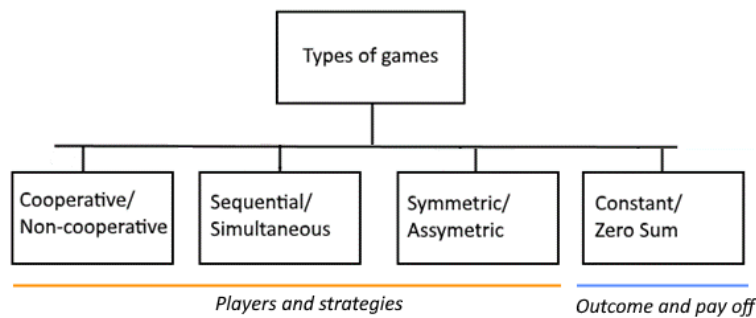

Figure 6 – Appendix B. Types of games. Source: Personal collection (on the basis of authors below).

Players and strategies
Starting with the first block, the game will be cooperative. Shubik & Powers (2016) make a distinction between *cooperative and noncooperative* games. In a cooperative game, the players are convinced to adopt a specific strategy to negotiate and create agreement with fellow players. The prisoner's dilemma is an example of an approach which could be adopted in a cooperative game: the negotiation will help in the decision to remain silent. In a non-cooperative game players are left to decide upon their own strategy individually, in order to maximise their own profit. In this game, a duo will have to adjust their individual strategies to one another's to find a collective one. The game is made cooperative to simulate having to build a neighbourhood together. It takes insight in each other's opinions to come to a collective solution.

Secondly, the game will be played *simultaneously*. Kyle Bagwell (1992) sets out a *sequential game* scenario where one player has the right to the first move, and the other player has the right to observe, and react to this strategy. Games in which moves are done *simultaneously* will thus change the power relations between players. The players will be able to make their moves at the same time, or collectively, to create a tranquil environment in which discussion is possible. Note that this only applies to the dependence between players in making their moves. There will be 18 alternating turns in which players can decide which development should implemented or which building should be built. This dynamic approach is chosen to come to the ideal neighbourhood. A decision made in turn 1 will influence decisions to come.

The common interest in a game can be described in terms of symmetric and asymmetric games. In symmetric games players can adopt the same strategies, as they provide benefit to all. In an asymmetric game, strategies adopted are different, as they benefit one more than the other (Murphy, 1991). The strategies adopted can be different each time, so asymmetric. It is dependent on personal interest which neighbourhood is built eventually to enable players to use as much creativity as possible. Points can be scored in many different ways. It is up to the players and previous decisions which strategy is more beneficial. A strategy can be chosen on the basis of two factors: personal preferences or the points that each building or development can bring.

Outcomes and pay offs

The game will have a *dynamic sum* and *non-zero* outcome. The outcome of a game can be defined in two ways: *Constant/Dynamic Sum, Zero/Non-zero Sum.* With a constant sum, the outcomes of all the chosen strategies by the players will stay constant, even if the individuals' outcomes are different. In a zero sum game all the players' decisions will eventually equal zero. The gain of one player will always be equal to the loss of another player in 'zero' games. This is also why a cooperative is an example of a non-zero game. Depending on the strategies adopted, the sum can be maximised (Mookherjee, 1997). The same goes for this serious game. The outcome, or total of points, can be different each time, depending on which decisions are made by the two players.

Finally, the serious game was built up with one more subject in mind.

Conflicting interests

A serious game is not merely a mathematical undertaking. As interventions impact citizens, a social dimension gets added. Spatial measures and decisions may lead to certain emotions from citizens; responses which practitioners, politicians, engineers and project managers struggle to deal with in practice. Reasons for negative responses may be insufficient informing about the benefits of spatial projects, leaving citizens primarily concerned about their direct environment. This may create a negative attitude towards for example energy transition measures, and may ultimately stand in the way of investing in energy measures for citizens. Moreover, in some cases resistance from local communities may be qualified as NIMBY-behaviour by practitioners. As a result, concerns from the public are not properly addressed, and the factors that cause the emotional responses remain unknown (Perlaviciute et al., 2018). Perlaviciute et al. argue that emotions are not irrational, but can be seen as 'practical rationality'. Responses from this rationality are evoked when spatial developments violate or support core values of citizens. These values being:

- Biospheric values (caring for protecting nature and environment)
- Altruistic values (aiming to safeguard the well-being of others in society)
- Egoistic values (aiming to safeguard personal resources like status and wealth)
- Hedonic values (seeking pleasure and comfort)

A serious game is a simulation of these conflicting interests. Thus, these values can be seen as the core stones for forms of interaction between players. The values shared above formed the basis for the different types of points which can be given, and different categories from which citizens can build. Biospheric values can be found back in the sustainability cards. An altruistic approach is taken by building inclusively, and for other societal groups beside the players themselves. Egoistic values are portrayed in the money that can be gained per card. Finally, hedonic values are woven into the different facilities which can be built close by.

The outcome of the serious game takes no formal part in this research to keep the scope clear. The data analysis will therefore leave the way these values unfolded during the serious game out. However, these values will be taken into consideration in the advisory report set up for the spatial planning department of the municipality, as they portray the several motives behind players' actions.

Appendix C – Data analysis details

Cronbach's alphas per compound variable

Compound variable	Cronbach's output
Pre-test civic engagement	**Reliability Statistics** | Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items | |---|---|---| | ,717 | ,656 | 25 |
Post-test civic engagement	**Reliability Statistics** | Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items | |---|---|---| | ,835 | ,824 | 25 |
Civic action (component of rational ignorance)	**Reliability Statistics** | Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items | |---|---|---| | ,788 | ,786 | 18 |
Benefits sought (component of rational ignorance)	**Reliability Statistics** | Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items | |---|---|---| | ,714 | ,719 | 8 |
Total rational ignorance	**Reliability Statistics** | Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items | |---|---|---| | ,732 | ,721 | 26 |

Total serious game experience

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,814	,822	6

Indicators used in the rational ignorance calculation

Civic actions
- Solving problems in the direct environment
- Sharing thoughts on issues in the town with others
- Contacting an official about issues
- Contacting local media about issues
- Taking part in an information session about the direct environment
- Taking part in participation session, organised by the municipality
- Volunteer
- Protest, march or demonstrate
- Sharing opinion on social media
- Having the ambition to get a career in politics, or authorities

Benefits:
- influencing the decision making in spatial planning
Variable: Influence in decision making of the municipality;
- making a difference for the community (altruism)
Variable: Believes a difference can be made for the community by him/her;
- helping to create a safe and liveable environment
Variables: Responsibility for a safe environment, wishing for community problems to be solved.

Appendix D – Serious game evaluation

These questions have been based on theory presented in the theoretical framework (Ch. 2.5).

To what extent were the players impacted (in real life), taking the game's purpose and aim into consideration?

In Appendix B, the game's purpose and aims have been noted:

There are three purposes to the game. The first two purposes are line with the aims of the participation process named in the methodology: to get input on how citizens wish for the Zeeheldenwijk to be designed, and to inform citizens on the already planned developments (including the possible methods to heat the neighbourhood). The third purpose is to give citizen insight in the complexity of building a neighbourhood, and dilemmas which can be encountered along the way. This purpose exists to give citizens an image of the issues a municipality deals with on a daily basis. (Naturally, the serious game will also serve as a tool to measure differences in civic engagement.)

The envisioned impact on the citizens is therefore that they gain new insight in the context of the Zeeheldenwijk, and spatial planning dilemma's which can be encountered along the way. Moreover, it is suggested that a serious game will lead to higher civic engagement levels (see hypotheses Ch. 2.6).

Starting with the insight and knowledge gained: both the survey results and game reports hold information on the extent to which players have been impacted by the serious game. Players were asked to score whether they learned anything from the serious game, or gained any new insights. The game reports show which insights were gained. Figure 1 (appendix D) shows a structured overview of the codes assigned during the qualitative data analysis.
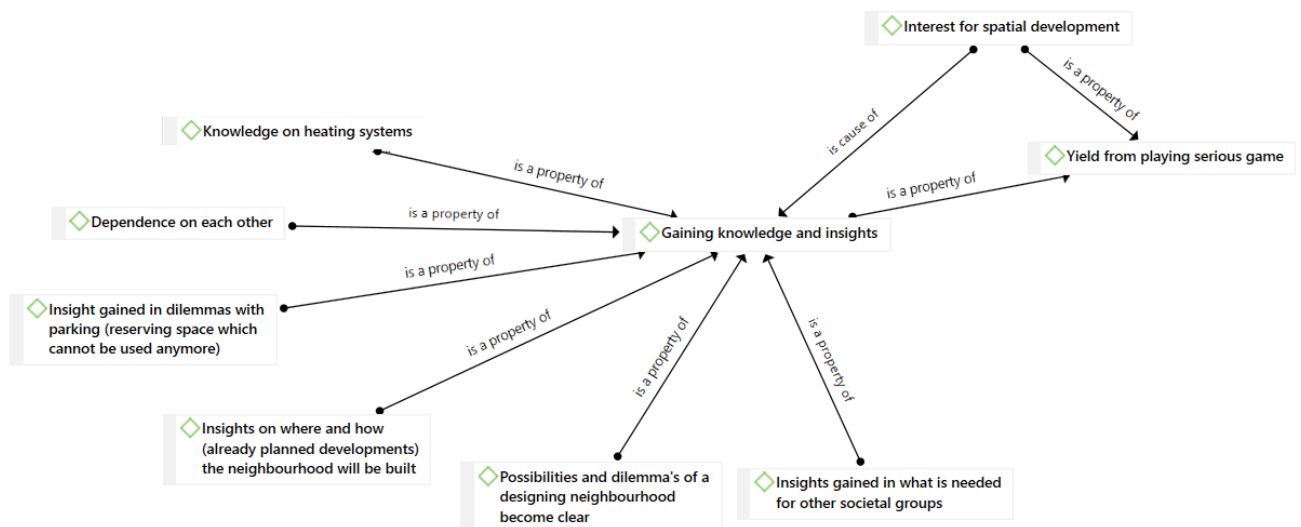

Figure 1 – Appendix D. Source: Personal collection (Atlas.ti).

The insight the players mentioned the most during the feedback rounds (from the frequency of the assigned codes), was getting a general image of which dilemmas can be crossed designing a neighbourhood. Some statements capture this accordingly (translated from Dutch):
"Hard choices had to be made." (Round 1)
"You think you're done, and more problems follow." (Round 7)
"Dilemmas come in quickly with housing and parking." (Round 8)

Also shown in the figure is knowledge on heating systems and insights on where and how (already planned) developments will be built. The game explanation and map held some 3D visualisations of the already planned areas and the bridge which will be built to create a third arterial road. Gaining knowledge on these subjects was mentioned during three gaming sessions. From the pregame notes it also becomes clear that there were players in at least three rounds who did not yet know about the exact location of the Zeeheldenwijk, or the types of heating systems which have to be implemented in new neighbourhoods. During two rounds it was also mentioned that playing the game brought more interest in spatial developments in the Zeeheldenwijk.

The data analysis in Atlas.ti held more yields than just gaining insights and new knowledge. Seen below is a code network which displays that players are also more urged to participate in the future (figure 2, appendix D). Though this was mentioned by two players in the game reports, this is also confirmed by the survey results. It was shown in the research results that the urge to visit information sessions / 'buurtschouwen' (going through the neighbourhood to see any societal issues) was higher after playing the game. It could be concluded that citizens are more urged to participate in sessions in general (not necessarily organised by the municipality) after playing the serious game.
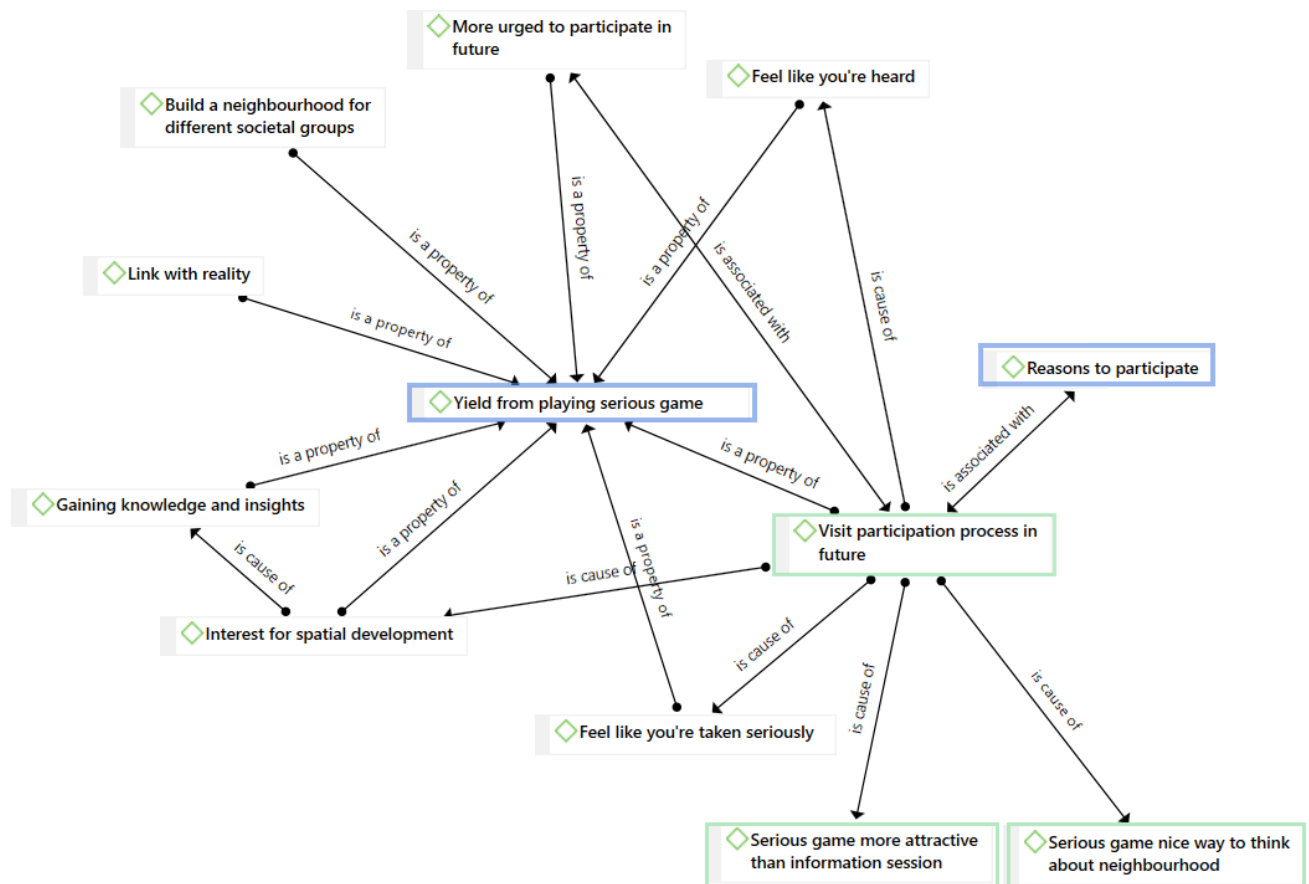

Figure 2 – Appendix D. Source: Personal collection (created in Atlas.ti).

Another interesting change is seen in the irrational ignorance gap. With suitable Cronbach's Alpha's of 0.625 and 0.693 a T-test could be carried out to see whether players are more urged to debate, listen, read, or learn even if the subject does not interest them. A significant difference can be seen between the pre-test and post-test compound variables below. Players seem to be slightly more urged to debate, listen, read or learn on subjects which do not interest them beforehand. This possibly has a connection with having a positive experience during the serious game, learning about a subject which would usually not occupy them. After all, players were mostly motivated to partake because it was a game, or because they were acquainted with the game host and wished to contribute to the research. Though it was mentioned during two rounds that players participated because they will possibly live in the Zeeheldenwijk in the future, players never partook out of specific interest in the spatial developments (figure 3, Appendix D).

Paired Samples T- test Irrational ignorance

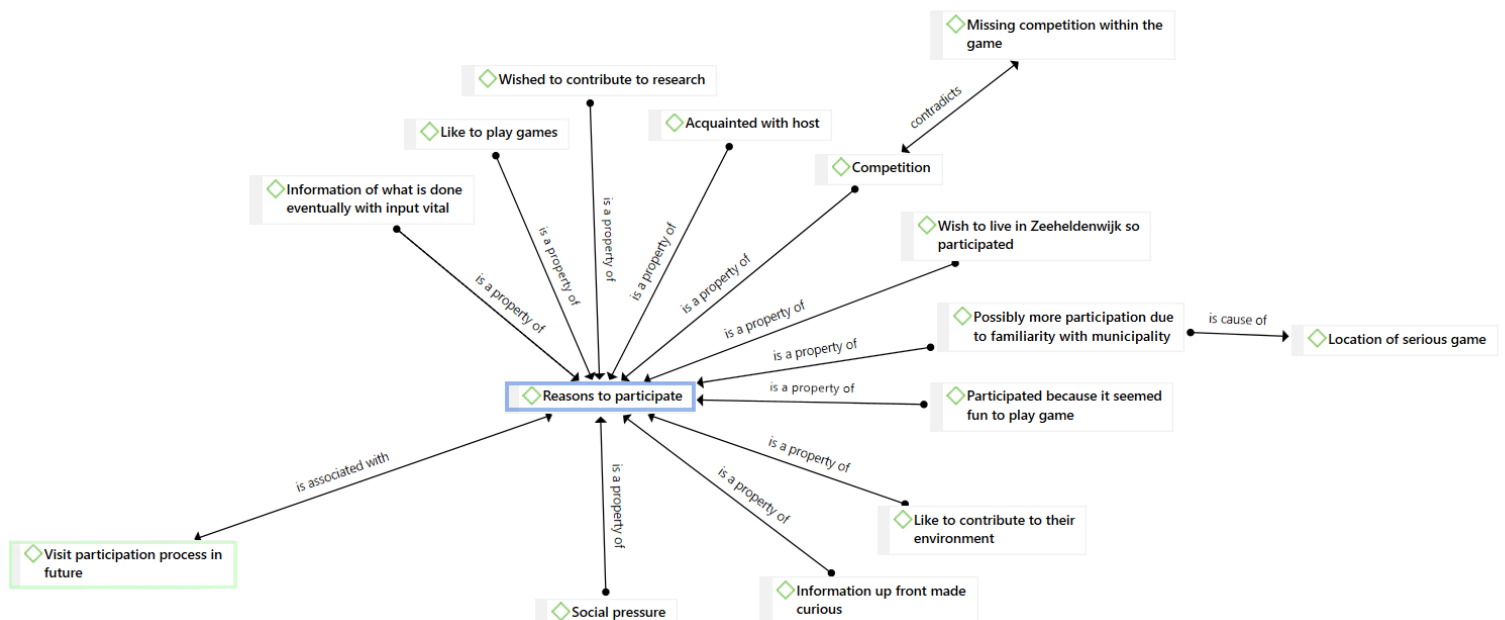| | | Paired Differences | | | | | | | |
					95% Confidence Interval of the Difference				
			Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig (2-tailed)
		Mean							
Pair 1	A_Irrational_ignorance - B_Irrational_ignorance	-,23437	,29536	,07384	-,39176	-,07699	-3,174	15	,006

Figure 3 – Appendix D: Reasons to participate. Source: Personal collection (created in Atlas.ti).

Lastly, it has already been concluded that players score higher civic engagement levels, mostly within the electoral index. This is also how players have been impacted in real life. The quality of input gained on the Zeeheldenwijk has yet to be analysed in the advisory report, but with these results, it can be concluded that all purposes of the serious game have been fulfilled.

To what extent was the content/information well presented, correct, and easy to access?

As seen in the results chapter, with a mean of 4,625 to the question if the player understood all the information shared during the session, the content/information was definitely easy to access. The purpose was also clear, seen from the mean of 4,500. The game reports show no different results. It was mentioned throughout the reports that:
"It was clear how the input will be used" (Round 1, round 5)
"The game could be followed easily" (Round 5)
"There were quite some cards at the start, but good guidance made it a fun quest" (Round 3)

To what extent did the game mechanics fit the purpose of the game, and how did the players experience this way of playing?

The game mechanics can be found in Appendix B (Game sheets & information). It can be concluded that the game mechanics have fit the purposes of the game well: it was discovered that the purposes of the game were fulfilled earlier. Moreover, it is evident from both survey results and game reports that the players thought the game was fun to play ($\mu = 4.875$). Many different reasons were given why the game was fun to play, as shown in the code network in figure x. Three duos of citizens mentioned the amount of cards seemed somewhat overwhelming at the start, but that it quickly became clear how to operate after commencing with the game.

What should be taken into consideration was a point of amelioration within the game mechanics, mentioned in one of the game reports. It was not appealing for them to play for the land yields (or GREX) during the game. Slightly more planning points could be gained with investments in sustainable or public developments. This might have had an impact (though only one group mentioned it) on the eventual results of the serious game. Another point is playing for points versus playing to create your ideal neighbourhood. Though different approaches could be taken to gain points, some very competitive groups chose some more beneficial planning cards over the developments they really wished for. To minimise the effects on the eventual outcome, it was noted which buildings were built for points, and which buildings the teams actually wished to see instead.
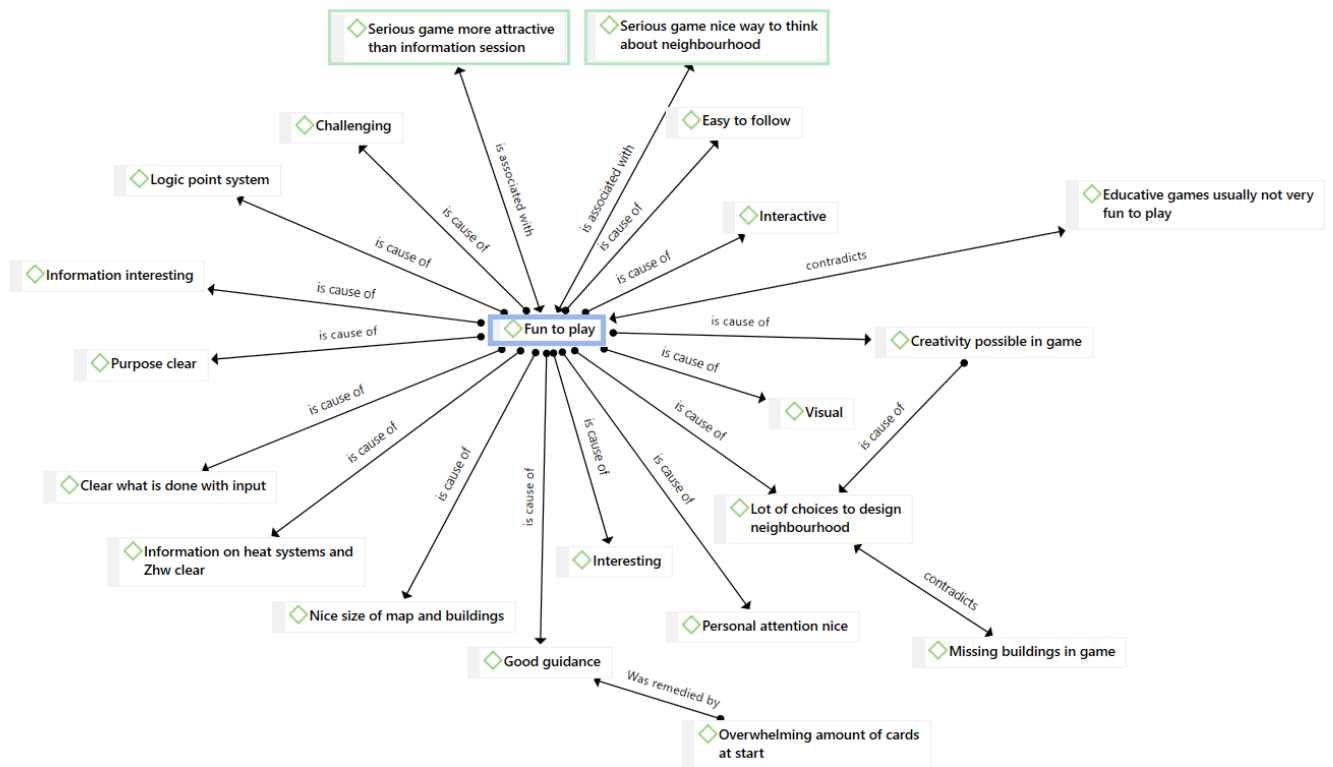
Figure 4 – Appendix D. Characteristics of the serious game. Source: Personal collection (created in Atlas.ti)

A final consideration in evaluating the game's mechanics is the fact that the initial sustainability measures on heat networks were removed from the game due to a lack on recent information (prizes, advantages), even though a part of the decision relies on these measures.

To what extent did the narrative fit the purpose of the game, and how did the players experience this story?

The narrative of the game was not mentioned explicitly in the game reports or the survey, though this could be connected to the fun players had during the game (shown above). Further conclusions cannot be drawn on the basis of the current data.

To what extent did the graphics/aesthetics fit the purpose of the game, and how did the players experience these aesthetics & graphics?

A map, maquette buildings, colourful cards and images of public/sustainable developments were used to play the game. It was established earlier that the pre-established purposes were fulfilled by the game. The question remains how players experienced the aesthetics and graphics. Players were asked whether the lay out helped them to play the game (μ = 4.563). From the survey results it can therefore be concluded that the graphics/aesthetics fit the game. During the game sessions it was also mentioned that:
"The maquette made it very visual. The map had a nice size." (Round 6)
"The game was very visual. The maquette really made you think about decisions you've made in buildings and facilities." (Round 8)
"It is fun to be occupied so interactively with the design of a neighbourhood" (Round 8)

As seen in the figure 4 (Appendix D), the interactive and visual characteristics of the game were reasons why the game was fun to play. On the basis of these points, the graphics and aesthetics of

the game were vital to achieving the game's purposes. Important to note is that phase 2 was not shown on the map, even though input will mostly be used as advise for this phase.

To what extent did the framing of game elements fit the game's purpose, and how did the players experience the framing of the game? *Enough skills to play it? Was it easy to learn from the game?*

It was not mentioned once in the game reports or open survey questions (what made the game a fun activity/ no fun activity) that the game was tough to play, or that the audience was not able to keep up with the information shared during the gaming sessions. This has also contributed to achieving the game's purposes, as players were able to learn something from playing the serious game.

Conclusions

Though the narrative could not be tested as extensive as the other game elements, overall it can be concluded that the purposes of the game were achieved, and that the serious game functioned sufficiently as a whole to use its results. Some mechanics could be ameliorated in the future. It should be made more appealing to play for the GREX. Moreover, concrete results of the serious game should be handled carefully, as playing for points sometimes overruled building an ideal neighbourhood. The solution was to write down in the report when buildings were built purely for points, but it might still have been an influencing factor in the final results. Nonetheless, the game was fun to play, and the yields are evident: civic engagement levels have risen, and the players gained new insights on different subjects.

Sources

Alonso-Fernández,C., Martínez-Ortiz, I., Caballero, R., Freire, M., Fernández-Manjón, B. (2019). Predicting students' knowledge after playing a serious game based on learning analytics data: A case study. *Journal of Computer Assisted Learning, V 36 (3), p. 350-358.*

Annetta L., & Bronack S. (2011). *Serious Educational Game Assessment: Practical Methods and Models for Educational Games, Simulations and Virtual Worlds.* New York: Springer.

Arnstein, S. R. (1969). A Ladder of Citizen Participation. *Journal of American Planning Association, V 35 (4), p. 216-224.*

Backlund, P., & Hendrix, M. (2013). Educational games - are they worth the effort? A literature survey of the effectiveness of serious games. *Games and Virtual Worlds for Serious Applications (VS-GAMES), 2013 5th International Conference.*

Bamberger, M. (1991). The importance of community participation. *Public Administration and Development, V 11, p. 281-284.*

Bishop, P., & Davis, G. (2002). Mapping Public Participation in Policy Choices. *Australian Journal of Public Administration, V 61 (1), p. 14-29.*

Bowler, S., & Donovan, T. (2002). Democracy, Instutions, and Attitudes about Citizen Influence on Government. *British Journal of Political Science, V 32 (2), p. 371-290.*

Bourdieu, P. (1986). The forms of capital. *Richardson, J.G. (Ed.), Handbook of Theory and Research for the Sociology of Education. Greenwood, New York, p. 241–258.*

Bradford, A. *Deductive Reasoning vs. Inductive Reasoning*. Retrieved 10-07-2020 from: https://www.livescience.com/21569-deduction-vs-induction.html

Breuer, J., & Bente, G. (2010). Why so serious? On the relation of serious games and learning. *Journal for Computer Game Culture, V 4 (1), p. 7-24.*

Campbell, D.E. (2009). Civic Engagement and Education: An Empirical Test of the Sorting Model. *American Journal of Political Science, V 53 (4), p. 771-786.*

Claridge, T. (2004). *Social Capital and Natural Resource Management: An important role for social capital?* Brisbane Australia: University of Queensland.

Claridge, T. (2018*). Criticisms of social capital theory: and lessons for improving practice.* Retrieved 16-06-2020 from: https://www.semanticscholar.org/paper/Criticisms-of-social-capital-theory%3A-and-lessons/5bab7b31d7447ed5a67c78a8906205a4ae9c1b8b

Coleman, James S. (1961). The Relations between School and Social Structure*. The Social Organization of Schools, New Conceptualizations of the Learning Process, p. 177-204.* New York: Plenum.

Creighton, J. L. (2005). *The public participation handbook: making better decisions through citizen involvement.* San Francisco: Jossey-Bass.

Cupchik, G. (2001). Constructivist Realism: An Ontology That Encompasses Positivist and Constructivist Approaches to the Social Sciences. *Forum: Qualitative Social Research, V 2 (1), art. 7.*

Dahl, R. (1971). *Polyarchy.* New Haven: Yale University Press.

Dixit, A. K. & Skeath, S. (2004*). Games of strategy*. New York: W. W. Norton & Company.

Fine, B. (2002). It ain't social, it ain't capital and it ain't Africa*. Studia Africana, V 13, p. 18 – 33.*

Gemeente Ijsselstein, PHK/SR/HM/Concernstaf. (2011). *Burgerparticipatie en de participatieladder.* Ijsselstein: Gemeente Ijsselstein.

Gemeente Schiedam. (2020*). Participatieladder*. Retrieved 08-03-2020 from: https://www.schiedam.nl/a-tot-z/participatieladder

Gibson, J. (1989). Understandings of Justice: Institutional Legitimacy, Procedural Justice, and Political Tolerance. *Law & Society, V 24, p. 469.*

Glanville, J. (2009). A typology for understanding the connections among different forms of social capital. *American behavioural scientist, V 52 (11), p. 1507-1530.*

Göbel, S., Hardy, S., Wendel., V, Mehm., & F, Steinmets, R. (2010). Serious Games for Health – Personalized Exergames. *Proceedings ACM Multimedia, p. 1663-1666.*

Gunning, P. (2002). *Understanding democracy: An introduction to public choice.* Retrieved 03-12-2018 from: http://www.fortunecity.com/meltingpot/barclay/212/votehtm/cont.htm

Habermas, J. (1968) *Erkenntnis und Interesse.* Berlin: Suhrkamp Verlag, Heinemann Educational Books.

Hamari, J. (2014). Does Gamification Work? A literature review of Empirical Studies on Gamification. *Proceedings of the 47th Hawaii International Conference on System Sciences, January 6-9, 2014.*

Harris, M. T., & Weiner, D. (Eds.). (2002). *Community participation and geographic information systems.* London: Taylor & Francis.

Jessor, R. (1977). *Problem behaviour and psychosocial development: a longitudinal study of youth.* New York: Academic Press.

Krek, A. (2005). Rational ignorance of the citizens in public participatory planning*. 10th Symposium on information- and communication-technologies (ICT) in urban planning and spatial development and impacts of ICT on physical space, CORP 05. Vienna University of Technology: Vienna.*

Krek, A. (2008). Games in urban planning: The power of playful public participation. In Mobility nodes as innovation hubs. *Manfred, Schenk, Proceedings of 13th international conference on urban planning, regional development and information society, Schwechat-Rannersdorf , p. 683–669.*

Lee, N.J., Shah, D.V. & McLeod, J.M. (2012) *Processes of Political Socialization: a Communication Mediation Approach to Youth Civic Engagement*. Thousand Oaks, California: SAGE publications.

Lenferink, S., Arciniegas, G., Samsura, A., & Carton, L. (2016). Integrating Geodesign and game experiments for negotiating urban development. *Research In Urbanism Series, V 4 (1), p. 71-92.*

Letteboer, M. & Reijers, V. (2020). *Woonwensen- en leefbaarheidsonderzoek.* Urk: Gemeente Urk.

Mansuri, G., & Rao, V. (2013). *Localizing Development – Does participation work?* Washington D.C.: The World Bank.

Mayer, I., Bekebrede, G., Harteveld, C., Warmelink, H., Zhou, Q., Ruijven, T., … Wenzler, I. (2014). The research and evaluation of serious games: Toward a comprehensive metholodgy. *British journal of educational technology, V 45 (3), p. 502-527.*

Mayer, M. (2003) The onward sweep of social capital: Causes and Consequences for Understanding Cities, Communities and Urban Movement. *In: International Journal of Urban and Regional Research, V 27 (1), p. 110 – 132.*

McCacllum, S. (2012). *Gamification and Serious Games for Personalized Health*. Amsterdam: IOS Press.

McClave, J.T., Sincich, T., Knypstra, S. (2016). *Statistiek. 12e editie.* Amsterdam: Pearson.

McKelvey, R., & Palfrey, T. (1995). Quantal Response Equilibria for Normal Form Games. *Games and economic behaviour, V 10, p. 6-38.*

Ministerie van Economische Zaken. (2016). *Energie Agenda.* The Hague: Ministry of Economics.

Mitcham, C. (1997). Justifying Public Participation in Technical Decision Making. *Technology and society magazine, V 1 (4), p. 40-46.*

Moody, R. (2007). *Assessing the role of GIS in e-government: A tale of e-participation in two cities. In 11th International research symposium on public management.* Germany: University of Potsdam.

Myerson, R. B. (1991). *Game Theory: Analysis of Conflict*. Cambridge, MA: Harvard University Press.

Palic, M., & Vignali, C. (2016). Special Issue: Research methodology. *International Journal of Sales, Retailing and Marketing, V 4 (9).*

Perlaviciute, G., Steg, L., Contzen, N., Roeser, S., & Huijts, N. (2018). Emotional responses to Energy Projects: Insights for Responsible Decision Making in a Sustainable Energy Transition. *Sustainability, V 10 (7).*

Poplin, A. (2012). Playful participation in urban planning: a case study for online serious games. *Computers, Environment and Urban Systems, V 36, p. 196-206.*

Poplin, A. (2013). Digital serious game for Urban planning: "B3, Design your market place!". *Environment and planning B: Planning design, V 40, p. 000-000.*

Price, P., Jhangiani, R., & Chiang, I. (2015). *Research Methods of Psychology – 2nd Canadian Edition.* Victoria, B.C.: BCcampus. Retrieved 17th of June 2021 from: https://opentextbc.ca/researchmethods/chapter/quasi-experimental-research/

Putnam, R. D. (1994). Social Capital and Public Affairs. *In: Bulletin of the American Academy of Arts and Sciences, V 47 (8), p. 5 – 19.*

Tritter, J. Q. & McCallum, A., 2006. The snakes and ladders of user involvement: moving beyond Arnstein. *Health Policy, V 76 , p. 156-168.*

Rocha, E.M. (1997). A ladder of empowerment. *In: Journal of Planning education and Research, V 17 (1).*

Rotmans, J. [Bender Talks] (2021, 20th of May*). Participatie en de Omgevingswet.* Bendergroep. https://bendergroep.nl/participatie-en-omgevingswet-tijdens-bender-talks/

Saunders, M. (2007). *Research methods for business students (5th edition).* Essex: Pearson Education Limited.

Schwandt, T. (1998). Constructivist, Interpretivist Approaches to Human Inquiry. *The Landscape of Qualitative Research: Theories and Issues, p. 221-259.* Thousand Oaks: Sage.

Shubik, M., & Powers, M. (2016). *Cooperative and noncooperative solutions, and the 'game within a game'. - Cowls foundation discussion paper no. 2053.* Yale: Yale University.

Sobel, J. (2002). Can we trust Social Capital? *Journal of Economic literature, V 40 (1), p. 139 -154.*

Somin, I. (2015). Rational ignorance. *Routledge International Handbook of Ignorance Studies, p. 274-281.* New York: Routledge.

Strong, M.F. (1995). *Grassroots environmental action. People's participation in sustainable development. Foreword.* London: Routledge.

Susi, T., Johanesson, M., & Backlund, P. (2007). *Serious Games – An overview*. Skövde: University of Skövde Press.

Wait, M. & Frazer, M. (2017) *The effectiveness of board game learning as an educational tool in employee development.* Paper presented at GBATA 2017: The 19th Annual International Conference of the Global Business and Technology Association, Vienna, 11-15th of July.

Winn, B. 2007. Design, play, and experience: A framework for the design of serious games for learning. *Handbook of Research on Effective Electronic Gaming in Education, p. 1010 - 1024.*

Wollebaek, D. & Selle, P. Does Participation in Voluntary Associations Contribute to Social Capital? The Impact of Intensity, Scope, and Type. *Nonprofit and Voluntary Sector Quarterly, V 31 (1), p. 32-61*

Wondolleck, J.M., Manring, N.J., Crowfoot, J.E. (1996). Teetering at the Top of the Ladder: The Experience of Citizen Group Participants in Alternative Dispute Resolution Processes. *Sociological perspectives, V 39 (2).*