The City Game Fit:
The Reverse Engineering of Urban Games

De Stad-Spel Schikking: Het Ontmantelen van Stadsspellen

(met een samenvatting in het Nederlands)

Proefschrift

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door

Sjors Carel Martens

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Promotoren:	Prof. dr. J.F.F. Raessens
	Prof. dr. P.J. Werkhoven
Copromotor:	Dr. M.L. de Lange

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Acknowledgements

Writing a dissertation is a grand enterprise for one person. Luckily, while the writing itself is solitary, the whole process and product is more a joint endeavour. Keeping in rhythm with the urban-focus of this particular dissertation, the whole organisation of a PhD dissertation can be compared to the build-up and functioning of a city. Trying to plan, build, and inhabit a city on your own is a foolish exercise (looking at you, Le Corbusier). As the many interlocking elements, influences, and agents making a city must be acknowledged, here I would like to present my acknowledgments to those who helped shape this thesis – city style (please don't get angry if I compare you to a bus).

Regardless of how great your plan for a city is, or for a thesis for that matter, you won't get really far without money. For me, the graduate programme of Games Research at Utrecht University so kindly supplied with the means and access necessary to start writing. Grounded in interdisciplinary cooperation, I appreciate the chance given to me to participate in a joint project.

Essential in a city is the infrastructure – the roads, the basic organisation, the rules, and routes for moving. In my thesis I received such a structure from my supervisors, Joost Raessens, Peter Werkhoven, and Michiel de Lange. Their insightful conversations and organisations, in the city centre, Uithof, New York, or Spain, managed to gave order and structure to my thesis. But just as the infrastructure of the city, you also need traffic stops, requiring waiting and patience. Yet it made the process flow safely and surely. I apologise for some of our traffic jams and the accompanying textual slander; I really appreciate the structure and help you gave me.

Even with roads, a city is nothing but traversable area. Another key aspect of a city are its buildings and those dwelling in it. This PhD dissertation was made for the most part in the Muntstraat and the attic of Drift 15. My PhD city was helped along through the help of its inhabitants. There were my students of the Creative Urban Technologies course whose whacky city improvement technologies managed to spice up my idea of city possibilities. A big thank you to all my colleagues that filled the buildings as well. You made city life quite lively indeed. Thank you Gisela, Phoebe, Desi, Eliane, Alex Gekker, Pierre-Yves, Francesca, Laura, Claudia, Melis, Donya, Zerrin, Gabriele, Evelyn, Nico, Joleen, and René, Imar, Stefan, Jasper, Chiel, Dan, Teresa, Marries, Nina, Remco, Guido, Michiel Kamp, Hanneke, Lucie, and Frans. Offices have a bit of a bad reputation when it comes to city building, but you've managed to make it enjoyable. A special thank you to William Uricchio and Frank Kessler for setting me on this path and for painting a pretty and clear horizon.

So in this overview we now have road, buildings, and people. While this already compares to a pretty fine PhD process, our city-simile is still rather bleak. We need some fancy designs and art to give the city some style. The people I met in Copenhagen, before my PhD began added some much needed

creativity to the process. Morten, Kasra, Phillip, Søren, Thom, Alex Holdt, Ea, Espen, Miguel Sicart, and Hajo, thank you for your dry design knowledge. Alternatively, our city needs some animal life. The animal shelter Párraga in Spain helped me through times of lacony and misanthropy. Thank you Miguel Angel, Virginia, and all the dogs, with special mention to Simba, Mery, Balú, Lupo, Leo, Dona, and Ramona. There is more to do than just write, and cleaning shits is not that bad an activity anyway. Furthermore, our city comparison can only work with emergency services to fix stuff when it inevitably goes wrong. I owe a lot to Vera and Velma, who helped me find some solid ground in the mess of my head/city.

Now we basically have a city with streets, facilities, animals, buildings, people, and culture. With the help of these people, one can write a PhD thesis. But it's not my PhD thesis. To make a city more personal, you need contacts. I couldn't have written this thing without my friends. International friends like Miguel, Carla, Duna, Berta, Raúl, Kali, Nieves, María and María, José Agustín, Vero, Alejandro, Pepe and Loli, you made writing this thing possible in any place in the world – but mostly in Spain. In the Netherlands, like green areas dispersed throughout the city, my friends helped me relax and enjoy things outside of cold hard urban thesis writing. Thank you, Ysbrand and Maaike, for your endless source of geekness, Peter and Sanne, for the bad films and game nights, Roos and Teun, the *Wineketeers*, Yannick and Yente, for fear of moths and cool dance moves, Manon and Carolien, examples in the distance, Thijs, the mustachioed artist, Esther, for Pokémon Go interaction, and Enrico and Raoul, two of the Fantastic Four. A city is a lame place without you in it and I'm pretty sure my dissertation would a) not be done, and b) be duller than it is right now.

As you share the city with other people, you are bound to have a neighbour. My neighbour in this process was Stephanie, and I could not have wished for a better one. From trying to figure out what the hell all this interdisciplinarity means, to making games for refugees, you have made this whole PhD process a wild ride. I must say that I'm still proud that we've managed to voluntarily lock up all the university professors during Christmas time. If that is not a measure of success, then I don't know what is. Especially in times of need, neighbours come to the rescue, and Stephanie helped me finish this blasted thing. Thank you girl.

All the inhabitants and structures of our PhD city have been accounted for. The only thing missing is my own home. My family. Thank you, Moeps and Poeps for bearing with me as I was finishing this dissertation. I have never been one to quietly write down stuff; it always goes paired with lots of swearing and cursing, and a general tone of 'no fun allowed' so thinly seeping through this thesis. You seem to be one of the few ones who can deal with this negative behaviour. Thank you for your care, mom, and for your level-headedness dad. And thank you grandma, for keeping me busy and keeping my parents sane.

My brother and sister, Wouter and Guusje, always seem to know something to do. While a PhD dissertation is a black hole sucking all your life and happiness away, these two always managed to have something to do that was fun. Be it magic, games, Gooigi, or just sitting on the sofa, regardless of the activity, it was always fun. It has been since the beginning. I'll forgive you for making fun of me when I explained the principles of immersion while falling asleep while playing Pirate Warriors.

Our city has been formed. We have all the social, cultural, and physical elements. Yet a city is also characterised by movement. For me, movement has been characterised by my dogs, Mortadelo (Morty) and Santiago (Santi). Thank you for making me go out when I would do nothing else but sitting inside. You managed to structure my days with your needs and happiness – sometimes too much happiness. I hope to spend so much more of my non-PhD time with you, which would, theoretically, mean I have more time to play.

Finally, the most distinguished part of the city isn't anything tangible or visible. It's a spirit – a feeling that sets one city apart from another and at the same time keeps it feeling alive and vibrant. Laura, you are that spirit in my city, my dissertation, and in my life in general. From my initial inquiries into where my spaceship was, I can now say with pride that "Ojalá fuera bizco para verte dos veces." If there was any good reason to have done this PhD, it was because I met you. Thank you for staying with me while finishing this thing and living with me in our city.

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Summary in English

This study looks at to what extent the pursued city model of a game can be reconstructed based on an analysis of the action space of the game and to what extent an analysis of action space can be used to improve the design of the game such that it better fits the pursued city model. With the increasing mobility and connectivity of technological devices, there is an increase in popularity and number of urban games, which are games physically set in the city or whose content is shaped by interaction with the city. Despite the new capabilities for these games, many urban challenges, such as citizenship, are addressed through treasure hunts with questions. The design of such urban games often seems to be based on the communication misapprehension of the hypodermic needle model or magic-bullet theory: the belief that a message can be directly communicated through technological means without any interference from the carrier or user. We argue that communication in urban games happens through interaction between game design, communicated city models, and appropriations of the action space. The action space of a design refers to the collection of possible actions that are possible with the current design, which users potentially can use for their activities. In this thesis, we introduce a new interpretative metric called the fit that studies the relationship between the pursued city model, as designed into the game, and those city models appropriated from the action space. This interpretative metric is used to prevaluate how well the design of an urban game caters to the pursued message. To measure the fit of urban games we introduce an interdisciplinary action space analysis, based on reverse engineering, which relies on affordance-centred game design and the newly introduced concept of city models.

For this metric and method, we reconcile the disciplines of humanities, social sciences, and computer sciences. By adapting the computer scientific method of reverse engineering, we start from a finished product, chart the possible actions in the action space, and identify the design decisions behind these actions. This interdisciplinary amalgam however assesses efficacy through a different interpretative metric and prevaluates the possibility of city models being afforded in general during the design. This distinguishes it from statistical validation wherein the existence of a singular effect after publication in a specific experimental corpus is evaluated instead. The introduction of this action space analysis, the modelling of the city, and the interpretative metric of the fit, structure this thesis into three parts.

In the first part, we introduce player appropriation into our understanding of the process of urban game design. When played, urban games are appropriated by players, meaning that they perform only a selection – intended or not – from the actions in the action space. A design is unlikely to communicate just the pursued message. Game designers can canalise the interaction but cannot absolutely determine the appropriated result. Because of this perspective on play, we argue that designing urban games means creating affordances, or possible interactions, of which some can be signified more than others, in order to shape the action space. Based on this exposition we introduce an analytical model for urban game

design to chart all possible interactions, desired or not. This inventory of affordances is required to see if the design is conducive to the communication of the pursued interaction.

For the second part we introduce the concept of the city model as a way to encapsulate the varying definitions of the city depending on the discourse. We explicitly approach cities as models to allow for flexibility while acknowledging partiality. City models then represent a specific interpretation of the city simplified into empirical characteristics that can be traced back to empirical design elements. We argue that all city models are specifications of eight general categories, each with their own formative characteristics. Based on these characteristics, we can reconstruct which city models are afforded in the action space, and ultimately, we can check whether these afforded models coincide with the pursued models.

The third part introduces the fit and the action space analysis method. The fit is assessed through the adaption of four phases of reverse engineering. The implementation phase charts all the afforded interactions contained in the game. The design phase identifies which of these affordances is forwarded as desired; this will become the pursued city model. In the requirements phase the afforded interactions are translated into city model characteristics. Finally, the comparison phase quantifies and qualifies the type of fit by comparing the pursued city model to the afforded city models. The fit can be procedural, ludic, civic, a combination of these, or attuned. A strong fit means that the appropriated actions from the action space communicate the characteristics pursued city model category. A weak fit denotes that the design of the game affords interactions that are not conducive to the pursued city model. To illustrate the capacity of this interpretative metric and action space analysis, their functioning is illustrated in four case studies: GEOCACHING, ONTDEK OVERVECHT, CITIES: SKYLINES, and POKÉMON GO, and subsequently the broader applications are discussed. These studies help us show the capacities and insights of the fit, as well as its limitations.

Concluding, by combining insights from different disciplines, the action space analysis assesses whether the pursued city model fits the city models reconstructible from the action space of the design. When focusing on the efficacy of a singular design, the action space analysis and the fit together show a variance in fit values. The fit can then be understood as a metric to prevaluate whether a design achieves in communicating the pursued city model with its designed action space. These insights can subsequently be used to show alternative uses of contained in these games, the limitations of such alternative use, design characteristics that are conducive or misleading when communicating a specific city model, and the pursued size of the action space. As a control on the feasibility of the pursued city model, the action space analysis exceeds statistical validation in that it checks all possible interactions. In future research, the sensitivity of the metric should be further investigated by comparing the afforded city models not only with the pursued city model, but with all city models possible. Future application of this fit method to additional case studies will further improve the insights into patterns it can provide.

Samenvatting in het Nederlands

Deze thesis kijkt naar in hoeverre een beoogd stadsmodel kan worden gereconstrueerd op basis van een actieruimte analyse en in hoeverre deze analyse gebruikt kan worden om het ontwerp van het spel te verbeteren zodat het beter bij het beoogde stadsmodel past. Met de toename van de mobiliteit en verbondenheid van technologische apparaten zien we ook een toename in de populariteit en het aantal van stadsspellen, die fysiek plaatsvinden in de stad of wiens inhoud gebaseerd is op interactie met de stad. Ondanks de nieuwe mogelijkheden voor deze spellen worden veel uitdagingen van de stad, zoals burgerschap, benaderd aan de hand van een speurtocht met gerichte vragen. Het ontwerp van zulke stadsspellen lijkt vaak gebaseerd op het injectiespuit-model of de *magic-bullet* theorie misvatting uit communicatie onderzoek: de overtuiging dat een boodschap direct gecommuniceerd kan worden door middel van een technologie zonder invloed van de communicator of de gebruiker. Wij beargumenteren dat communicatie in stadsspellen een samenspel is van spelontwerp, gecommuniceerd stadsmodel, en toe-eigening van de actieruimte. De actieruimte van een ontwerp is de verzameling van mogelijke acties die in het ontwerp besloten liggen, waaruit de gebruikers kunnen kiezen om te ondernemen. Wij introduceren een nieuwe interpretatieve metriek, genaamd *the fit*, die de relatie tussen een beoogd stadsmodel zoals in het spel ontwerpen door de ontwerpers, en een stadsmodel zoals toegeëigend uit de actieruimte. Om deze fit van stadsspellen te kunnen beoordelen introduceren we een interdisciplinaire actieruimte analyse, gebaseerd op *reverse engineering* methode, en die berust op een *affordance*-gerichte ontwerpfilosofie, en het hier geïntroduceerde concept van stadsmodellen.

Om het beoogde stadsmodel en die modellen die opkomen tijdens spelen te kunnen vergelijken combineren we in deze thesis de geestes-, sociale, en computer wetenschappen. Door de computerwetenschappelijke methode van reverse engineering aan te passen, kunnen we beginnen bij een compleet product, hiervan de mogelijke acties uit de actieruimte in kaart brengen, en de ontwerpbeslissingen achter deze acties identificeren. Hierdoor voegen we computerwetenschappelijke ontwerpkennis en systematiek toe aan de geestes- en sociale wetenschappen. Deze interdisciplinaire methode bekijkt effectiviteit van stadsspellen aan de hand van een andere interpretatieve metriek dan sociaalwetenschappelijke statistische validatie, en prevalueert zo tijdens het ontwerp in het algemeen de mogelijkheid van het spelontwerp om sommige stadsmodellen te communiceren. Hierin verschilt het van klassieke validatie waarin wordt geëvalueerd of een enkel effect plaatsvindt na de daadwerkelijke publicatie bij een specifieke onderzoeksgroep. De introductie van deze reverse engineering methode, de modellering van de stad, en de interpretatieve fit metriek geeft deze scriptie een driedelige structuur.

In het eerste deel introduceren we speler toe-eigening aan ons begrip van het ontwerpproces. Tijdens het spelen worden stadsspellen toegeëigend, wat betekent dat zij een selectie uitvoeren – beoogd of niet – van de acties in de actieruimte. Het is onwaarschijnlijk dat een ontwerp alleen de beoogde boodschap

communiceert. Spelontwerpers kunnen de interactie sturen maar kunnen niet vastleggen wat het toegeëigende resultaat zal zijn. Met deze benadering tot het spelen beargumenteren wij dat het ontwerpen het maken van *affordances*, of mogelijke interacties binnen de actieruimte, betekent, waarvan sommige meer naar de voorgrond kunnen worden geschoven. Aan de hand van deze expositie van ontwerp hebben we een analytisch model voor stadsspelontwerp geïntroduceerd dat alle mogelijke interacties in kaart kan brengen; zowel de beoogde interacties als de onverwachte.

In het tweede deel introduceren we het stadsmodel, om de grote variatie, afhankelijk van het discours, van de definitie van de stad af te vangen. We benaderen steden expliciet als model om flexibiliteit te waarborgen maar tegelijkertijd partijdigheid te bekennen. Stadsmodellen representeren een specifieke interpretatie van de stad, versimpeld tot empirische kenmerken die voortkomen uit empirische spelontwerp elementen. Wij claimen verder dat alle stadsmodellen specificaties zijn van achter algemene categorieën met hun eigen kenmerken. Op basis van deze kenmerken kunnen wij stadsmodellen reconstrueren zoals deze in de actieruimte besloten liggen, wat als vereiste geldt voor de bepaling of stadsspellen hun beoogde stadsmodel communiceren.

In het derde deel introduceren we de fit en de actieruimte analyse. De fit wordt beoordeeld aan de hand van de vier fases van een adaptatie van reverse engineering. De implementatiefase brengt alle mogelijke interacties besloten in het spelontwerp in kaart. De ontwerpfase identificeert welke van deze mogelijke interacties naar voren komt als specifiek nagestreefd; het beoogde stadsmodel. In de benodigdhedenfase worden de mogelijke interacties vertaalt naar stadsmodelkenmerken. Als laatste, in de vergelijkingsfase wordt het type fit gekwanti- en gekwalificeerd door het beoogde stadsmodel te vergelijken met de mogelijke stadsmodel uit het ontwerp. De fit kan procedureel, ludiek, civiel, een combinatie van deze, of compleet afgestemd zijn. Een sterke fit betekent dat de toegeëigende acties uit de actieruimte nog steeds de beoogde stadsmodel kenmerken communiceert. Een zwakke fit betekent dat het spelontwerp interacties toestaat die niet bijdragen aan de beoogde boodschap. Om de capaciteit van deze interpretatieve metriek en de actieruimte analyse te illustreren wordt de uitvoering ervan aangetoond in vier case studies: GEOCACHING, ONTDEK OVERVECHT, CITIES: SKYLINES, en POKÉMON GO. Vervolgens worden de bredere toepassing en het bereik van de fit besproken. Deze onderzoeken helpen ons de capaciteiten en inzichten van de fit aan te tonen, alsmede de beperkingen.

Concluderend, door inzichten uit verschillende disciplines te combineren, kan de actieruimte analyse onderzoeken of het beoogde stadsmodel past bij de achterhaalbare stadsmodellen uit de actieruimte van het ontwerp. Al kijkend naar de effectiviteit van een enkel ontwerp tonen de actieruimte analyse en fit een variatie in fit waardes. Hierdoor kan de fit begrepen worden als een metriek om te prevalueren of een ontwerp een beoogd stadsmodel kan communiceren aan de hand van een ontworpen actieruimte. Deze inzichten kunnen vervolgens gebruikt worden om alternatieve gebruiken van bestaande spellen en de beperkingen hiervan aan te tonen, ontwerpkenmerken die bijdragen of afdoen aan de communicatie van specifieke stadsmodellen te belichten, en vereiste breedte van de actieruimte te beoordelen. Als

controle op de haalbaarheid van een beoogd stadmodel gaat de actieruimte analyse verder dan statistische validatie omdat het alle mogelijke interacties bekijkt. In toekomstig onderzoek zal de gevoeligheid van de interpretatieve metriek verder onderzocht moeten worden door de afforded city models met alle mogelijke stadsmodellen te vergelijken, en niet slechts met het beoogde model. Verdere toepassingen van de fit en haar methode op meerdere case studies kunnen de inzichten vergroten die uit patronen voortkomen.

Introduction

"I also had a dim idea that if I walked the streets of New York by myself all night something of the city's mystery and magnificence might rub off on me at last" (Plath 2013, 99).

Cities are mysterious entities with a presence that commands a meaning different to all who dwell in it. Some reject the impression, others absorb it, are formed by it, and try to shape it. Author Sylvia Plath provided a melancholic and nihilistic account of the Big Apple, resigning her fate to the same heights as the skyscrapers around her. Yet more uplifting approaches surface as well. Specifically, playful approaches that attempt to make the city accessible through games. The template of the scavenger hunt has taken on a myriad of forms and functions in order to shape the city. Scavenger hunts are basically guided searches with assignments at points in space, like treasure hunts. Their principle appears so simple that the scavenger hunt seems an archetype – a prototypical example informing many different, yet similar treasure hunts through space. Try out the games in Table 1, here made specifically to illustrate our point of the variability of the function of scavenger hunts[1]:

Scavenger Hunt - Sustainability This nature guided tour can show you the scarcity of natural elements in a city, depending on the length of your walk	**Scavenger Hunt - Tourism** This tour should take you past important, notable landmarks that introduce to the city.	**Scavenger Hunt for Fitness** This tour, especially if done faster and faster, serves to improve the physical health of the player
Start at the end of the street	Start at the end of the street	Start at the end of the street
At the first tree, go left	At the first tree, planted in 19-something, go left	At the first tree, go left
At the first flower, go right	At the first flower, a local species, go right	At the first flower, go right
Find the nearest park and observe the nature around a monument	Find the nearest park where a historical event happened	Find the nearest park and walk around it twice
Pick up trash and at the nearest trash can go left	Buy a snack at a kiosk and at the nearest bin go left	Squat to Pick up trash and at the nearest trash can go left
When reaching a square, count the bird cages, and take the street with that number	When reaching a square, note the historical bird towers	When reaching a square, walk around the bird cages and follow the last bird seen
End	End	End

Table 1 Three Scavenger Hunts. The instructions for three different yet similar scavenger hunts. Source: Author creation

[1] These games are playable everywhere, but have been shown to function best when starting at the Academiegebouw in Utrecht, the Zuiderpark in Den Bosch, or La Plaza de la Merced in Murcia.

The attentive player will note however that these three scavenger hunts are all the same. Yet due to slightly different emphases, three different goals are emphasised through the same mechanics: sustainability, tourism, or exercise. Even the non-attentive player will notice that these goals are not reached equally through these actions. The player is expected to gain a larger understanding of larger issues that encompass the city or their life. While the above examples are simplistic adaptations of a scavenger hunt, multipurpose games set in the city exist in great amount. Games that teach you traffic safety (CITY JAM - La Mosca 2014), art history (COMICS ART CAPTURE CHALLENGE - fAR-Play Team 2010), local resources (COMMONS - Kirkpatrick, Lam, and Lin 2010), a rural mindset (INDETERMINATE HIKES+ - EcoArtTech 2014), and (even) being friendly to neighbours (ACTS OF KINDNESS - AOK Media 2011). All in all, there are many games set in the city that pursue serious purposes, yet they are often quite similar and, to differing degrees, not always successful. There seems to be a misfit between the pursued city model that is designed into games, and the afforded city models that are reconstructed when interacting with the design. With this phenomenon in mind, the main research question of this thesis is to what extent the pursued city model of a game can be reconstructed based on an analysis of the action space of the game. A second question is to what extent an analysis of action space can be used to improve the design of the game such that it better fits the pursued city model.

This main question is based on an understanding of the process of urban game design and shaping of interaction in an action space, shown below systematically in Figure 1. Note that we do not deal with the player explicitly in the shape of interviews but instead approach them as implied; focusing solely on the possibilities for players to interact that are contained in the design. In the urban game design process, the game designer has an idea of how the city should be engaged with and designs this idea into a game, here called the pursued city model (1). The characteristics of the design are designed to be played with. This means that the designers create an action space - the collection of possible actions that are possible with the current design, which users potentially can used for their activities (Dijst 2004, 29) – that may forward a pursued interaction (2), but there are more interactions in the action space than just the pursued ones that can be performed when appropriated during play (3). The action space of an urban game then affords multiple city models, here called the afforded city models, based on the different possibilities in the action space (4). We only look at the afforded city models that are possible *within a singular game,* which means that we look explicitly at how the action space fits its pursued goal instead of their position in a broader repertoire of general city model categories. In this thesis we look at whether and how the pursued city model and the afforded city models *fit*, or match (5). This fit is introduced as a new interpretative metric of evaluation, as well as a deeper insight into the engineering of the game itself.

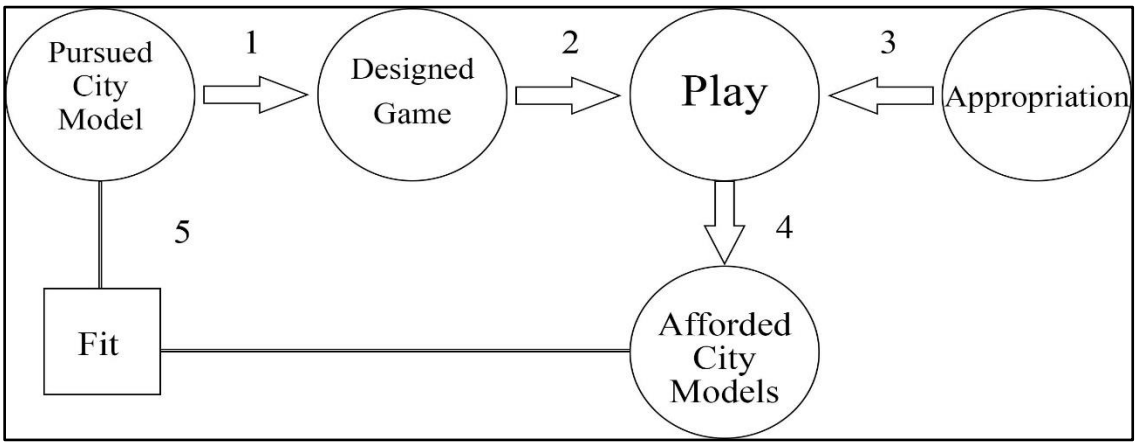


Figure 1 The Urban Game Design Process.
Designers pursue a city model they design into games (1). They can only guide player interpretation through affordances and significations, so they create an action space (2). This action space affords multiple interaction possibilities of which multiple combinations can be appropriated (3). The differing interactions contained in the action space, when appropriated during play afford multiple city models (4). The degree and type of overlap of the afforded city models and the pursued city model can be assessed in the fit (5).Source: Author creation

Problem – The Magic-Bullet Theory

The above scavenger hunt example shows that games with a purpose outside of entertainment – serious games – have a tenuous relationship with their design and their goal. There are plenty of calls for validations of results (e.g. Raphael et al. 2010; Schouten et al. 2017) yet statistical validation of serious games is something that is only rarely undertaken (Jacobs 2016). Validation of serious games in the city requires city-minded frameworks (idem) while their scope of research is often focused on specific effect, on specific people, at a specific moment in time. Although closely tracking correlations, statistical validation examines the effect of a medium on a very specific audience at a very specific moment in time. Insight into whether and how these urban games function is missing. Notwithstanding successes, a lack of assessment regarding the efficacy of serious games leads to a misinterpretation of the capacities of games (just saying games achieve something does not mean they do) and can mean the misallocation of funds in favour of games over other, possibly more effective means.

With an increased reliance on gamification, or "the implementation of game features into [a] the companies' products and services" (Fuchs et al. 2014, 8) – such as a skill based reward structure or leader board to score employee performance – it appears as if gaming practices can be used for every aspect of daily life, with multiple scavenger hunts being only the tip of the iceberg.[2] The functions the features of a game (but also fully fledged games) have to fulfil have proliferated as they are drawn out of their own context, going as far to make players "use their problem-solving skills not only to solve

[2] An alternative interpretation of gamification is given by Mathias Fuchs et al. as "general process in which games and playful experiences are understood as essential components of society and culture" (2014, 7). This broader paradigmatic perspective on society and culture exceeds the purpose of this study. While we acknowledge this broader interpretation, for the purpose of studying the fit we will follow the understanding of gamification as the use of gaming features in non-gaming settings, striving to improve interaction.

puzzles within a digital game but also to approach social and political issues in the real world" (idem, 9). As will be shown in chapter one, dragging game features into the broader context of the city dilutes and confounds what urban games are actually good at. While there is nothing *a priori* wrong with this, a zealous trust in its (unvalidated) effects is a fallacy. Mathias Fuchs et al. paraphrase Ian Bogost in stating that gamification "frustrates the practice of game design and reduces playing to a stimulus-response experience" (2014, 10). In Bogost's own polemically named article 'Why Gamification is Bullshit' he states that "it doesn't really matter whether individual companies have or have not 'succeeded' in their business applications; that is, whether or not the gamification solution in question has 'worked'" (2014, 69). While too denigrating to marketers, Bogost's critique lays bare the central lacuna in using games for serious purposes that will be discussed in this study: the design of the game must *fit* the pursued goal.

This lack of a fit echoes the consequences of what Evgeny Morozov calls "solutionism," or the "unhealthy preoccupation with sexy, monumental, and narrow-minded solutions […] to problems that are extremely complex, fluid, and contentious" (2013, 6). In the scavenger hunt examples above, the complex issues are city exploration, sustainability, and fitness – all more complex than a guided walk – and the sexy solutions are the magic medium of games. As games remain mostly entertainment vehicles, they do not always offer a solution. Often solutionist games are clones of existing games although now conveying different, and often larger, messages (Tulleken 2019), such as SWING VOTER GO (McGonigal 2016), a POKÉMON GO (Niantic 2016) clone focused on getting voters to voting stations instead of catching virtual creatures.[3] For these solutionist games, the design of the game – its mechanics, values, sometimes even visuals – does not matter, as it is the capacity of play and the presence of a game that is the effective element. Put bluntly: throw a game against a problem and the interactivity will do the rest, or so it is believed.

This understanding stems from the simplistic interpretation of games as tools – like a hammer to a nail – that monofunctionally helps to achieve a goal. Anthropologist Thomas Wynn explains that tools, with technology as a more systemised and networked tool, are often faultily understood as solely physical function extensions of human anatomy (1994, 133). Seen as such a tool, games are merely an instrument which serves a varying purpose. However, Wynn explains that it "is almost certainly wrong to think that the nature of a task determines anything specific about the shapes and sizes of tools, or how they will be used" (1994, 155). Tools are not just physical objects that serve a function, but instead are entrenched in cultural behaviour (idem, 151). The apprenticeship and expectations of a tool will dictate its dominant use, but this does not exclude alternative use, or even faulty uses of a tool. This tool analogy illustrates that this hypervariable and solutionist use of urban games echoes what has been called "the hypodermic

[3] Especially in this case, the act is more important than the game, but in general cloning ideas for different values does not translate well. Herman Tulleken explains that "[t]he [cloned] game may be ill-suited to your brand or business goals, and so will work against those" (2019). While it can work, cloning is not without its risks.

needle or magic-bullet model" in communications studies, further explained in chapter one (Scheufele and Tewksbury 2007, 10). Briefly put, this perspective envisions media as capable of directly implanting desired ideas into the mind of the user, as if with a needle; as if by simply using a game to address an urban issue, the desired interaction can be instilled in the player. We argue that where this magic-bullet theory of games fails is in its singular understanding of what a game (whatever that general category may be) can achieve. This thesis will debunk this magic-bullet theory of games, and instead argue for a different interpretative metric to evaluate efficacy by taking the act of play into account.

As more and more game elements are uncritically applied to different contexts, this magic-bullet theory can occur in multiple aspects of the city. This study however focuses on battling the magic-bullet theory in urban games, thus specifying our corpus further than general gamification. Urban games go beyond gamified features and instead are games played in, with, or about a city that can sometimes improve the civic functioning of players on several grounds. This demarcation is urgent due to two main reasons. Firstly, by 2050 about 66 percent of the human population around the earth will live in cities according to a United Nations Word Urbanization Prospects report (2014, 1). While this is an urbanization highlight, it does not yield solely positive results. Anthony Townsend points at the obvious increased pressure on urban housing (2013, 2), power relations shifting to data-using companies instead of governments (idem, 7), the role of efficiency, technology playing a more integrated role in daily life and increasing attention to sustainability and energy use. Furthermore, in a broadcast lecture at Utrecht University, Meike Bartels explained that the degree of urbanization, as environmental factor, impacts on the happiness of its inhabitants and Mazda Akli argues that megacities can negatively impact on stress processes in the brain ('Healthy Urban Living' 2015). Games are used as instruments for solutions to the problems of urbanization. This indicates the second reason: the number of urban games has steadily been increasing since 2008, and is promised to see another surge after the recent success of POKÉMON GO.

Countering the magic-bullet theory and its underlying assumptions, the present study will explicitly dissect the matching between urban game design, and the civic ideas behind the urban goal that is pursued. Central to this countering act is the recognition and inclusion of a third domain, that of player appropriation, next to the communication of a city model through game design. However, we argue that specifically studying player actions or input through questionnaires and interviews will keep the testing of efficacy of urban games after publication of the games, thus hardly combatting the magic-bullet theory. Therefore, we take a design-focused approach, instead dealing with an implied player as manifested in the actions that can be realised when interacting (playing) with the design. We look at how an action space is shaped by the designer to communicate a certain city model, but which ultimately allows for more interactions than just this pursued one. In doing so, we problematise the magic-bullet theory by taking all alternative interactions into account which an implied player could theoretically undertake. This allows us to study the efficacy of communication before any player ever sees the game

as we solely focus on the design; the fit allows for the prevaluation of urban game design. Underlying all our claims about the fit is the realisation that urban games consist of the interrelations between game design, city models, and afforded appropriations, shown in Figure 2. To study the interrelations between these three domains requires the translation of game design into affordance inventories and civic goals into city models, discussed in chapter one and two respectively.

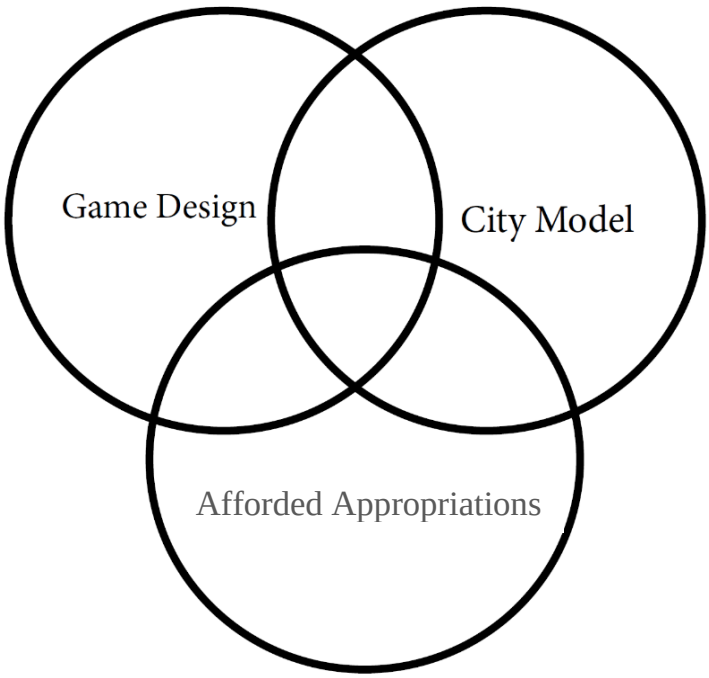


Figure 2 The Three Domains of Urban Games.
The interrelations between these three domains and their attunement to each other will influence whether and how a game fits its purspose. Source: Author creation

Given the problem of the magic-bullet theory intruding on the increase of urban games, we introduce an alternative approach. With this intention, this study answers the following research question:

> *To what extent the pursued city model of a game can be reconstructed based on an analysis of the action space of the game and to what extent an analysis of action space can be used to improve the design of the game such that it better fits the pursued city model?*

To answer this main question, this thesis can be divided into three parts, containing five chapters in total. These parts each explore a section of the elements needed to discover the fit:

- The first part looks into the uncertainty in the design of urban games in chapter one with the following subquestion: *How can an action space approach to urban game design incorporate appropriation of unpredictable affordances into the inventory of urban game design characteristics?*

- Part two investigates the pursuit of varing city perspectives in games in chapter two with the following subquestion: *How can the design of city models into action spaces of urban game design, be canalised and compared?*
- Part three, consisting of chapter three, four, and five, combines the insights from the previous two chapters by introducing the interpretative metric of the fit. The following subquestion characterises this part: *How can an action space analysis discover the fit value the pursued city model and the afforded city models in urban games?*
- Wheareas chapter three looks at the steps of the action space analysis, chapter four and five will explore this question further by asking *how the heuristic of the fit and its action space analyis can be validated through the assessment of the fit of a design with its pursued city model only in the cases of GEOCACHING, ONTDEK OVERVECHT, CITIES: SKYLINES, and POKÉMON GO* and *how the fit and its action space analysis can be further applied in the domains of game design, policy making, and cultural criticism*

The introduction of that action space analysis in order to assess the fit of urban game designs ultimately serves as efficacy validation. By studying whether the pursued city model is attained within the many afforded interactions in a design, can shed light on the communication capacities of an urban game, thus possibly criticising the magic-bullet perspective. Such a critical attention to singular designs becomes especially relevant in the current cultural climate.

Relevance – Technoèsis Intervention

With the urbanisation happening and technology advancing to networked, mobile, and plentiful levels, urban games multiply at a fluctuating time. Several technological developments have enabled new interactions with the city, but have also problematised familiar formulas. In particular, Information and Communication Technologies (ICTs) and its networking, are offering a multitude of new interactions, connections and possibilities to approach problems. Townsend explains that the disconnection from the grid through networked mobile phones and the rise of the Internet of Things are mostly responsible for the new possibilities (2013, 2–3). Mobile phones, and especially smartphones connected to the internet came to determine the pace of life, with work and leisure blending through a single machine. Not only did the reliance on the mobile connect people to the internet and therefore each other, it made the location of the user both irrelevant, and extremely relevant. While untethered from the grid, location specific uses of the phone became more relevant, with GPS dominating modern wayfinding and specifying comment additions. Engaging with the city at any possible location thus became a possibility. Yet the city was not the only entity included in engagement, as it was expanded to also include things. Policy professor Albert Meijer explains this Internet of Things in the context of the city as the situation wherein

"information gathering not only happens through human measurements, but also by creating an environment in which everything and everyone continuously generates and processes information" (2015, 7 Author's Translation). Modes of transport, household appliances, smartphones, street lights, and lots of other 'things' became smart, meaning that they generate information and in turn process it as well. It became possible to monitor and control spatially displaced objects through human intervention or algorithmic processes. The city became more malleable as it turned into a network of human and non-human agent that could be interacted with through connected systems. Technology made urban games possible and some successes appeared such as SHADOW CITIES (Grey Area 2010) and INGRESS (Niantic 2012). These were however the most successful games, with a plethora of less successful and failed experiments not gaining any attention. So, while the means were there to be used to engage citizens with the city in innovative ways, there was no stability. This resulted in unsure attempts at producing these games, hearkening back to the magic-bullet theory. With the success of POKÉMON GO, urban games and their augmentation of reality have been touted to stay (Malik 2016; Sicart 2017), yet the uncertainty persists.

This period of change left urban games in a niche of possibility, but with little standardised knowledge. Urban games at this point function in the cultural context of technoèsis, a term from Roy Ascott used by art philosopher Petran Kockelkoren to explain the process in which "we learn to perceive and to attach words to what we perceive in a culturally conditioned way through technology" (2005, 153). With the arrival of a new technology, a new sensory regime is needed; a way of interacting and interpreting with the world through this technology. This can mean a vocabulary to make sense of what the technology does, or a whole new way to build one's life around the new tech and its practices. Key to this moment of technoèsis however, according to Kockelkoren, is that "[e]very technology is surrounded by a nimbus of images and metaphors that guide the development of that technology and must eventually help to domesticate it" (ibidem). In other words: there is not one way in which the technology is used that is proven to be the most effective. For Kockelkoren this provides artists the space to manoeuvre and offer experimental or possible interpretations of the technology. For us however, this moment of technoèsis for urban games is when the magic-bullet theory must be fought with alternative interpretations.

Kockelkoren laments that too often "The device [the technology] is embodied, disappears from the field of attention, and is neutralised as a frictionless 'go-between'" (2005, 163). Recognising the magic-bullet theory here, when it comes to developing a trajectory to meddle in the technoèsis, we can follow Kockelkoren's critical perspective he attributes to art. He states that "art is an accomplice to the diffusion of conventional forms of disciplining, but at the same time it represents a critical potential to resist them" (idem, 162). By this he means that artists, when it comes to new technologies or means to interact with the world, "explore the access to reality that devices offer by trying out a new visual language for it" (ibidem). In other words, artists explore the alternatives; they experiment to lay bare alternative or

weaker approaches, before, like with tools as Wynn explains, they become coded into cultural expectations. What this means for the study of urban games in their moment of technoèsis, is that instead of jumping on games as simple go-betweens between designer and citizen, all alternatives that can come from a design and from an approach to a city must be explored. A game allows for different acts of play, some following the rules while others do not, and cities have a different interpretation depending on the person signifying it. Contrary to the magic-bullet theory then, it is our job to explore the alternative possibilities of play stemming from the design and those alternatives that come with the messages communicated. The degree to which these alternatives also fit with the purpose of the game will ultimately offer a more flexible interpretative metric to validate the efficacy of urban games. To offer such a critical alternative during the technoèsis of urban games requires a triple intervention: In chapter one we will unpack the design of urban games and will argue that the linear communication of a city idea through a game must be complicated with a broader affordance of appropriation in the designed action space. In chapter two, the pursued objectives for the city are standardised and presented in the form of the newly introduced concept of city models. Then, in chapter three and onwards, we will dive into the fit between the city model explicitly pursued in the game design and the city models afforded and reconstructed. This will be made approachable and repeatable by the introduction, validation, and exploration of a reverse engineering method called the action space analysis that introduces engineering research to more humanities and social science takes on games and the city.

Methodology – Preparing Reverse Engineering

Given the rise and current state of urban games, an intervention must be made that explores alternatives, with explicit attention to the design of urban games, as well as a more complex understanding of the city. Understanding what 'the city' or 'the urban' means in itself is worthy of a thesis, yet in this thesis this term is studied through its canalised form of game design. With the technology changing, as well as the city, a simplistic understanding of both games and cities will ultimately provide little alternatives at this moment of technoèsis. Furthermore, since this thesis is primarily preoccupied with the relationship between the complex urban games and the complex concept of the city, studying them in isolation will yield a similar simplistic take as the magic-bullet theory. To actually provide new insights into the closer relation between the nitty-gritty of game design and the variable nature of cities, this problem is too large to be approached from a single epistemological point of view. To tackle this large-scale problem, this thesis will indulge in an interdisciplinary methodology. For this reason, disciplines such as game analysis, design studies, science and technology studies, urban studies, computer science, and engineering are combined.

Sally W. Aboelela et al. have distilled a concise definition of interdisciplinary research from a plethora of interdisciplinary studies:

> Any study or group of studies undertaken by scholars from two or more distinct academic fields, based on a conceptual model that links or integrates theoretical frameworks from those disciplines, using study design and methodology that is not limited to any one field, and requiring the use of perspectives and skills of the involved disciplines in all phases from study design through data collection, data analysis, specifying conclusions and preparing manuscripts and other reports of work completed (2007, 339–41).

In this thesis the conceptual framework, fully realised in chapter three, is the adaptation of the computer science and engineering practice of reverse engineering and its unique addition to game studies in the humanities (Zagal 2010, 23). José Zagal discerns three disciplinary approaches to games, namely social scientific, humanities, and industry/engineering approaches. These look at the effects of games on people, the meaning and context of games, and the development and design respectively (Zagal 2010, 13). The social sciences and humanities, shown in Table 2, are more often linked together, for instance through statistical validation. The meaning and context as contained in the game on the one hand shapes our understanding of the fit, as it can show us the pursued idea of the city. Yet the effect, including alternative, unintended understandings of the city, matter as well, as it shows what is completely contained in the designed action space of the game. Neither humanities or social sciences unpacks the game itself however, further than games as artefacts. To battle the magic-bullet theory, we need to look at the build-up of games in order to show their inherent strengths and limitations. Hence the right column is added to the left and middle ones in this thesis. This will be done through adapting the method of reverse engineering to reconstruct the playable idea of the city from the design itself, creating what we call an action space analysis.

Discipline	**Social Sciences**	**Humanities**	**Engineering/Industry**
Object of Study	The effects of games on people	The meaning and context of games Games as artefacts in and of themselves	The design and development of games Games as drivers of technological innovations
Key Question(s)	– What do games do to people? – How do people create and negotiate a game?	– What meanings are made through game use?	- How to make better games
Example	Learning, Effects of violence in games	Affordances of the medium, critical analysis, rhetoric	Graphics, AI, networking, etc.

Table 2 Outlines of game studies disciplines according to Zagal (2010, 13). Source: Author creation

Originally, reverse engineering is “the process of discovering undocumented internal principles of a piece of code” (Dolan-Gavitt et al. 2015, 1), specifically detailing pieces of soft- and hardware. Figure 3 by Chikofsky and Cross (1991, 16), outlines the processes of forward and reverse engineering, cleverly illustrating the differences. Forward design, which is the regular design of a game) starts with design considerations, meaning the issues, their selected solutions, and discarded alternatives. This counts as the input of a design, which is subsequently designed and coded into the shape of a game. When forward designing, this is where the process stops, as the design is finished. Reverse engineering instead starts from the final product (or a testable prototype). Now, the finished product and the possible interactions, or the output, are available, both planned and unplanned. Reverse engineering strives to reconstruct the input based on the designed game and the action possibilities. In software reverse engineering, this reconstruction will yield the specific coding and functioning of the design; basically opening the software up to see how input is translated into output. In order to determine the fit in existing urban games, the design issues – or the interpretation of the city the designers followed – must be reconstructed and compared to those afforded in the action space. To fulfil these necessities for this engineering method, insight into the urban game design and the exploration of affordances in the action space is required, as well as a way to approach the design issues, or the understanding of the city that is designed into the game. As such, the perspectives and skills of the involved disciplines stem from game studies, science and technology studies, and urban studies.

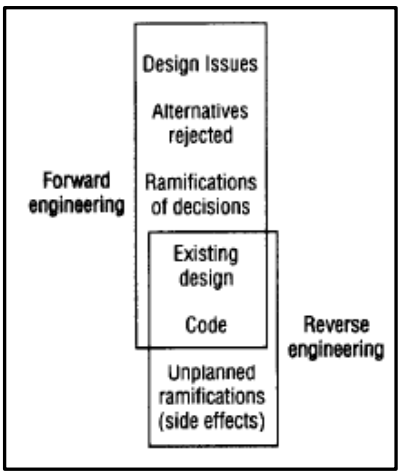


Figure 3 Forward vs. Reverse Engineering.
Outline of the 'knowns' in both Forward and Reverse Engineering. Source: (Chikofsky and Cross 1991, 16)

In the pursuit of the fit as means to improve the reflection on urban game design, this thesis ultimately brings together three discourses into a new method and interpretative metric. Given the questions raised above, this thesis is structured in three parts, which are briefly discussed here.

Structure

Part One – Chapter one

In the first part of the thesis, comprised of chapter one, we study how an action space approach to urban game design can incorporate appropriation of unpredictable affordances into the inventory of urban game design characteristics. The magic-bullet theory is based on a misunderstanding of humanities-focused game analysis, centring on the meaning. To counter this trend, and to accommodate to the reverse engineering approach later on, the first chapter will complement urban game studies with closer attention to appropriation of the action space. According to the magic-bullet theory, designing a game

is enough to achieve the effect. Chapter one will go against this by introducing the dimensions of interaction possible within the action space. To include alternative uses in this analysis, while also paying closer attention to the design, insights from science and technology studies and game studies will be included. Science and technology studies allows urban games to be regarded as a collection of affordances – actions that players can perform because they are possible in the design, whether desired by the designers or not. This perspective allows for alternative uses to arise and be recognised. Thus, observing the game with appropriative possibilities in mind is the first step. The next step is to explicate how an action space is interacted with by an implied player. An adaptation of the writings of Miguel Sicart creates a conception of the player and the act of play that elaborates on how the action space is interacted with, as well as the links to daily routines. Ultimately, this chapter will end with an overview of distinctive elements mostly interacted with in urban games. Though theoretical in focus, the first chapter provides essential epistemological insights to describe urban game design and their affordances. It is based on the assumption that, given enough time, players can explore all possible interactions in a game, yet are ultimately limited by the action space set by designers.

Part two – Chapter two

In order to determine whether a game guided by affordance design from designers, actually fits the meaning attributed to it beforehand, the second part studies how the design of city models into action spaces of urban game design can be canalised and compared. Urban games deal with the city, yet what 'the city' is has been debated at least since Plato's *Republic* (1992). The city and the urban have sported a grand variety of interpretations and to account for all of them in the reverse engineering method is a Herculean task. Instead, chapter two will dive into modelling the city. Whereas many authors have suggested general archetypes, these exemplary prototypes should be acknowledged as following a form of modelling nonetheless. Mary S. Morgan and Margaret Morisson's explain the consequences of models being abstractions of empirical reality in order to satisfy the theory – a specified case of those principles (Morgan and Morrison 1999b, 12). Following their guidelines, the complex concept of the city can be modelled into the newly introduced city models, replete with identifiable characteristics: an instigator, an ideology, a city aspect, a carrier, and citizen actions. Based on these characteristics, city models can be compared, and an inventory of eight generally recurring categories can be made. This modelling is necessary to characterise and compare the city models pursued in game design and those appropriated in the act of play. With a manageable model of cities in place, a subsequent step is the identification of these models in urban games. Building on the findings from the first chapter, city models will be translated into their related empirical game characteristics; the loops and metagames. With these translations in tow, the second chapter ultimately shows that the complexity of the city can be modelled and that these city models are designed into games, yet are not unilaterally interpreted as such by the player.

Part three – Chapter three, four, and five

The third part studies how an action space analysis can discover the fit value the pursued city model and the afforded city models in urban games. This final step is based on the assumption that game design characteristics – the loops and metagames introduced in chapter one – can be reconstructed into the city model characteristics that are afforded in the action space, and as designed by the designers. To make this assumption plausible, the third chapter introduces and adapts the computer science practice of reverse engineering in the action space analysis to accommodate the modelled cities and the affordance-guided play activity. This means reinterpreting the steps of software reverse engineering in a more urban game perspective, dealing with fuzzy concepts as the city and appropriation. Adding a final step to reverse engineering, a comparison between reconstructed designed city models and experienced player city models will ultimately shape the fit. The introduction of this new interpretative metric serves as alternative to statistical validation, with different measures of efficacy. The fit has prevaluative worth in that it can discover the possibility of city models being afforded in general during the design, instead of evaluating the existence of a singular effect after publication in a specific experimental corpus, as in statistical validation. At the end of this chapter, a computer science addition has been made to humanities game studies, as well as a qualitative and quantitative addition to validation research.

This new interpretative metric can now be tested on exemplary urban game cases. After identifying characteristic urban game categories, four cases – GEOCACHING (Geocaching 2000), ONTDEK OVERVECHT (Play the City 2017), CITIES: SKYLINES (Colossal Order 2015), and POKÉMON GO – are subjected to the action space analysis in chapter four. Here we study explicitly whether and how the design of four games adequately affords its pursued city model. This is a conscious limitation as it shows the efficacy of the fit as reflection on a singular design, other than a reflection on all possible city models addressed. Determining the fit in these cases shows the initial value judgement on whether these games achieve their pursued city model, but furthermore highlights further uses of these games. These case studies show that the fit and its reverse engineering method can give insight into the design of urban games, their specific strengths, weaknesses, and limitations, the presence of explicit and implicit city models that structure the play activity, and the acknowledgement of afforded alternatives. Showing the insights of the fit as interpretative metric can highlight the alternative the fit offers to validation research, for measuring efficacy. To corroborate this claim of being an alternative, chapter four ends with the comparison of results gathered from the fit and its action space analysis and those gathered from validated methods, illustrating the validity of the fit as interpretative metric on the basis of comparison.

Whereas chapter four deals with exemplary studies, chapter five steps back and reflects on what can be concluded from the fit. Instead of turning the fit into another holistic theory like the magic-bullet theory, chapter five delimits its capacities yet foregrounds its capabilities. Sketching future uses in game design,

policy making, and cultural criticism can show the value of the fit, while simultaneously tempering expectations.

In sum, this thesis looks at to what extent the pursued city model of a game can be reconstructed based on an analysis of the action space of the game and to what extent an analysis of action space can be used to improve the design of the game such that it better fits the pursued city model. In doing so, it will offer a critique against the current state of urban games - the magic-bullet theory – and instead suggest alternative measures to mete success and cities against. We argue that the fit and reverse engineering together offer a more approachable, general, and applicable methodology to study urban games and measure their efficacy. With the fit, the relation between what is put into a game and what comes out of it can be made measurable with only access to the game.

Like cities, at first glance these tall claims may seem outrageous and impractical. But just like the city, if approached street by street, and building by building, the grand picture will fit together. Games will be shown to contain multitudes of cities, while others might not even contain a street the players recognise. Starting with a deeper look into urban games, the fit will arise as a roadmap to games for cities.

Chapter 1 – Urban Games as Playable Sociocultural Systems

Introduction

Urban games can have a great impact on the cityscape. These games are urban in that they are physically set in the city or have cities as subject matter. The blending of these games with everyday life, both physically and symbolically, means that they directly intermingle with the city. Think of POKÉMON GO (Niantic Labs 2016) that was described as "a craze that swept July 2016" (Robinson 2016). This game contributed to a change in the urban fabric with positive and negative outcomes stemming from the same design. The positive formed through increasing outdoor activity which is healthy exercise, and the increased presence of people which was used by local police to pursue a net decrease in robberies, deputising players as watchful eyes (Verlaan 2016). On the negative side, the increased outdoor activity also contributed to massive traffic accidents because more people mindlessly pursued the virtual monsters (Pharoah 2016), and leading to unwanted trespassing because of poorly placed markers in the game (Griffin 2016). The capacity of the game to make players go outside ultimately had different yet multiple results that impacted the urban fabric. The magic-bullet theory assumption that the design of the game will ultimately yield the desired player interaction becomes untenable. The appropriation of the design by the players was ultimately what gave rise to the alternative uses in POKÉMON GO. Not accounting for these alternative uses can result in a misfit between design and civic goal. Therefore, this chapter will introduce the player as unpredictable system into the relation between urban games and the city interactions. Players will be introduced as an essential, complicating, appropriating, and enabling agent in the manifestation of urban games – they have to be played by someone after all. However, we will not engage with individual players and their actions. We will generalise them through their capacity of appropriation of the action space; players as the assumption that ultimately every designed action – intended or not – will be interacted with because of an interaction based on appropriation. Urban games will be described in such a way that such an unpredictable system of appropriative actions and expectations can interact with them in all their complexity. Ultimately this chapter will answer how an action space approach to urban game design can incorporate appropriation of unpredictable affordances into the inventory of urban game design characteristics.

An action space approach to urban game design counters the magic-bullet theory to urban games. The magic-bullet theory relies on redesigns of existing games – mostly scavenger hunts with topical questions. Games designed from this perspective take a monotonous approach to different problems and varying levels of complexity. The magic-bullet theory assumes that the communication of a message – in this case a city model, or desired understanding of the city – means translating this message into game

design; the arrow on the left in Figure 4. This translation is a moment of interpretation and skill, and can thus cause miscommunication. This salient moment is therefore important when determining the fit of the design with the pursued city model – the interpretative metric qualifying and quantifying if and how the pursued goal matches the goal players reconstruct from the design of the game. The second, and most problematic, assumption of the magic-bullet theory is the conviction that playing the game, the arrow on the right in Figure 4, will yield a *reconstruction* of exactly the same city model that was designed into it – as if the design was simply a more interactive and participatory mouthpiece; a magic bullet transferring the message in an entertaining way. This second step will be debunked and discussed mostly in this chapter by diving into the process of play in 1.2.

Figure 4 Representation of the Magic-Bullet Theory.
In this perspective a purpose is designed into a game and communicated unaltered. Source: Author creation

We will argue that this magic-bullet theory is based on a relation between the city model and urban game design that needs to be expanded by including player appropriation.[4] This expansion assumes that in the act of play a player can interact with the game in ways unforeseen or unconducive to the original urban purpose. The designers can only guide the communication of the city model, not determine it completely. Introducing player appropriation to this process will ultimately impact on the evaluation of whether the original goal is reached. This chapter will present an epistemological approach to urban game design that will highlight the most salient characteristics that impact on this communication, to be able to offer a critical heuristic later on.

The first section 1.1 will dive into urban game design. The goal of this first section is to introduce an epistemology on urban game design that explicitly takes player appropriation into account, and thus confronts the magic-bullet theory. This section will first of all introduce the details of the magic-bullet theory that are countered here. Secondly, this counter will take the shape of the interpretation of urban games as a collection of *affordances* designed into an *action space*, in both an ontological and pragmatic sense, meaning whether and how the affordances of technology matter respectively. Ultimately this section will provide a framework that allows us to understand the process of urban game design as the shaping of an action space, identify the affordances players interact with, and illustrates the ultimate requirement of considering play.

[4] Note that this is not an inclusion of the player. While we infer the player through accepting appropriation and expanding the design options through affordances, we will not investigate the players through interviews themselves. We do however think that the capacities of the player should be considered in the process of urban games.

With the understanding of urban game design updated to accommodate the player, the second part 1.2 will explain what it means when players appropriate urban game affordances. Here we will introduce players not through their inventoried opinions, but as an approach to interaction. Following the theories of Miguel Sicart, the main attributes of play that characterise player interaction as an unpredictable system will be discussed. Why and how players play urban games is essential to understand how the communication of urban purposes happens. Therefore, this section will rely on the concept of the action space, or space of possibility, as the meeting ground between the appropriation of players and the design of the game, here understood through the empirical characteristics of loops and metagames. These stand for the actions that have to be repeated in order to gain progress and the contextual factors that give these repeated actions meaning respectively, further explicated in 1.2.2. At the end of this section it should be clear what it means for players to play an urban game and how it interacts with design.

Finally, in 1.3 the player appropriated urban games are positioned in the city. Here we introduce the main distinctive design tools at hand that afford different forms of play in an urban setting. Games used to pursue urban purposes are a specific subset of games with more specific attention to space and their place in it. Using the epistemology of appropriated affordances, these characteristics that make these games urban will be expanded to create a general overview of what kind of urban purposes these games pursue.

At the end of this chapter, the approach to urban games will be updated to accommodate players and their actions. This brings with it an understanding of the main distinctive characteristics urban games contain that sets them apart from other games and makes them capable of communicating urban purposes. These insights are required in order to be able to determine which elements can vary when trying to strengthen an urban game. When it comes to determining the fit, knowing what salient characteristics to compare is an essential necessity.

POKÉMON GO will serve as exemplary case study, in this chapter and in the rest of the thesis. To facilitate understanding, the functioning and context of this game shall be explained before all.

Pokémon Go

As part of the hugely successful Pokémon franchise, Nintendo, Game Freak, and urban game studio Niantic Inc. worked together to make and launch POKÉMON GO on July 6th 2016. Presented as an application that promised to bring Pokémon into the real world, POKÉMON GO is an urban game that uses augmented reality in order to place a fictional, Pokémon-filled, layer over everyday surroundings, accessible through a smartphone. This game presents the player with a map of their direct area on their phone whereon, while walking through space, imaginary creatures – Pokémon – appear that can be 'caught.' This catching happens through a minigame wherein the player taps the Pokémon on the map

and then flicks a catching device – a Poké Ball – at the entity. The ultimate goal of the game is to catch as many unique Pokémon as possible. Exploring the city gives players a higher chance of catching different Pokémon. Walking around the city furthermore brings players to PokéStops where they can restock on Poké Balls. The game itself, however, is purely set in the phone. The augmentation with Pokémon can only be seen by the player on their phone. The game itself, at launch, had no multiplayer elements at all; it was basically a scavenger hunt on the phone only but requiring physical movement.

POKÉMON GO was a huge success, garnering significant media attention, becoming the most downloaded game in the Google Play store (Price 2016), and skyrocketing the profits of the Pokémon Company by 2.400% (Frank 2017a). Despite its phone centred gameplay, POKÉMON GO managed to change the physical appearance of cities for a summer. Many players walked outside looking for Pokémon and despite the lack of multiplayer functions in the game, a social interaction dominated the gameplay. It is exactly this discrepancy between the design of the game and the ultimate forms of play that can be used to understand the need for alternative perspectives on urban games, and which can serve as exemplary case study in the illustration of newly introduced elements.

POKÉMON GO is interesting in that it exhibits malleable rules despite it being a hard-coded digital game. Analog games, given their non-coded setting rely on a set of unwritten but very formative rulesets (Hughes 2006), and thus are more flexible in their application. Analog games with a function have existed as part of cities for a long time, such as the gladiator fights as a source of urban entertainment, spectacle and pacification (de Lange 2015, 428) or street games such as football helping community spirit (Riess 1989). Despite the coded nature of POKÉMON GO, many alternative uses arose from the malleable rules and the analog component. Allowing both for strict control through coding, while still allowing the flexibility and rich history of analog urban games to shine through makes POKÉMON GO an interesting blend of two worlds.

1.1 Demystifying the Magic-Bullet Theory through Affordances

Key to the magic-bullet theory is that games are being regarded as an *instrument*. The problem with this form of thinking is the belief that the technology is singular in function – as if a hammer can (and will) only be used to hammer a nail. The common adagio of humanities research applies here: It is not as simple as that. This linear and singular thinking can be understood as Evgeny Morozov's aforementioned take on "solutionism," (2013, 20). The topics games in the city try to address are simplified in such a way that something as broad as 'a game' is presented as a solution. This attests of the overestimation of the capacities of games, as well as the downplaying of the complexity of cities. For example, the grand topic of raising awareness to the dangers of traffic is addressed through guided searches and minigames in CITY JAM (La Mosca 2014).

This section will set out to provide an alternative to singular effect convictions in games by exploring how the design *affords* its misuse. To do so, this section will first outline the main processual gripes of the magic-bullet theory in 1.1.1. Using the examples of games such as POKÉMON GO and other playful interventions such as the Playpump, these gripes can be grounded and debunked in order to show the need for an alternative perspective: that of the affordance. Then, in 1.1.2, this affordance perspective is introduced in order to allow for the player to feature in urban games. Ultimately, this first section introduces the main epistemological understanding of game design that features in the validation of urban games.

1.1.1 The Magic-Bullet Theory

The call for a new means of validation in the shape of the fit arises from the repeated and simplistic misuse of urban games. Treated as simple ´behaviour changers´, these games are uncritically employed to convey a variety of complex topics. Often these games have a similar shape – a scavenger hunt with questions, as shown in the introduction – while conveying different forms of urban engagement with different degrees of complexity. Moreover, these games are often clones of existing games yet with completely different goals (Tulleken 2019). By examining the recurrence of this perspective in urban game design, its main fallacies can be identified, traced to its source, and replaced. This section will unpack the simplistic use of games for serious purposes as a magic-bullet theory, both epistemologically in 1.1.1.1 and technologically in 1.1.1.2.

1.1.1.1 Epistemology of the Magic-Bullet Theory

The term magic-bullet theory is often used alongside the hypodermic needle theory,[5] used to criticise a research trend during the 1920s and 30s of communication studies. Especially with the rise of mass media, critics were afraid of these communication channels instilling messages in the audience, as if directly implanted. Dietram A. Scheufele and David Tewksbury argue that this perspective on media reception was abandoned soon due to more complex understandings of reception (2007, 9). Especially the insights of Stuart Hall who showed that the audience confronted with a communication medium is capable of understanding – or decoding – the message either in agreement, negotiation, or rejection, instead of simply always agreeing, as the magic-bullet theory assumes (1980). Scheufele and Tewskbury explain that reception "depend[s] heavily on people's homogenous networks and their selective informational diets," and thus not just the presented message (2007, 9). While the magic-bullet theory seems to have been relinquished in studies since the 30s, Scheufele and Tewksbury explain that later

[5] Here we shall use the magic-bullet theory nomenclature however. This is because it is used more often in gaming context (for instance Becker 2013). Apart from this recurrence, the alleged violent nature of videogames makes magic-bullet seem more fitting.

understandings of media differentiated between "accessibility," in the shape of priming and agenda setting, versus "application," in the shape of framing (2007, 15). While the specifics are beyond the scope of this study, the magic-bullet theory in games, we argue, persists in a overall reliance on accessibility: the more the player is confronted with a specifically presented idea – i.e. a scavenger hunt with a certain city model behind it – the higher the chance of adoption. For the magic-bullet theory the application of the city model is irrelevant, as it is the contact with the participatory format of games that is enough. Add to this a general ignorance of the capacities of games – a lack of ludoliteracy (Zagal 2010) – and games are vulnerable to simplistic understandings such as the magic-bullet theory. With this etymology straight, we can now dive into the shape of the magic-bullet theory in urban games and playful interventions.

The magic-bullet theory can best be understood based on an exemplary case: the Playpump (Borland 2014). A humanitarian project by Trevor Field and international backers from 2000 till 2010, the Playpump was a carrousel-operated water pump that substituted children play for the work of pumping water. Presented as a simple solution of playing instead of working, the Playpump received positive media attention in Europe and the United States. Borland explains: "Play was presented as way of negating work—play as 'not work'" (2014, 334). Using images of happy kids playing while relieving the adults made Western investors indulge the project. Play could be used to make the lives of people in developing countries better. A good message from a game.

However, it turned out that the Playpump replaced more efficient traditional pumps. Furthermore, childrens' play did not yield enough water, resulting in adults (mostly women) still needing to pump. This proved more problematic, as playing by adults has negative cultural connotations in the communities (Borland 2014, 331). Regardless of this design fallacy, the users were instructed to appear happy with the pump in order to attain more donations for the project (ibidem). Ultimately, the truth came forward and the investments stopped. Yet, the Playpump, as a playful intervention, was praised as effective on its merit as a game. The design, the user, and even the audience, were not considered for anything else other than to give money. Instead, the fact that something playful was used for a serious purpose was enough to merit a media spectacle. The Playpump exemplifies the magic-bullet use of games for civic purposes in that it regards 'play' and 'playfulness' as sufficiently effective, while eschewing the actual take up by the audience/players and the efficacy of the design. As shown by the Playpump, this simplistic but marketable understanding of urban games can have financial, or even fraudulent consequences, as well as perpetuate colonialist power relations. Whereas the Playpump was a relatively early example, the magic-bullet theory and its marketing spectacles, have persisted in urban games.

Belgian Urban Game design studio Das Box has created an encyclopaedia chronicling a vast collection of urban (digital) games around the world (Das Box 2016). Their overview of games is comprehensive and detailed, containing about 150 games from over the entire globe. Using their descriptions, links, and

tags it becomes clear that the grand majority of these games are solely built for entertainment. Most games are territorial control games or some form of scavenger hunt. This fits perfectly for entertainment games, yet the magic-bullet theory becomes clear when looking at the games with a serious purpose; about 50 of the sample. The specific goals for the games with a serious purpose range from general touristic pathfinding (GENT UNDERCOVER - La Mosca 2013), to improving traffic safety (CITY JAM - La Mosca 2014), and being kinder to thy neighbour (ACTS OF KINDNESS - AOK Media 2011). However, nearly all of the 50 games have one of two designs: a scavenger hunt with meaningful questions at specific locations, or the ability to check-in at marketable locations and get discounts. This simplistic design for different functions - learning art history, improve biking skills, obtaining a rural mindset, etc. - professes the conviction that just making players go to places will ultimately give them a deeper understanding of larger issues and values. While these games certainly achieve effects, such as player movement, the abundance of simplistic scavenger hunts and check-in games depicts the sorry state of urban games used for serious purposes. Even beyond the encyclopaedia of Das Box, simplistic clones with similar purposes proliferate. In the summer of 2019 alone, four POKÉMON GO clones were released, each advertising a different franchise. Journalist Adam Dorfman however points out that these games are exact copies of its original in gameplay, with the fit with their franchise being determined by visuals and secondary goals alone (2018). The magic-bullet theory is detrimental to the ingenuity of urban game design.

The magic-bullet theory arises from the confoundment of the game with the urban goal. An urban game according to the magic-bullet theory sees the design directly touching on the urban influences, ultimately disregarding the efficacy of the design and oversimplifying the understanding of their urban goal. This simplistic understanding is common in serious games or games that pursue a goal other than entertainment as they are approached as mere carriers of a message. An example of this can be seen in the serious games that serve as advertisements; advergames. These games are often treated as glorified commercials, instead of games. David Gurney and Mathew Thomas Payne say about advergames that the games "are to be taken … and ought to be evaluated on their own terms; these are not advergames qua ads but advergames qua games" (2016, 186). Furthermore, Herman Tulleken from advergame bureau Plinq has outlines 52 common mistakes when designing games with marketing or external purposes (2019). Within these 52 mistakes still happening today, two of them stand out in that they strongly attest of a magic-bullet theory informing the demands of the clients. Firstly, Tulleken stresses attention to design. Making a game with a serious purpose is not as easy as cloning existing games with different artwork. In fact, design considerations are key and should be left to experts. The reason for this is the second pattern: the design needs to *fit* the goal. Tulleken argues that a singular goal has to be chosen, and the artwork, main interactions, and gameplay – everything – have to be adjusted to this, while still providing a fun experience. This requires extensive testing and prototyping; it is not something that gets communicated through text alone. Given these critiques, the question guided

scavenger hunts are becoming more suspect by the minute. The magic-bullet theory then ignores pitfalls by not taking the relation between the game design and the urban functioning serious. This may seem like a purely theoretical value judgement, however, the financial consequences are real. Municipalities are jumping on the bandwagon of the ludification of culture, meaning more games and playful interventions in general, or gamification; the inclusion of "game elements in products and services with the aim to advance user involvement" (Raessens 2014, 6). In this case spending subsidies on games following a magic-bullet theory presents a real financial consequence. As these games achieve a lower efficacy than games that do fit together, revising the assessment of urban games becomes a matter of public concern.

1.1.1.2 Technology of the Magic-Bullet Theory

This sidestepping of the design specifics serving the function of the game stems from an obscuring approach to technology, echoing patterns from broader technological trends studied in Science and Technology studies (STS). Technology has at times been described solely as "applied science," mirroring the disregard for the specific considerations of the design of the game, instead focusing only on the objectives of the scientific study (Sismondo 2010, 9). Edward Tenner for instance defines technology as "a human modification of the natural environment" (2009, 3), again seeing the means with which to pursue a specific goal as solely conducive to its purpose. The magic-bullet theory is based on the faulty assumption that technology is a neutral agent. However, as will be further explained in chapter two, communicating a city model will ultimately mean transferring values through play, which impacts on the design specifics as well as the technological carrier. Such neutrality is made plausible through the common principle of black boxing. This term is determinant for the fallacy of neutral design as well as the ignorance of player activity. STS scholar Langdon Winner describes the black box as follows:

> The term black box in both technical and social science parlance is a device or system that, for convenience, is described solely in terms of its inputs and outputs. One need not understand anything about what goes on inside such black boxes. One simply brackets them as instruments that perform certain valuable functions (Winner 1993, 365).

If this black box were to be opened, the lack of neutrality in technology would become clear, as well as the various influencing elements at stake. Yet the magic-bullet theory sees the black boxes as independent units. The black box in itself is a common engineering practice and is thus not *a priori* a suspicious act (Winner 1993, 377). Especially in games, game scholars Peter Jakobsson and Daniel Pargman argue that "a great part of what makes playing a game fun is attempting to open the black box" (2005, 5). This is done by mastering the game, figuring out how it works, or even finding loopholes and cheating. This opening of the black box is however more demystification – revealing what was

purposefully hidden to be discovered. This was described in the earlier days of videogames already by Ted Friedman when he said that "[o]ne succeeds by discovering how the software is put together. The player moulds his or her strategy through trial-and-error experimentation to see 'what works'— which actions are rewarded and which are punished" (1994, 81–82). This figuring out of rules and systems is part and parcel of videogames.

Yet opening the black box when trying to understand the design of the game for a function should go beyond unearthing the hidden options that improve mastery. Raessens, amongst others, distinguishes between Friedman's interaction – which Raessens calls deconstruction – and "construction" or "the addition of new game elements, [which] can [consist of] the making of new games or—and this is much more common—the modification of existing games" (2005, 381). We argue that the magic-bullet theory only allows for deconstruction of the game. In order to understand how a game is designed to appeal to a specific goal, the black box needs to be opened to see what design decisions contribute to communication, more akin to construction (or reverse construction). Sergio Sismondo explains that "the shape of computers, computer programs and networks are created with their social effects very much in mind" (Sismondo 2010, 62). This means that at the very least technology should not be seen as a neutral item to add in any situation. Technology "must enroll [sic] any number of actors, not all of whom may be immediately compatible" (idem, 65), which implies that technology has to provide for compatibility in a certain way. Opening the black box then means looking at these preconceptions behind design decisions, instead of simply the most efficient way of manipulating the system.

1.1.1.3 Criticism on the Magic-Bullet Theory

The magic-bullet theory in games in the city has begun to draw criticism. Central in this criticism is Alberto Vanolo who has analysed the role of gamification in cities, or the inclusion of game and play elements in civic processes (2018). He recognises the pointers given by Tulleken when he states that "[o]f course, civic games have to be designed carefully and properly in order to nudge proper participation, and civic gamification has meaningful limits: games may not address every urban, social and political issue, and the engagement in gaming tend to diminish with time among most users" (2018, 322). At the same time, Vanolo does not condemn the introduction of games for urban issues, as he states that "[g]aming elements in strict sense are often marginal or even absent …, but still these experiments emphasise the role of play and fun at the intersection between digital technologies and urban space" (2018, 323). There is then definitely fruitful ground for urban games, yet as Vanolo points out, in line with Tulleken, the design as well as the 'proper participation' has to be extensively studied. While Vanolo and Tulleken make strong points when it comes to increased attention, the specifics remain absent. To understand what 'proper participation,' "the role of play and fun at the intersection between digital technologies and urban space" (Vanolo 2018, 322), and the flexibility, yet fitting of

values in urban games can mean, POKÉMON GO offers insights. By looking at POKÉMON GO, the magic-bullet theory can be condemned while simultaneously showing why an alternative perspective is needed.

Looking deeper into POKÉMON GO and how it was played illustrates that 'proper participation' is hard to define and that the role of play and fun is highly context dependent. What can however be clearly shown is that there is no singular interaction possibility like the magic-bullet theory imagines. Despite being designed as a single player game, POKÉMON GO shaped and increased social interactions, even allowing people who are more socially isolated, such as players with autism, to start a conversation easily for the topic had already been decided (Cao 2017). The increased amount of people out and about had several positive indirect social side effects such as players visiting isolated quiet places which helped stop several suicides (Paterson 2017) and a net decrease in robberies due to players deputised by local police as night guards (Verlaan 2016). At the same time, in attempts to catch Pokémon players climbed fences and fell of cliffs or caused massive traffic accidents (Pharoah 2016), spawning the hashtag #dontpokemongoanddrive. Urban spaces were reinvigorated by adding a new layer over the mundane reality, either by defamiliarising space (Sparrow 2016) or enhancing it with actions (Mäyrä 2017b). The appearance of more people around specific places also facilitated urban movements, similar to historical urban gatherings (Perry 2016; Colley et al. 2017). One such movement for instance brought players to the Italian ghost town of Consonno to spur activity and reignite interest in the town (Landoni 2016). The game and its user activity also impacted on urban design, showing that long straight roads with green nearby can keep areas inhabited throughout the day (Richards 2017). The game gave several businesses a boost – mostly restaurants (Evangelho 2016; One More Thing 2017), while other bars found the non-paying but still visiting people a nuisance and more than once the police was called to inspect groups of people returning to people's houses that have an in game function, but outside of the game just look suspicious (Griffin 2016). The game made augmented reality a widely known technological possibility (Malik 2016) yet increasing social activity, both real and virtual, with unclear rules of accountability caused several harassment cases and other criminal activity with no clear responsibility (Cross 2016). Simultaneously, the game persisted inherent urban racism, such as minority zones containing less PokéStops (Gordon 2016), and Omari Akil even claiming that "POKÉMON GO is a death sentence if you are black man" because lingering at night around houses as a black man comes at a higher risk of being shot by the police (2016). Regardless of this variety of consequences, both positive and negative, POKÉMON GO made the profit of the Pokémon Company multiply 26-fold. Possibly a sign of its popularity, POKÉMON GO made others claim hatred for the game (Dewey 2016), and even asking for POKÉMON GO to be actively resisted as it does not forward the proletariat Marxist cause (Kriss 2016). It should be clear that POKÉMON GO caused a variety of interactions that were not designed into the game. Players and the urban space the game was set in used the game as facilitator for further activity. Participation can thus be guided by play while not contained within a game – ignoring the singular

magic-bullet theory effects. Different players found different values in the games which resulted in varied interactions.

Games that are deployed on the basis of them being interactive, without attention to their design or player interpretation are understood as coming from a magic-bullet theory. Games functioning from this model miss considerations into their persuasion. Different approaches are available to appeal to the social value that has to be communicated, as outlined by B.J. Fogg, yet the magic-bullet theory eschews them all or pays insignificant attention to them (2003, 91). Often clones from existing games, these 'bullets' are seen as solutions by themselves without clear attention to values, transformation, and appropriation. The main problems caused by the magic-bullet theory are, firstly, a disregard for game design, stemming from a false conviction that technology used is neutral and thus does not merit inspection. Secondly, a disregard of player influence on the outcomes of the game because of black boxing of the experience. Instead, by opening the black box, the material and social build ups can be determined. This means determining all design decisions that went into the game as well as the player actions facilitated yet not expected. By regarding the design in more detail, the possible forms of persuasion can be identified and derived, having been implemented consciously. With this perspective on the current state of urban games, we will now introduce an alternative approach that takes these considerations into account: an affordance perspective.

1.1.2 Affordances Approach

The magic-bullet theory has been shown to completely ignore the material input and social output. Guiding our alternative are the points from technology scholar Mirko Schäfer who says: "the actual social use … [can] be analysed according to the three procedures that shape technology: *affordance, design and appropriation*" (2008, 31; emphasis added). Schäfer approaches the technology from a participation perspective, instead starting from the entrance point of the user. He explains that "when speaking of participation …, it's not only the design of software and network technologies that matters, but also their basic features" (Schäfer 2008, 90). His approach to affordance is guiding for our understanding of affordances in urban games, yet it is only the foundation which requires further specification. We will argue that affordance orchestration as epistemological lens based on a combination of theories manages to approach urban game design from both a material as well as social standpoint.

The term was first used by James Gibson in *The Ecological Approach to Visual Perception* wherein it was defined "an action possibility available in the environment" (Evans et al. 2017, 37). Gibson used the term more in a general psychological sense and since then it has been twisted and turned through the appropriation into many different contexts (ibidem). It was not until Donald Norman dealt with the term

in 1988 in his *Design of Everyday Things* that the concept became linked to human computer interaction – a key domain when looking to debunk the magic-bullet theory in technology.

Norman studied the design and mental processes that went into interaction with objects. Explaining what aspects of an object trigger actions and understanding in the user, Norman defines affordances as follows:

> "The term *affordance* refers to the relationship between a physical object and a person (or for that matter, any interacting agent, whether animal or human, or even machines and robots). An affordance is a relationship between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used" (Norman 2013, 11).

The operative term here is 'relationship' thus determining that affordances are not characteristics of the technology. Norman explains that "whether an affordance exists depends upon the properties of both the object and the agent" (2013, 11). This relational view then misplaces the possible actions of the user from being the result of an instrument to being a dynamic process between some characteristics of the technology, the nature of the user, and the context the technology is used in. A tennis ball for instance is round, elastic, and soft. These are all characteristics of the ball, but these characteristics *afford*, or allow for, the user to perform different actions. If the user is a tennis player then the roundness and elasticity make it perfect for throwing or hitting. If the user is a dog, the softness and elasticity makes it an ideal toy. At the same time, these characteristics also specifically limit other affordances, such as stacking, for the round shape makes for poor stability. Determining affordances is therefore a lot more dynamic, but also more complex than the magic-bullet theory would ever allow. All in all, affordances embrace agency in both the design and the player, thus acknowledging the material and the social dimensions. By relying on appropriation, this perspective does not suppose a predetermined set of actions that will occur, nor will the appropriated actions themselves be the same among players.[6]

In POKÉMON GO for instance, the game affords catching Pokémon. This is mostly made apparent because the game explicitly tells the player so and tapping all over the screen will subsequently enter a Pokémon battle where the only action possible is catching. This affordance then is the result of the rules set out by the game and the player following these rules. Alternatively, the relationship between game and player can be influenced more from the player side. The player can for instance, use the game to

[6] Throughout the years, affordances have received ample attention, regrettably resulting in a dilution of the term. According to Taina Bucher and Anne Helmond, there have been five general trends of affordance definitions: relational, perceived, technological, social, and communicative; amongst which differentiations can be made based on their abstractness and imaginary nature (2017). Misuses are relative to their own definition, which is wholly based on the original relational trajectory of the earlier definitions of affordances. The full distinction of this term here is beyond the scope of this study, whereas here our approach is mostly based on Norman due to his identifiable characteristic and design focus. An untangling of the literary reflections on the term was performed by Sandra Evans, Katy Pearce, Jessica Vitak, and Jeffrey Treem (2017, 39–40).

track their jogging. The distance travelled, shown when interacting with Poké-eggs can be used by the player for a different purpose than the game attributes to it (namely, hatching eggs to get more Pokémon). As such, POKÉMON GO has multiple affordances, some being explicitly highlighted, while others arise from the interpretation by the player.

All in all, this affordance-centred perspective on urban game design typifies the relationship between the design and the player. Communication scholar Andreas Gregersen's "cognitive experientialist approach" (2014), explains this relationship through a more formal method. He sees a game as "a generic and finite province of meaningful experience, where players are invited by video game design to exercise agency within a system exhibiting a particular designed structure" (Gregersen 2014, 168). These finite provinces of meaningful experience (the afforded actions) "serve to establish a common cognitive and experiential frame" (ibidem), if well designed. The finite provinces of meaningful experience relate to the city through "typified actions" – elements imbued with meaning that invoke understanding of the city (idem, 164). If these typified actions are placed ignorantly, then the finite provinces of meaningful experience can go beyond or not reach the desired understanding, as is the case of the magic-bullet theory wherein the affordances are not carefully considered. Instead, the affordance-centred perspective on design ensures that the affordances designed into the game by the designers create an experiential frame through typified actions that are conducive to the understanding of the city, while simultaneously acknowledging that different interpretations can exist. This perspective then starts from a relational view between designer and player.

Game design, from this perspective, can then be interpreted as 'action space design'.[7] This relates to a designed "area within which people undertake activities, or could do so if they wished" (Dijst 2004, 31). These activities are afforded due to elements in the design, but are ultimately finite – they are contained in a space. Martin Dijst describes this action space as a rather general area, leaving room for these afforded activities to both be consciously designed, while others can be undertaken by the player, even if not originally intended. How does one determine what the affordances of urban games are if they are optional? How can designers shape this action space so that desired activities are mostly undertaken? Salient markers that elucidate the relationship between the features and the outcomes have to be determined. This brings us back to the earlier take on human-computer interaction design by Donald Norman.

[7] As Martin Dijst explicates, and as we will soon below with the introduction of 'space of possibility,' there are several different terms for the same principle as action space. Dijst mentions that "[t]his concept is approximately coterminous with activity space, travel field, spatial usage fields and daily contact space" (2004, 34).

1.1.3 Affordance Agency: Signifiers, Constraints and Feedback

In order to reconstruct the goal that a design pursues and whether this goal fits its design, we need tools to describe or organise affordances. Norman was one of the first scholars to deal with affordances in the context of human-computer interaction in *The Design of Everyday Things*. In this book, with several editions under its wing, Norman dives into the psychology of people to understand how objects are used.[8] Especially in later editions of his book, Norman argues that the interrelation between signifiers, constraints, and feedback ultimately forward, delimit, and shape affordances. We argue that constraints and feedback are forms of signification as they both draw attention to (non-)possibilities. Understanding what they are and how they interact with each other will then give us the means to identify affordances and battle the magic-bullet theory. It is through these three characteristics that the design of urban games can be studied on what the action space affords, which affordances are more prominent than others, and whether the action space possibilities fit pursued interation.

The nature of the relations between the design and the player actions can be influenced or directed to some extent, highlighting preferred activities in the action space, through what Norman calls signifiers. In response to designers using the term affordance to describe physical additions, Norman distinguished them from signifiers by saying that "affordances determine what actions are possible. Signifiers communicate where the action should take place" (2013, 13). More specifically, he explains that "the term signifier refers to any mark or sound, any perceivable indicator that communicates appropriate behavior to a person" (Norman 2013, 14). These signifiers can be consciously placed to direct attention (such as a push sign on a door) or sometimes a sign functions as an unintended signifier, like the bulbous shape of a teddy bear, intended as a signifier for cuddling, signifying the possibility to use it as a kickable object for someone. In POKÉMON GO the explicit text boxes explaining what to do also signify correct actions. Pokémon appearing when walking signifies that these creatures fulfill a function, and the distance travelled, tracked under eggs, can signify a roadmap, or, as we have seen, a performance chart. Signifiers then draw attention to affordances in the action space, but what this attention means depends on the shape of the signifier and interpretation by the player.

Communicating possible interactions can either be affirmative, limiting, or interpretative. Signifiers can communicate the existence of a specific affordance, making them, as Norman calls it, a "perceived affordance," meaning an affordance explicitly telegraphed (2013, 18). The explicit text boxes in POKÉMON GO offer such affirmative signification, overtly stating what has to be done. Some affordances can then be foregrounded more prominently through design choices, but as Norman explains, other

[8] One of the most recurrent and illustrative examples is that of doors. Have you ever run into a door because it was unclear whether you had to push or pull? Norman analysed how design can prevent this from happening, without text (for that is bad design, as it excludes non-linguists). Featuring a door handle affords grabbing, but the outcome can still be pushing or pulling, so that doesn't work. A flat metal plate on one of the door affords placing your hand on it but the outcome can now be touching or pushing, for pulling is impossible (Norman 2013, 13).

affordances remain invisible or become perceived due to unintended signifiers. These affirmative signifiers offer key characteristics to analyse when validating urban games as they highlight the preferred interactions.

Alternatively, signifiers can also constrain actions – then called constraints – which makes users aware of a 'wrong' or impossible affordance – basically pointing to the prohibition of some affordances. "Constraints are powerful clues, limiting the set of possible actions," Norman explains, which makes it a key marker for determining the steering of attention through design in technology (2013, 125). In POKÉMON GO for instance, given the affordance of distance tracking for egg-hatching, the game contains a restraint that prevents players from using motorised vehicles to quickly skip these distance markers. If the GPS changes too rapidly, the screen will display a message stating that the player is moving too fast, and the distance tracking will be disabled until a slower speed is reached. This message and technological consequence constrains the affordance of distance tracking explicitly, signifying salient movement as ambulatory only.

Directing attention to or away from affordances can be signified, but so can interpretation be guided through feedback. While applied in many contexts, in design and especially human computer interaction, feedback stands for "communicating the results of an action" (Norman 2013, 23). Although more general design notes they deserve mentioning, as feedback helps identifying signifiers and constraints, and provides a vocabulary to be used in the case of error. In POKÉMON GO, when spinning a PokéStops for items, bubbles with the items appear on the screen and the Poképoint turns purple instead of blue. All these changes happen in response to the swiping act of spinning a PokéStop, giving feedback to the player about what their actions have unleashed. This is more visual feedback, but textual feedback, stating 'Try again later' when attempting to spin again, also occurs in abundance. Feedback can come in various shapes, ranging from a light that turns on when a button is pressed to a sound that slowly increases. Regardless of the shape, the feedback has to be clear in what it signifies. According to Norman this means it must must be immediate, or simultaneous to the performed action; informative, or clear in what the action effectuated; efficient, or used sparingly as to prevent an uninformative overload; and planned, or prioritised (2013, 23–25). If the feedback is clear, the design will signify what a user action did and what it meant.

When determining how the designed action space is conducive to the goal despite its multiple action possibilities, feedback, signifiers, and constraints are salient markers to detect discrepancies. The level of and the manners in which the execution of actions is suggested (or not) and the meaning derived from these actions (or not) are then salient zones to focus on when trying to outline the process of meaning making and conflicting use through technology. With these findings, an alternative perspective needed to analyse urban games as player-centric designs is provided. The linear process envisioned by the magic-bullet theory, as seen in Figure 4 should be expanded with the activities of a player, as already illustrated in our updated representation of the urban game design process in Figure 1 on page 3. In this

processual figure, a city model is still designed into the game, forming an action space, but now this game both affords actions, and can be appropriated by the player due to unforeseen affordances. It is during this interaction between game design and player appropriation that the city model is reconstructed, possibly following a desired signified affordance, or appropriating unseen possibilities. This act of play needs to be clarified to see how and why players interact with the affordances in the design and how this can be predicted. This takes us deeper into the urban game design itself, and its interaction as play.[9]

1.2 Play as a User Model

To adequately validate urban games, their design needs to be understood as a collection of affordances, forming an action space. This again relies on signification, feedback and constraints to be shaped by designers. Yet these designs mean nothing if not combined with the user's actions and intentions. How can the player actions be understood when dealing with urban games? This section will outline the main assumption about player activity, roughly based an expanded theory of urban play by Miguel Sicart (2016).[10] Note that we will not introduce the player as a questioned subject but instead generalise the capabilities of play through a series of assumptions and interpretations of design.

With affordances as the perspective on design that steer but do not determine possible actions, we base our understanding of the player on the assumption that, given a long enough period of time, a collective of players can and will explore all possible actions in the designed action space, desired or no. This assumption carries with it several implicit insinuations. As outlined earlier by Gregersen, we regard players as functioning within a finite realm of possible actions – the action space. Within this space there are several different interactions possible, with some of them signified, while others are not specifically highlighted. Each individual player will appropriate the affordances differently, giving rise to different experiences. By starting from the assumption that a collection of players can explore all possible actions, analysing urban games becomes a matter of understanding all possible actions, not solely those conducive to the desired goal.

[9] This section has tackled the topic of technology. Granted, this is not a philosophy of technology approach, so it has remained superficial at times, instead focusing on games. However, it tackled a pertinent fallacy in the approach to technology - the magic-bullet theory – that finds its repercussions in games.

[10] Defining play is a strenuous task. While some overviews, linked to the definition of 'game' exist (Juul 2005), for our purpose of approaching urban games play needs to be understood in an urban context. To this end, different theories on urban play exist already and will be discussed in 1.3 (For example Montola, Stenros, and Wærn 2009; Xiong, Ratan, and Williams 2009; de Souza e Silva and Hjorth 2009; Gordon and Baldwin-Philippi 2014; Schouten et al. 2017), our interpretation of urban play is conducive to the affordance-centred design model. Not all of the theories on urban play are as attentive to this perspective, and as such our understanding will mainly follow the writings of Miguel Sicart, with alterations where needed.

A note on the distinction between play and urban play is required. A perspective on urban play is required that acknowledges the affordance-centred perspective on design by taking note of unintended signifiers and constraints that drag daily life into play. Therefore, we regard urban play as the playful interaction wherein the act of play blends with daily life or routines related to cities or similar living spaces. This blending can happen on several levels, such as the actual physical setting, or the use of objects from the city. Simultaneously, the urban dimension of play can come from a blend on content-level. Games that explicitly deal with the city and its design, such as SIMCITY (Maxis 1989), or invite the players to reflect on the functioning of the city also indulge in urban play. It remains a more flexible approach to urban play without strict characteristics, but instead relies on assumptions. These assumptions stem from the ideas suggested by Sicart in his ´Playin´ the City´ (2016). He sees play in the city as "urban appropriation activities that draw new spaces of play in the city beyond those designed and determined by urban planners" and "play for challenging and rethinking urban development" (Sicart 2016, 30). Our understanding has adapted these two ideas in order to accommodate both digital and analog games more explicitly.

These assumptions are based on writings on play by Miguel Sicart and other authors. By diving into them in 1.2.1, the assumptions can be made plausible, as well as explaining how, and why players explore afforded possibilities. Ultimately, based on these supported assumptions, in 1.2.2 a framework is provided – loops and metagames – that allows us to systematically map the action space, thus creating an overview of what urban games are capable of.

1.2.1 Urban Play

This section will explain where the assumptions come from that form our perspective on player interactions with affordances. As said above, the assumptions followed in this study are based on adaptations of several theories that will be discussed here. We regard playing urban games as an activity that affords much more than just what the game provides as players bring in interactions from their daily practices as well. Where does this broad regard for play come from?

In order to translate the assumptions into an understanding of urban play, the approach of Miguel Sicart to play will serve as guideline. Sicart seems a staunch opponent of the magic-bullet theory as he states "[d]o not give in to the temptation of making commercial controlling devices in the shape of pre-made games" (2016, 30–31).[11] Regardless of this alignment, Sicart's approach to play informs the assumptions of player interaction with affordances as he sees play as a broad activity. He explains that "this rhetoric of play understands play as a human mode of being in the world, a particular phenomenological stance

[11] While Sicart mostly directs his ire towards the gathering of data through apps related to the city, his claims hold true regardless of the exchange intended. The argument remains: magic-bullet expectations of simplistically designed games will not yield satisfactory results.

toward the world" (idem, 29). Instead of solely seeing play as an activity occurring while playing a game, Sicart draws the activity broader than that, allowing for playing to interact with more than just what a game prescribes. This fits better with the affordance-centred perspective wherein players can undertake different actions than the game suggests. Furthermore, such an inclusive perspective allows for activities that are blended with daily life, such as the physical occurrence of urban games in city settings. Sicart calls for play as the main interaction with urban installations and roles for ultimately this would work to make "urban environments more human, more open to creative expression and less functional" (2016, 30). This broad appeal to play ensures that all city life and interactive means can be approached through play. From that idea on out, urban games that deal with the city, afford signified actions but also afford other interactions with the city. As such, to fully understand the capacity of the design of a game means to look at how the variety of players explore all possible affordances; all those actions that they bring in from their playful interaction with the city.

The worldly perspective argued by Sicart explains the general background of the assumptions that underlie our understanding of player interactions. By looking at his more detailed, although sometimes associative, writings on play characteristics, the specifics of player interactions with affordances can be foregrounded. Based on his treatise on play in *Play Matters* (Sicart 2014), Sicart credits urban play as appropriative, carnivalesque, expressive, personal, and autotelic.[12] Unpacking the characteristics of urban play will outline how the introduction of the radical agent of the player to the understanding of urban games shapes the interactions between player and game, and player and city.

1.2.1.1 Appropriation

Our perspective on urban game design relies on affordances being designed, forming an action space, which subsequently can be used to steer the player into the desired direction while not determining their actions completely. The inclusion of the player into this understanding of urban games means that multiple actions are afforded by the designed action space. These actions are the result of, what Miguel Sicart calls, appropriation. In 'Playin' the City,' Sicart explains the appropriative character of play as "the sense that it wants to take over the world in order to manipulate it" (2016, 29). In *Play Matters* he specified appropriation as taking over a context in which play exist while "it cannot be totally predetermined by that context" (2014, 11). Through this characteristic Sicart acknowledges that playing will allow players to deviate from the usual or suggested course of action, while still being limited in their possibilities. Urban play then exploits the affordances of the design by appropriating the elements contained in the game, brought in by the player, *and* those that are present in the urban setting or are related to its city content – thus actively stretching the borders of the action space. As such, appropriation

[12] In *Play Matters* Sicart appropriative is divided in contextual and appropriative, while expressive is exchanged for subversive. These changes will be discussed in the detailed treatise of the characteristics but overall do not impact their contribution to the player action assumptions.

characterises the interaction of the players with the design. Yet what consequences does this have for the possible forms the player interaction can take?

Whereas Sicart acknowledges that appropriation can take place, his focus is on the phenomenology of play; the experience the player has. Formal elements that help us understand what makes up this experience have to be sought out elsewhere. To understand that, we argue that his ideas have to be expanded with further insights from other theorists, primarily Dutch historian Johan Huizinga. In *Homo Ludens*: *Study of the Play-Element in Culture* published in Dutch in 1938 (yet here read from its 2008 translation in English), Huizinga wrote about the different player attitudes that ultimately explain the extent of appropriation. The appropriative nature of play is explained by Huizinga's focus on boundaries and rules. For Huizinga, rules "determine what 'holds' in the temporary world circumscribed by play. The rules of a game are absolutely binding and allow no doubt" (2008, 11). Disrupting the rules means destroying the very fabric that makes playing possible both in digital and analog games. Regarding affordances, this means that the rules function as constraints – both visible and invisible, spatial and temporal – to the possibilities of the player. While rules are the prerogative of the designer, the city setting of urban games complicates the absoluteness of the order, especially the temporal and spatial, as will be discussed in the next section. Huizinga thus specifies the empirical elements – the rules – that give shape to appropriation.

Huizinga adds more formal specificity to Sicart's appropriation in his explanation of the rules as designable constraints. Yet what Huizinga does not explicitly discuss is play as "free movement within a more rigid structure" (Salen and Zimmerman 2010, 304). While rules delimit the action space in which a game takes place, within these rules there are a variety of actions possible depending on the interpretation of the rules. Some players may perfectly follow the rules, by just walking and catching Pokémon in POKÉMON GO for instance, while others may interpret the catching of Pokémon more as an invitation for social or physical activities. Huizinga's understanding of the rules as constraints can therefore be specified with reference to Eric Zimmerman and Katie Salen and their "space of possibility," which refers to "the space of all possible actions that might take place in a game, the space of all possible meanings which can emerge from a game design" (2010, 67). The space of possibility echoes the action space, although now explicitly including meanings as well as actions. Dijst in his description of action space does not disregard meaning-making however, therefore in the rest of this thesis space of possibility and action space will be used interchangeably. Essential in these concepts is the acceptance that one "can indirectly construct the space of possibility, through the rules you design" (ibidem). In urban games this space of possibility is larger due to possibilities and rules intersecting with daily life and/or the physical environment, opening up many other possibilities than just those designed in the rules.

Taking a step back, the relationship between these three authors can be outlined through increasing specification (see Figure 5). First of all, Sicart identifies play as an appropriative action, yet he does not dive deeply into what this means. Secondly, and more specifically, Huizinga expands on appropriation by saying that this happens within designed rules together form the constraints within which the player can appropriate. Thirdly, and most specific, Salen and Zimmerman state that within these rules, this rigid structure, the player has a variety of possible actions; all grasped within the space of possibility. In order to go against the magic-bullet theory used in urban games all the possible actions, intended or no, undertaken by players have to be understood. This then means understanding all possible appropriations, thus charting the space of possibility.

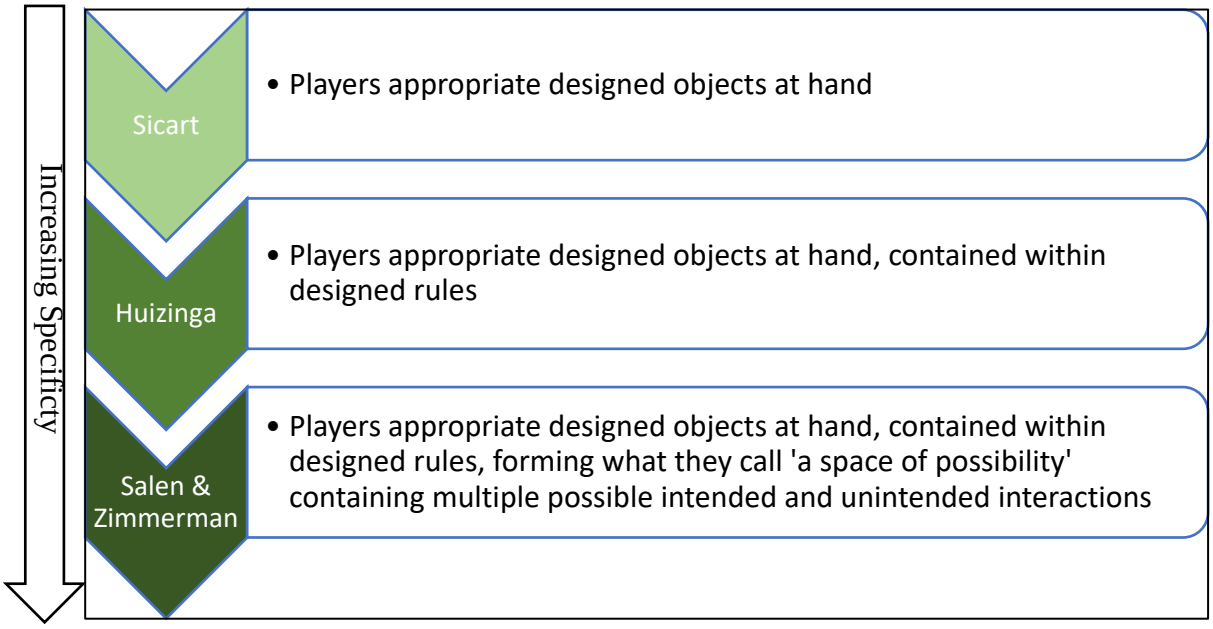


Figure 5 The Gradual Specification of Appropriation.
The relations followed in this thesis when talking about appropriation. Source: Author creation

1.2.1.2 Carnivalesque

Sicart's play characteristic of appropriation informed the assumption that players, given enough time, can explore all the multiple actions of the action space. His next characteristic gives insight into the shape of these appropriations and their consequences, although it requires clarification with other theorists. The second characteristic Sicart attributes to play is Mikhail Bakhtin's concept of carnivalesque, explaining that "it can harness its appropriative capacities to identify and subvert sociocultural structures" (2016, 28).[13] Sicart summarises the concept as the aforementioned subversion and a "precarious balance between creation and destruction – play has a compulsion for disorder that is closely related to its capacity to create order" (ibidem). We interpret Sicart's assertion of carnivalesque

[13] The reasoning behind this definition of the term 'carnivalesque' goes beyond the scope of this study. The topsy-turvy history of the term in game studies can be traced in Sicart's *Play Matters* (2014).

play as revealing two insights: the breaking down and building up of the rules can take several forms, and the appropriations within the space of possibility allow players to take a stand in urban issues.

To understand what Sicart means by the balance between creation and destruction, we believe the insights of French philosopher Roger Caillois offer clarity. Caillois distinguishes between *paidia* and *ludus.* Paidia is "common to diversion, turbulence, free improvisation, and carefree gaiety … [which] manifests a kind of uncontrolled fantasy" while ludus is "to bind [play] with arbitrary, imperative, and purposely tedious conventions … in order to make it more uncertain of attaining its desired effect (Caillois 2001, 13). According to Caillois, the tumultuous paidia – or free play – will eventually become regulated into a form of ludus as civilization develops (idem, 29). As such, play can be both very free form and structured. When it comes to charting the possible interactions of the player in an urban game, the interaction of players does not solely follow the rules, as is believed in the magic-bullet theory. Instead, players can indulge in a continuum between paidia and ludus, exploring new interaction forms through appropriation and breaking the rules.

The carnivalesque attitude of the player towards the affordances of the design means that the rules are but a pawn in their larger plan. As Huizinga notes, players have to stick to the rules, as per ludus, but there is no reason they cannot break them down and rebuild them similarly to fit their own play style, as per paidia. This form of playability afforded by this play characteristic will here be understood according to Huizinga's quartet of rule-engagers. He explains that during play the players transpose themselves to a world largely temporally and spatially separate from everyday life and its understandings – into the so-called magic circle (Huizinga 2008, 10). How the players relate themselves and their actions to the conviction of this magic circle will ultimately shape the possible actions they take in four different ways.

The first way, which Huizinga accredits to 'the player,' is the interaction explained earlier as appropriation. Players in this case follow the rules, but have the freedom to fill in the space of possibility in a way they see fit. The afforded actions here are constrained by the rules as the player obeys them. The larger the space of possibility allowed by the rules, the more actions the players can take. Yet, this first appropriative form of play is only functioning as long as the players obey. When designing an urban game which functions as a think tank or experimental tool, blind obedience might not be the most useful. This is where Huizinga's other forms of play come in; those of the cheater, spoilsport, and outlaw.

The second form of playability is cheating, in which the player "pretends to be playing the game and, on the face of it, still acknowledges the magic circle" (Huizinga 2008, 11). This means that, for all intents and purposes, the cheater is playing along with the game but can break certain rules, bend them, or interpret them differently at will, often "as a means of winning the game" (idem, 52). While this does give an unfair advantage, the rules of the game are left intact or are only temporarily altered, thus preserving play. However, when it comes to urban games, this does not have to be a disruptor, as sometimes the rules to which the city is subjected in the game can be stifling. Huizinga already

acknowledges the more lenient attitude to cheaters (idem, 11). As a second form of interacting with the affordances, the cheaters appropriate the rules. In true carnivalesque fashion, cheaters break down and rebuild the rules when they see fit. In doing so, they draw attention to the rules, highlighting weak spots or reflecting on their general nature. In urban games, wherein the interaction is somehow related to the city in its content, setting, or otherwise, and in such case, pushing against rules or forms of understanding can be illustrative of possibilities in the city. A cheater, by virtue of its appropriation of the rules, can then in urban games be a valuable player that appropriates affordances differently and refreshingly.

The third form of playability that structures the player's interaction with the affordance is that of the spoil-sport: "The player who trespasses against the rules or ignores them" (Huizinga 2008, 11). According to Huizinga, these players show the uselessness of the rules, thus disrupting the whole experience of play. These players act as if the whole practice of playing is irrelevant and instead draw attention to repercussions outside of the realm of play. Yet, Huizinga also acknowledges that these spoil-sports are not totally dismissive as he calls them "apostates, heretics, innovators, prophets, conscientious objectors, etc" (2008, 12). As innovators, these players explicitly destroy the rules in order to force alternatives. As such, the spoil-sport can be exactly the required player to identify faults in larger urban schemes. Furthermore, explicitly drawing attention to issues outside the game can have great benefits in urban games. Therefore, we regard the spoil-sport as an essential form of interaction with affordances as they ground the games and possibly use them to address urban issues.

Finally, even more extreme, Huizinga identifies a type of player, the outlaw or revolutionary, that "make a new community with rules of its own" (Huizinga 2008, 12). Whereas the cheater appropriates the rules and the spoil-sport rejects them, the full carnivalesque nature comes forward in the outlaw who breaks the rules and instead substitutes their own. Although Huizinga mostly relates these to heretics and secret society members, in urban games these outlaws can serve a productive function. By rejecting the rules to which the players have to interact with the city, the outlaws can truly think outside the box. Not only do they create new affordances by ignoring these existing and rules, but they offer alternative solutions. It is especially this engagement with the affordances that may make a game designed for an urban purpose miss its goal completely.

The four forms of playability give shape to Sicart's assertion that play is carnivalesque. The balance between order and disorder exhibited in the player, cheater, spoil-sport, and outlaw mirrors a subscription to paidia or ludus: players can more or less subscribe to the rules or appropriate freely to form their own rules. [14] Through Huizinga's quartet a general overview of possible interactions with the affordances in urban games is discerned. The relationship between authors is systematically shown in Figure 6. These forms of playability offer a general overview of the extent of actions players can take, which makes the assumption that a collective of players can explore all affordances contained in the design more plausible.

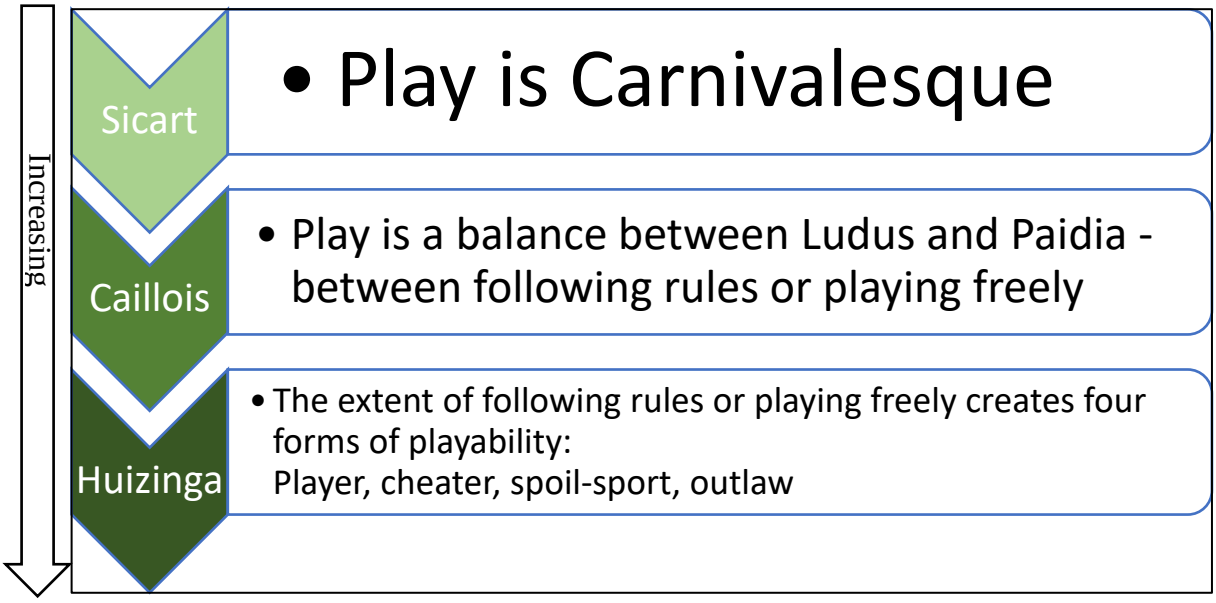


Figure 6 The Gradual Specification of Play.
The expansion of Sicart's idea of Carnivalesque play with insights from Caillois and Huizinga with increasing specificity. Source: Author creation

The forms of playability taken by the players, and their stance on the Ludus-Paidia continuum ultimately allows the players to take a stand in urban issues. Sicart attributes to the carnivalesque that it grants the players the capacity to subvert sociocultural structures. With the different forms of playability and the relation to the rules, we have offered an interpretation of what Sicart meant by this. What this essentially means is that play is capable of finding the current order and going against it. This can mean bending the rules of a game a bit, but, and especially in urban games, this could also mean that the players can go against the sociocultural structures they live in. In a similar vein, play scholar Brian Sutton-Smith identifies play as inherently ambiguous, referring to several other authors to explicate that it is always on the precipice of reality and make-belief (2001, 1). This ambiguity is exactly the strength of play as a useful perspective on engaging citizens, although it has to be analysed with care, taking all affordances into account, be it in-game or against sociocultural systems.

[14] Arguably, by breaking the rules, no new affordances are created. The act of breaking the rules has always been afforded and as such actions that arise from breaking the rules fall within the space of possibility.

An example of such ambiguity is for instance play's capacity to group players together in pursuit of a common goal. Huizinga forwards community formation as one of the main strong suits of play. Exactly through the distinction from daily life in space and time through rules play allows players to collectively share an experience. Huizinga explains that "the feeling of being "apart together" in an exceptional situation, of sharing something important, of mutually withdrawing from the rest of the world and rejecting the usual norms, retains its magic beyond the duration of the individual game" (2008, 12). POKÉMON GO saw many of such social interactions arise during and because of gameplay. Dating services setting up Pokémon dates built on this capacity (Walcutt 2016), and animal shelters let players walk dogs while playing, which sometimes led to adoption after the game ended (Sunkara 2016). Depending on the player's adherence to the rules or form of free play, different interactions can arise from a design, thus making the addition of the player as radical agent to urban game design have influential and multiple consequences.

1.2.1.3 Expressive, Personal and Autotelic

The appropriative and carnivalesque qualities of play explain how the action functions. Sicart's final three characteristics that form play relate more specifically to player motivations that can determine which affordances are explored. Each player can explore different affordances in a design, depending on how they play the game. Sicart explains the three concepts as follows:

> [Play] is expressive, that is, conducive to the creation of new things, actions, or behaviors. These are of a personal nature since playing is first and foremost an individual expression that can be collectively cohesive by mutually binding yet flexible agreements, materialized in games, toys, playgrounds, or other playful props. Finally, play is autotelic in that it has its own purpose, a purpose defined by the very activity of play but in constant negotiation while this mode of being in the world is dominant (Sicart 2016, 28).

We argue that the capacity of games to be expressive, personal, and focused on its own activity gives direction to the engagement with affordances and shapes the forms play can take. This shaping can be explained by positioning Sicart's ideas in the broader play discourse and expanding it with the understanding of the use of play in cities by Michiel de Lange.

Sicart's characterisation of the expressive nature as conducive to creation is a deviation from many other approaches to play. Creation as a result of play is a controversial dimension. Huizinga was the first to state the absence of material gain as a key characteristic of play (2008, 13), and later on Caillois jumped through several hoops to justify Huizinga's addition of it (2001, 5). Huizinga explains that "play naturally contributes to the well-being of the group, but in quite another way and by other means than the acquisition of the necessities" (2008, 9). For Huizinga, the value of play is in the community building, the inclusion, and the experience, for if monetary gain was pursued, the voluntary nature, as

well as the separation through rules would be lost. This would result in an end to play. Yet Sicart is adamant that plays can be expressively creative, as well as personally enriching.

Sicart counters Huizinga's gainless claim by still calling play autotelic – play for the sake of play, even despite creating personal new results. What this apparent paradox shows is that in Sicartian play, more so than in Huizingan play, the focus should be on the play activity itself and the pursued actions within that. Added to that is that in this play activity the expressiveness should be highlighted – what kind of behaviour is produced or pursued and why. If we hearken back to our discussions on the appropriative and carnivalesque nature of play, players will engage with the rules of the game in order to appropriate the affordances in a way they see fit. This ultimately opens the door for a variety of different forms of gain that players can gather from urban games. Within the space of possibility, players are able to express themselves in a variety of ways, depending on their engagement with the rules during play. Huizinga suggested community formation but other immaterial profits are afforded such as making a place your own, or physical exercise. The player is free to derive any sort of personal meaning from the act of playing, thus affording more than one mode of playing. The designer can suggest several interpretations and especially in urban games, the personal take on the city is worth expressing. This means that when analysing digital urban games interaction as play, the unconventional, controversial and downright unexpected and unfair interactions should also be included. This also means that the affordances must be discovered during the act of play but are not necessarily limited to what happens during this act. The domain of signification can stretch beyond the ludic expression.

Pointers on the shape of such interactions are given by new media scholar Michiel de Lange. He outlines four ways in which play takes shape in urban games, which is the result of the appropriation and carnivalesque engagement. These four ways illustrate how interactions with urban games are structured and open to personal expression during play.

1. "[G]ames may be used to engage people in the actual planning and design process itself through simulation, feedback and using outcomes in actual design" (2015, 430).
2. "[G]ames allow people to act on a wide range of specific urban issues through role-playing, building trust, forging collaborations and tapping into crowd creativity" (ibidem). This is because play manages to create an open artificial setting in which experimentation is afforded and encouraged, transcending inhibitions.
3. "[G]ames are used to stimulate playful encounters and interactions with other people and places by stimulating serendipity and fun" (de Lange 2015, 432).
4. [G]ames are used to foster a "sense of place", a feeling of belonging and care for the city through emotionally powerful play experiences" (ibidem).

De Lange adds some much-needed specificity to the general prose of Sicart. While still suggesting general play, these four uses illustrate the personal and expressive values that can come forth during the

act of play. It is exactly because of the act of play and the interaction with the rules that the affordances of the design can come to fruition differently.

With these insights however, it would seem play can almost take any shape regardless of the design, giving rise to endless affordances as long as the player is expressive enough. A considerable constraint however, stemming from the personal use of play, is the requirement of a personal motivation to engage. This principle already was discussed by Huizinga, who called it volition (2008, 7). The player will only appropriate affordances creatively if they are doing so by themselves. If forced to do so for another, or if there is no appropriation at all possible, then the personal motivation will falter and players may stop interacting. Doing your taxes or waiting for a traffic light would, according to Huizinga, not count as play as these are mandatory tasks. This complicates the affordances of urban games because many of the afforded player actions are derivations of non-play actions. Still, as De Lange shows, player actions in the city can still stem from personal volition and the expression of one's opinion. As a constraint, volition is then a prerequisite for any affordance to even be considered for appropriation, but their nature as possibly serious does not offer any limitations.

1.2.1.4 The Understanding of Play

While there are many other theories on play out there, the above discussion of Sicartian play will be followed in this thesis. The discussions that formed 1.2.1 ultimately characterise the relation between urban game design and the player. Playing a game means identifying and exploiting affordances in the design in order to achieve a personally satisfactory experience. We have explained that this identification and exploitation follows several patterns:

1. All affordances together create a space of possibility in which the player can act
2. Players appropriate the means within the space of possibility. This can include the rules themselves, or urban elements technically not covered by the game.
3. Depending on the obedience to the rules, players can engage with the affordances in different ways
4. A variety of personal expressions can surface due to this appropriation during the act of play.
5. The domain of signification can stretch beyond the play session.

With this outline of what we base the assumptions around play and urban play on, the relation between the design of a game and the interaction of the player is clear. This understanding of play is however only epistemological; it helps us understand how players intact. In order to use this understanding to compare whether the design of a game ultimately yields the desired result after it has been subjected to the appropriative, carnivalesque, expressive, personal, and autotelic whims of the player, we need a pragmatic way of charting the space of possibility. This will grant us the capacity to chart all the afforded

actions in a design. Such a pragmatic means can be found in Sicart's article 'Loops and Metagames: Understanding Game Design Structures' (2015).

1.2.2 Loops and Metagames

While there are many approaches to formal game design features in existence, Sicart's approach adds "a new gradient of abstraction that will allow the analysis and evaluation of series of mechanics, and how they are affected by (designed) contexts" (Sicart 2015, 3). This approach provides the tools to fill the gap between analysing "game design as broad patterns and as detailed actions" and looks at the interaction possibilities provided by the game and their signification in a sociotechnical system outside of it (idem, 2). This fits our approach on urban games, which relies both on design and the urban setting behind it.

Sicart's method is focused on "the tension between play and the designed structures" (2015, 2), and he approaches this tension by looking at "the concept of game loops to analyze all the actions designed in the system for player interaction, and the concept of metagame to analyze how the game object creates a particular context that also plays a role in the configuration of the play experience" (ibidem). While offering useful grips to map the space of possibility, some alterations are needed to do justice to the expanded understanding of the player as discussed in 1.2.1. Sicart uses loops and metagames to give insight in game design. Instead, we shall expand his model to cater to player appropriation. This section will introduce the loops and metagames as a system to map the space of possibility, but add player appropriation, technological factors, and systematic overviews.

1.2.2.1 Loops

Sicart introduces loops as a concept to understand and characterise game design. The concept describes the repeated series of actions a player has to perform in order to reach an end point. In SUPER MARIO LAND (Nintendo 1989) (MARIO), the loop consists of walking right and jumping, as this will ultimately bring the player to the end of the level. Sicart describes game loops as follows:

> A game loop is a composite of game mechanics, computing operations, and feedback mechanisms that is repeated until a break condition is reached, either in the game mechanics or in the computing operations (ibidem).

For MARIO this means that the game mechanics of walking right and jumping, performed through the computer interactions of pressing right on the d-pad and the A-button, resulting in the feedback of movement and jumping. By performing these actions repeatedly, the player will reach a break condition

in the game, the end of the level, when the game mechanics stop, as the player cannot do anything else until the next level starts.

Sicart distinguishes between primary and secondary loops. The primary, or core, loop is "is designed to bound the apparently infinite possibilities of the expanding world presenting to the player to a horizon of possible actions, a possibility space in which some actions that can be performed repeatedly structure the activity" (ibidem). In MARIO the infinite possibilities are bounded by making the end of the level on the right, and making a jump mandatory to even survive the first five seconds as a Goomba is slowly approaching. These mandatory actions of walking right and jumping have to be repeated structurally, in each level; without them, the player will not advance. That is all the player has to do to reach the end, however within that sequence of actions the player can experiment, such as jumping on the ceiling of the level to find a shortcut or carefully time jumps in such a way to achieve a super jump at the third iteration. Regardless of the mastery or exploration of the core loop, these actions need to be performed in order for the game to progress.

The core loop is related most to the rules that structure the space of possibility. More so, those actions perceivably signified are the closest link to the pursued interaction, as these are the repeated actions that gain most attention. Yet as we have seen, players appropriate and break rules. Although the player is still able to express themselves personally by finding mastery or developing new uses for the core loop, just a core loop would be no different from players doing what they are told. What is needed is attention for alternative and the appropriated loops. Enter the secondary loops.

Secondary loops are "those actions a player can choose to learn to achieve particular mastery or to explore the whole world and the narrative of the game" (Sicart 2015, 4). Basically, these are secondary actions possible in the game the player can undertake that deviate from the core loop, providing a new experience or action, but ultimately stem from actions in the core loop. Some of these secondary loops are programmed into the game. In MARIO the player can choose to go for the high score by collecting all the coins, next to reaching the end of the level. This secondary loop is suggested by the game as the coins are programmed to add to the score.

Based on the carnivalesque nature of play, players do not just stick to the suggested options however. Especially in urban games, the means of the game and city can be appropriated to form new actions. Therefore, we introduce a distinction between Sicart's secondary game loops, programmed into the game, and secondary *player* loops, arising from player appropriations. This addition steps away from Sicart's system focus and instead embraces player experience. A secondary player loop in MARIO could for instance be to play as musically as possible, using the affordance of the sound design to create a beat by killing enemies, jumping and hitting blocks. This holds no further use in the game apart from the player's enjoyment. The secondary loops can appropriate not just the game rules but also the physical

environment of playing. This fits better with the player inclusive perspective followed in this thesis. The full extent to which these loop appropriations allow for urban intervention will be discussed in 1.3.

Yet even the addition of secondary player loops does not accommodate all player freedom. When arguing from a player perspective, the core loop can also change based on the pursued purpose by the player. The design suggests a general purpose in its signified way of completing games, but players may pursue a different end state than the programmed loops envision. In SIMCITY for instance, the core loop centres on the building of a city for profit. Yet scholars may use the game to create simulations of certain urban planning situations. This changes the end state into data gathering instead of profit hunting. As such, a player-inclusive perspective must acknowledge that more core loops are afforded. With different core loops, different secondary loops spawn, as they arise from the actions contained in the loop. The secondary loops, mostly player versions, are then linked to the core loop they spawn from. While each core loop can have multiple secondary loops, some secondary loops can only arise from unique core loops. Therefore, we go beyond Sicart's outline in arguing that core loops and secondary loops should be grouped together in '*loop groups*.' These groups are differentiated by their core and secondary loops. To create a comprehensive mapping of the loops within the space of possibility, each secondary loop can be linked to its core loop separately (see Collection 1). With this player perspective of loops, mapping the space of possibility becomes systematic. Still, to make the urban positioning systematically analysable too, a way to map the circumstances that give rise to core and secondary loops is needed. That is where Sicart's metagame comes in.

Core Loop	**Secondary Loop**
Core Loop A	Secondary Loop A
Core Loop A	Secondary Loop B
Core Loop B	Secondary Loop C

Collection 1 Loop Groups organised according to their core loops and differing secondary loops. Source: Author creation

1.2.2.2 Metagame

From a player perspective, the loops show the space of possibility in the form of possible player actions. Player core and secondary loops allow for the appropriation of real-world actions as well, which is a key addition when studying urban games. Metagames allow the sociotechnical systems that the players appropriate into the game to be charted as well, thereby grounding the game even more in an urban setting. Sicart defines the metagame "as any aspect external to interacting with game loops that influences the play experience of a game" which makes games a "situated activity that is meaningful not just as an individual interaction, but within a particular context" (2015, 5). This relates to elements of signification like story, but also real-life elements intruding. For MARIO the external aspects are for

instance Mario's reputation as Jump-Man, and the artwork on the game box giving colour to the sprites. Other metagame aspects could be the competition going on between siblings in order to get the highest score, thus adding meaning to all possible actions as point-gathering. Sicart distinguishes between five types of metagames: informational, fictional, economical, performative and physical metagame. While these are idealised categories that in reality contain considerably overlap, they will be discussed here separately, in no particular order. Again, these five categories derive from Sicart's game focus and therefore will have to be complemented with our player-centred perspective.

Informational Metagame

For Sicart "the informational metagame comprises all that information that is not strictly relevant to play the game, but that expands the experience of the game and affects the interaction with the loop" (2015). External platforms like walkthroughs, forum discussions or other merchandising about the game that contain information fall under this metagame. MARIO was the subject of many game magazine talks, specifically detailing the warp-pipe shortcuts that can be discovered by walking over the ceiling in the second level (Consalvo 2007, 38). Such an external source of information would count as informational metagame. In a game like POKÉMON GO it might also be a completely separate app, the PokéRadar (Bilal Mirza 2016), which shows where the player can find specific Pokémon in real time. Alternatively, relevant information might also come in the form of people; a community engagement can be a source of information. The informational metagame is identified by the designed elements in the game that the player can imbue with more depth through external knowledge. While a preferred source of information can exist, players can add their own domains. Especially in urban games, external domains of information, such as knowledge of the city setting, can be brought in by the players. The line between information not strictly relevant, and essential to the game is thinner in urban games. Depending on the obedience to the rules, external knowledge could be considered cheating (Consalvo 2007, 85), giving rise to a variety of different appropriations. This particular metagame can then be used to add more information to the game which can imbue it with more depth or elucidate necessary actions.

Fictional Metagame

This metagame "is the level of abstraction that can be used to understand the way in which fictions are used to wrap and communicate the game loops" (Sicart 2015). Mainly related to the narrative charge of the game, this metagame focuses on the signification and diegetic meanings. The fiction is made up of the setting, the roles of the characters, the history, and the main themes addressed. For MARIO, the story, detailed in the manual, is that of Mario trying to save Daisy from the evil Tatanga. This story is not necessary to play the game, but does add meaning to the player actions. Designers can present an interpretation of the city in urban games through this narrative, thus creating a perceived signifier.

However, players can reject, accept, or alter this suggestion, granting space for appropriation and alternatives. Formative for this freedom is their control over the fictional description. It can be essential for progressing, or the game can thrive on what Lisbeth Klastrup calls 'tellable events:' "real events, realised and performed by players in interaction with each other and the world, which would retrospectively make good stories" (2003, 104). The fictional metagame then provides constraints and signifiers to the interpretation possibilities.

Economic Metagame

Sicart defines this metagame as "all elements external to the game loops that can be purchased, either with in-game currency or with real currency, and that have an effect in the experience of the loops" (2015). For MARIO, which appeared long before in-game purchases were included, this metagame is hardly existent. But imagine if players could spend money (real or virtual) to unlock power-ups like extra lives, growth mushrooms or fire flowers, then the economic metagame would relate to the meaning added to the money as item to purchase power-ups with (and possibly the meaning deprived from these purchaseable items). Engaged urban games can have participatory and engagement goals, but the possibility of a profit-oriented motive should not be disregarded. Especially when analysing serious urban game design, cash grab mechanics should be identified and critiqued.

Regardless, many urban games have some sort of urban engagement component instead of a profit pursuit, mostly relying on player participation or engagement during, or even after the game. The 'economic' affordances of the games should be interpreted more broadly as forms of productivity. On the one hand the engagement can be valued on the level of efficacy. Playing the game can have an actual participatory function, impacting on larger discussions and giving everyone a voice that is heard by the executive parties. Alternatively, it can also be purely symbolic. A game about urban issues can provide a platform for citizens to talk but if these musings do not leave the magic circle of the game, then there is no productivity. On the other hand, as an extension of this first value scale, urban games can be productive on a personal or public scale. Urban games can then be effective for the agency in public issues, effective for its private enlightenment, public effacement through symbolic participation, or just individual entertainment (see Table 3 below for an overview). MARIO in this case is purely private and symbolic, as there is no function of this game behind the entertaining play. Whereas the game may be forwarded with a particular purpose in mind, the player remains free to appropriate the affordances in their own way. They can solely use the game for individual betterment or they could draw a single player game out of proportion and into the public sphere, as was done with POKÉMON GO as dating service or urban watchdogs.

	Participatory	Symbolic
Public	Agency in public issues	Public Effacement
Private	Private enlightenment	Individual Entertainment

Table 3 Economic Metagame possibilities, grouped according to their actual impact, and scale. Source: Author creation

Performative Metagame

Performative metagame refers to the possibility of a game to be used as a performance for an audience, with the players performing skills and feats. MARIO'S highscore function allows for informal competitions and performances of skills for instance. As urban games take place in a physical and shared setting, the chances of encountering an audience or playing as a public display are considerably higher. The public visibility of these games can be an essential aspect of the game or it may be an appropriated by-product. Nevertheless, the shape interaction with the game takes in public space is a contested dimension that can be intended, or an unintended appropriation. For instance, in POKÉMON GO interaction with other players is not rewarded in the game.[15] Instead, the players themselves showed off their Pokémon, or knowledge of the game, to other players by themselves, often going out together. This display of skill is fitting with the Pokémon franchise, where sharing knowledge of the world is especially valued (Sefton-Green 2004). Here it was the appropriation by the players that made the game performative. In urban games however, an added affordance is the ever-present audience, in the shape of random bystanders. The performative metagame in urban games is then a fruitful ground for design and appropriation.

Physical Metagame

The final metagame entails the physical context which shapes the experience of the game. Sicart explains that this envelops the context for which the game is designed to be played; alone or with others for instance (Sicart 2015). MARIO was the first Mario title on the Gameboy, a portable platform that could be taken anywhere. This ultimately impacted on how this game could be played and enjoyed, in comparison to the TV-linked NES and SNES titles. Especially in urban games this metagame stands out as the relation to the space can vary. Location specific interactions might be more context-dependent, whereas other games might rely on movement through general space. POKÉMON GO for instance offers information about specific places in Pokéstops and specific Pokémon only appear in their elementally associated place. Contrariwise, JURASSIC WORLD ALIVE (Ludia 2018) (a POKÉMON GO clone which lets the player capture dinosaurs in urban space) has meaningful locations spread over the in-game map, but

[15] It is now. Since June 2018 trading and the inclusion of 'friendships' has become a part of the game.

they are not explicitly linked to real locations. Furthermore, any type of dinosaur can spawn everywhere, causing aquatic types to appear in the middle of sandy areas. The physical metagame can then explicitly constrain and signify the space the game is played in. Yet, players can appropriate the location they use for playing as well, for instance by staying seated on a bench around which Pokémon keep appearing. Although not an element in the game, players appropriate their physical surroundings for their own enjoyment, thus making the urban setting open for inclusion into the game.

Although Sicart mostly speaks about the setting, the physical dimension should also include the platform and technology used for the game as this considerably impacts on where a game can be played. As discussed earlier, the material of the game can influence interaction options for they come with specific affordances. A mobile and location specific game like POKÉMON GO also offers the possibility of social connection through other apps on the phone, possibly explaining the social consequences not designed beforehand. This again comes down to the amount and type of freedom the player is afforded; can they interpret multiple forms of interacting or are they bound to a singular action in their daily activities. Consequently, when analysing whether a game actually communicates the desired message, the chosen technology should be included in the analysis as well, as it is never a neutral carrier.

The metagames outlined and expanded above represent a way to systematically map the sociotechnical factors that explain appropriations. As was the case with the loops, specific suggestions can be designed into the game but the players can have more or less freedom to shape their own experience with the game further should they want so. However, specific forms of the metagame fit with specific core and secondary loops and vice versa. Single player loops will not suddenly indulge heavily in performative metagames that thrive on multiplayer play. Therefore, the manifestations of the metagames can be grouped in the loop groups as well, as the metagames are paired with their corresponding loops. See Collection 2 for an illustration of the form of mapping we follow in this thesis, using MARIO as example.

Core Loop	Secondary	Informational	Fictional	Economic	Performative	Physical
Walk Right (Right+Jump)	High Score	Locations of Coin Blocks	Less relevant. Focus on Player Stories	Private Symbolic	Display Skill. Beat competitor scores	Single Player, but demonstrable to others
Walk Right	Speed Run	Shortcuts	Irrelevant	Private Symbolic	Time as mark of skill	Single Player but demonstrable

Collection 2 The systematic mapping of the metagames according to their conjuration of their loop group in MARIO. This particular game only has one possible core loop, but other games can have multiple, depending on their end states. Source: Author creation

1.2.3 Radical Players in Urban Games

Paragraph 1.2 has dealt with the question what it means for the interaction with urban games if the radical agent of the player is added. Instead of the simplistic understanding of the magic-bullet theory wherein the playing of the game equals the adoption of the communicated point of view, the radical player shows that the act of play is anything but neutral. In this section we have introduced assumptions of how players function and their forms of interaction during play. Starting from Sicart's characteristics we have shown that players can appropriate the elements of a game – and in an urban game even more every day elements – or the rules in order to create a personal expression during play. This does not necessarily mean that the players follow the designed suggestions. Instead they pick a set of actions from a space of possibility that is shaped by the affordances of the game. In order to chart this space of possibility, we have introduced an alteration of Sicart's loops and metagames. By mapping the actions the players can take in loop groups, appropriations of affordances can systematically be tracked and organised. All of this is required to be able to compare whether the design of he game actually affords the desired effect or whether it fits another purpose.

This section has studied the relation between the design of a game and the radical agent of the player. In doing so the player has been characterised as well, not as a studied subject, but as a collection of assumptions that are based on an understanding of the act of play. With their interaction and perspective on design clear, urban games can now be examined themselves to see where affordances can arise in an urban setting.

1.3 Urban Games

An affordance focused perspective ultimately allows for the inclusion of the player as radical agent into urban games. This last section shall explore how this understanding of affordances and player appropriations is designed for when making an *urban* game. Although it will not delve into definitional matters until next chapter, in 1.3.1 the characteristics urban game design can rely on shall be discussed and organised to illustrate what specific affordances to look for in urban games. In doing so we will highlight what it means when these characteristics of urban games, designed into the loops and metagames, are appropriated by players. Ultimately then, this section provides our theoretical model of what urban games are.

1.3.1 The Urban Game System

Affordance design explains how designers can steer players to appropriate the design elements according to the intended use. But what are the design elements of urban games? What are the main

tools urban game designers can work with in order to steer the player whilst simultaneously keep the game situated in the city? As explained earlier, we understand urban games as any game that blends with daily life or routines related to cities or similar living spaces. Other scholars, such as Adriana de Souza y Silva and Michiel de Lange, have shown that this blending can happen on several levels, such as the actual physical setting, or the use of objects from the city, but also on content-level, relying on reflections on how the city functions. The main distinction of these games from other games is their use of space, discussed in 1.3.1.1. Based on the approaches to space from other scholars, as will be shown below, we identify three key characteristics of urban games: moveability in 1.3.1.2, sociability in 1.3.1.3, and defamiliarisation in 1.3.1.4.[16] While others are possible, we will argue that these characteristics do most justice to the forms of playability of the appropriative player as outlined in 1.2. The exploration of these characteristics will ultimately guide the identification, characterisation, and interpretation of the loops and metagames of urban games, as these usually are somehow related to these three characteristics. This section therefore serves to guide – as a searchlight if you will – the charting of the loops and metagames in urban games, further detailed in chapter three.

1.3.1.1 Space

Formative for urban games are their unique relation to space. From the name 'urban games' one can imagine that these kinds of games have some sort of connection to an urban area – or a human settlement with a high population density such as a town or a city. Urban games have to make do with the physical reality of the city, either as actual setting, augmentable space, or provider of content. This predetermined positioning of a game both offers constraints as well as affordances. We argue that urban games are characterised by their dependency on existing physical space, but are empowered by rich signification possibilities of place, mindset, and player, thus both relying of affordances and appropriation

The constraints stem from the idea of game space as one of the main areas the designer can use to steer the player. Game studies pioneer Espen Aarseth explains that "Computer games are essentially concerned with spatial representation and negotiation, and therefore a classification of computer games can be based on how they represent – or, perhaps, implement – space" (2000, 154). Indeed, game space has been described by comparative literary scholars Mary Fuller and Henry Jenkins as comparable to new world travel writing – literally charting new space (1995). Conversely, the use of space seems to

[16] The last term has a long tradition in media but is mostly credited to Viktor Shklovsky and his Russian Formalist colleagues as the capacity of language (in whatever form) can alter our perception. Shklovsky talks about how in literature an author "makes the familiar seem strange by not naming the familiar object. He describes an object as if he were seeing it for the first time, an event as if it were happening for the first time" (1988, 22). Later also attributed to film through the neoformalist tradition by Kristin Thompson (1988), defamiliarisation basically stands for the presentation of a familiar object, setting, or situation, in a different light so that it becomes new and exciting. We argue that this is one of the main capacities of urban games: to give a new perspective on the urban setting.

be awfully static when it comes to urban games. Instead of allowing a virtual world to imagine or unreachable places to explore, urban games position themselves in a physical reality: The city or town. The impact of this decision is illustrated by Aarseth when he states that "[c]omputer games, finally, are allegories of space: they pretend to portray space in ever more realistic ways, but rely on their deviation from reality in order to make the illusion playable" (idem, 169), showing that control over space is one of the main variables that can make designers shape play, now severely limited by predetermination.

The limited control the designer has over the space is countered by a semiotic component outlined by media scholar Michael Nitsche. He explains that "game spaces evoke narratives because the player is making sense of them in order to engage with them" (Nitsche 2008, 3). For Nitsche, control over the environment is important, but ultimately space can stand on its own. The elements that make up the space "do not contain a story themselves but trigger important parts of the narrative process in the player" (ibidem), with Nitsche citing them as evocative. This is where the boon of the fixed space of urban games comes in. Designers have to deal with concrete structures, pre-laid roads, inaccessible areas, and dangerous zones, but they can dive into the rich connections already written into the space. Buildings or sites may have a historical narrative underlying them or certain areas have a reputation. Even better, some spaces of play may be engulfed in a current discussion, making the play possibly link into many metagame layers. Next to that, according to French historian Michel de Certeau, every traversal through such spaces is a travel story – a spatial practice (1984, 115). He explains that the static locations of the city gain narrative meanings when operations – engagement by a subject – are attributed to elements in the space (idem, 118). So instead of control over space the urban game designers have a treasure trove of historical, reputational, and personal stories to evoke and appeal to.

All these stories account for affordances, some known, some unknown, the designer can make perceivable or constrain. Using the Boston Old Town House for a science fiction scenario will require a constraint of its historical narrative to arise for instance.[17] This means that urban games have a different approach to space than other games, for in the latter it can be created from scratch and manipulated to fit the play experience. The loops and metagames then can mostly be used to *evoke* instead of construct. This evocation can rely on existing associations or instead leave it up to player appropriation to attribute space with meaning. As such, space in urban games is one of the main elements the designer has to interact with when designing for the appropriating player.

1.3.1.2 Moveability

Based on this understanding of space as a manoeuvrable treasure trove that can be discovered (guided or individually), the characteristic of moveability becomes apparent. This characteristic is one of the

[17] Although this is not impossible, as the science fiction/distopia game of FALLOUT 4 (Bethesda Game Studios 2015) uses the Boston Town House as a base of operations.

main design directions that influence the affordances and appropriations. It differs from mobility – a more commonly used term (de Souza e Silva 2009; Goggin 2011) – because urban games are characterised by more than that. Whereas mobility refers to the ability to move around while engaged with the platform, urban games are both mobile and what Christian McCrea calls portable for the platform or interface can itself travel (2011). We argue that urban games are formed and differentiated based on both characteristics instead of just the mobility of the player.

The role of mobility cannot be denied however. Technological changes untethered the user from the static grid.[18] This means that the player can move through space while playing instead of being hooked to a static screen. With the user mobile, applications could build on location specific places to unearth information and engagement. Some games managed to become "location-based mobile games (LBMGs), which are games that are not purely played on screen, but also depend on the players' positions in the physical world. LBMGs involve the players' interactions with particular locations as part of the game" (de Lange 2009, 56–57). Yet mobility itself had larger consequences. Mobility allows players to move through the space, which according to De Souza e Silva, gives the act of moving a different meaning for this is often one of the main structural elements of the games (2009, 413). The act of walking changes the relation to space and will ultimately result in considerably different games depending on the type of walking designed for the player. Filipa Matos Wunderlich explains how the practice of walking can be used to gain a deeper insight into the player's relation to the city. She argues that "[w]alking practices vary in pace, rhythm and purpose, and nurture more or less intimacy and more or less a critical relationship to place" (Wunderlich 2008, 131). Walking, or movement through space, ultimately equates interaction with space; players that have to deal with location specific mechanics ultimately move differently through space than those whose interaction is afforded everywhere.

Portability on the other hand allows the games to be set in different parts of the city, which means there are different means to appropriate. Portability allows for the positioning of games in distinctly different locations, without necessarily making the player move. Such situatedness can be of great effect. The mobility aspect then allows urban games to engage with different publics, in different places, through a variety of movement actions. The game FACE YOUR WORLD (van Heeswijk 2005), for instance, asked children living close to the Staalmanplein to design their ideal formation of the square which was then communicated and executed by the municipality. The positioning of this game at Staalmansplein made this game more grounded in reality and thus directed the appropriations to more useful results. Allowing games to be played in different spatial locales can be of great effect and distinction to urban games. The

[18] Fransisco Lapenta argues that these new technologies are more amalgamates called "geomedia". He states that "geomedia are not new media per se, but platforms that merge existing technologies (electronic media+the Internet+location-based and Augmented Reality technologies) in a new mode of digital composite imaging, data association and socially maintained data exchange and communication" (Lapenta 2011, 15).

specificity of the location for a game is then a salient characteristic for urban games that shapes the affordances and appropriations.

1.3.1.3 Sociability

Following from the increased movement through space, both by the player and the game, another characteristic arises: sociability. Instead of being anchored behind a screen, moving players have a higher chance to run into other people, players or not. While not a unique characteristic, as online games also afford social interaction, urban games are unique in their explicit affordance of physical face to face contact. Here we will reflect on the affordances arising from this characteristic and the appropriation possible to the player. We argue that one of the main distinctive categories of urban games is the way designers can interface their players with the bystanders and other players in the urban setting.

The form and consequences of social interaction are explained by Markus Montola et al. when they discuss a subset of urban games – the pervasive game. They state that a "pervasive game is a game that has one or more salient features that expand the contractual magic circle of play spatially, temporally, or socially" (Montola, Stenros, and Wærn 2009, 12).[19] The operative verb here is expand, which explains the impact urban games can have on the player and the city. The game no longer takes place in a delimited magic circle but instead involves all of city space, an often undefined time period, and can involve anyone. Depending on how the designer designs the game, different relations with the surrounding people can arise. Flash mobs thrive on visibility while dark play is a form of performance wherein the audience is unaware of a game being played around or even on them (Schechner and Brady 2013, 119). Furthermore, the involvement of the surroundings can make the designed games have a more direct effect if people are actively involved. This distinction between how to deal with the social dimension can then be formative for games.

A targeted deployment of this sociability is described by Adriana de Souza e Silva. Following Rheingold, she argues that urban mobile games create 'smart mobs,' as they use the ability of the mobile phones to organise ad hoc social networks in public spaces (de Souza e Silva 2009, 414). For the design capacity this means that the mobile phones function "as collective communication tools rather than as two-way voice communication devices" (ibidem). This social function allowed the 2019 Hong Kong protestors to use the shared reference frame provided by POKÉMON GO to organise mass protests, using the multiplayer elements as excuse to pass police blockades (Vincent 2019). The changed approach to social contact through urban games can then have multiple functions, often thriving on an unfamiliar

[19] Urban games are set in or deal with the city. Contrariwise, pervasive games are more open in their space, time, and player relations, and as such can be set outside the city. Their scope can be worldwide, or solely focused on a school campus. The distinction is in the undefined character – or unknown nature to the player – of the space, time, and players.

way of interacting. This realisation broadens the scope of afforded actions, at least broader than the magic-bullet theory imagines urban games are capable of.

1.3.1.4 Defamiliarisation

The final characteristic of urban games is defamiliarisation of familiar space. Because of the different relation to space, urban games manage to deal with familiar spaces in a refreshing way. This ultimately means the semiotic changing of familiar affordances, opening them up for appropriation. Often explained as augmented reality, or a virtual layer over reality, urban games allow for the well-known city to be seen in a different light. The relation to space in urban games is based on unearthing the treasure trove of meaning. This also means that designers can add new meanings. Montola et al. explain "[urban] games can take the pleasure of the game to ordinary life … [and urban] games can take the thrill of immediacy and tangibility of ordinary life to the game" (Montola, Stenros, and Wærn 2009, 21). This was explicitly framed by Frans Mäyrä, who notes that POKÉMON GO for instance "made those winter walking trips a bit more interesting and motivating again today" (2017b). While the technological augmented reality of POKÉMON GO brought this virtual layer to a larger public, urban games have had this augmentation capacity for a long time. Sicart explains that "[b]y playing, public and private spaces are given new interpretations and importance, and they are given meaning for social groups. Play is a way of making spaces culturally relevant for communities that identify with the practices of play in those spaces" (2017, 32). Nevertheless, the new technological capacities have offered new ways of adding *pizzazz* to everyday life.

De Souza e Silva explains how this defamiliarisation works. She says that "these games transform the familiar urban space into an unknown and unexplored environment" (2009, 412). Referring to Lehtonen and Mäenpää she calls urban mobile games emergent, experiential, unpredictable, and surveyed (ibidem), and it are these characteristics that make her description so suited for our understanding of urban play. The space being emergent means that play arises from it, instead of being predetermined by it – something reminiscent of the appropriative nature of play. An important side note to this is added by the experiential characteristic which states that the space will remain unaltered in urban games even when playing, echoing the autotelic engagement of play. This solely experiential characteristic allows for players to remain safe in anonymity, with the game being solely a temporal experiment although the space is appropriative. The space is unpredictable because of it though, as it is dependent on meetings, encounters, and other chance contacts, with new people or people playing a role. As such, these games facilitate creative and most of all personal play wherein one puts themselves 'out there' by being approachable in physical reality, not to mention surveyed through stereotypical phone gazing poses. Therefore, playing urban games defamiliarises space while simultaneously making the player stand out due to poses, actions, or contacts. Urban mobile games for De Souza e Silva then allow for a new

approach to space, personally appropriated while still engaging in the social reality. This shared mutability with little consequence can be of great use for serious purposes.

Eric Klopfer, Kurt Squire, and Henry Jenkins, although speaking about handheld personal computers (or Personal Digital Assistants – PDAs), hammer on this serious application of the technology (2002). According to their approach, the loops of urban games will have to facilitate multiplayer movement through significant locales, with plenty of space of secondary player loops. Essential to their urban game design, these technological characteristics should be used so that "the device itself offers a window on a virtual reality," inside which different play forms are possible, such as historical role play, scientific simulations and extra-corporeal investigations (ibidem). For Klopfer, Squire, and Jenkins, the main capacity of urban games is then to substitute a virtual reality over the physical one, creating a hybrid reality. This defamiliarisation then is where most of the serious purposes come from. Yet whether these purposes are always met remains to be seen. Nevertheless, the relation of the urban game to the physical reality is a salient point of distinction.

1.3.2 Our Model of Urban Games

Urban games are characterised by their relation to space, approaching it more as a fixed entity that is a discoverable treasure trove. Because of this relation moveability, sociability, and defamiliarisation are the main designable characteristics for the designer to shape the space of possibility (Figure 7).

Players in turn can appropriate these designs to shape their experience as well, possibly differing from the pursued interaction. When trying to understand what urban games can do – exceeding the singular thinking of the magic-bullet theory – moveability, sociability, and defamiliarisation are the main pointers that structure an inventory. When determining what affordances are in an urban game and how these can be appropriated, we argue that these three characteristics are the general directions in which possibilities arise. When comparing whether the design of the game (and its affordances) fits with the pursued interaction, as will be done in chapter three, creating an inventory of what urban games can do is one of the necessary steps. With this theoretical overview of the main designable topics of urban games, this inventory is more accessible.

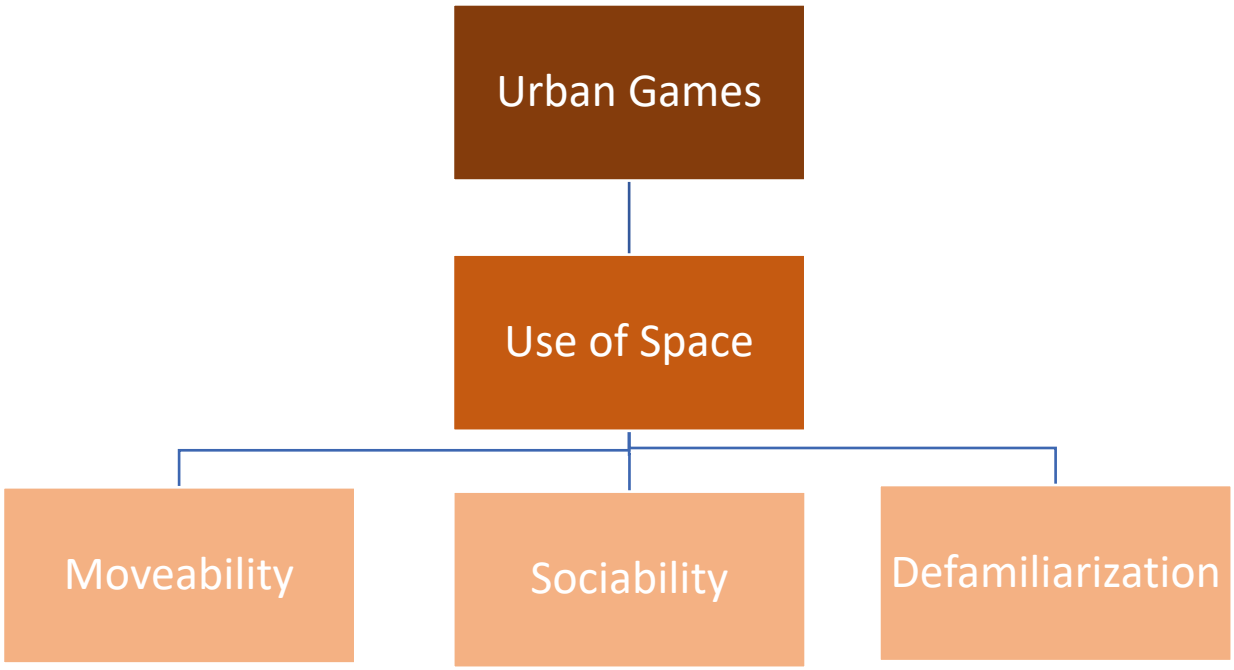


Figure 7 Our Theoretical model of Urban Game Design.
We argue designers of urban games have to deal most with their desired use of space. This use ultimately is mostly shaped by the approach of the designers to moveability, sociability, and defamiliarization. Source: Author creation

1.4 Conclusion

This chapter has dealt with the the urban game and its appropriation. How this type of game relates to the city after player appropriation is essential when validating these games. This chapter has suggested an alternative perspective on their design, offered an understanding of how they are interacted with and how this can be mapped, and offered an overview of the main design characteristics of urban games.

The magic-bullet theory that relies on the simplistic use of games *an sich* to address urban issues was countered by introducing a conception of the player as radical agent to the understanding of urban games. These games, specifically set in or related to the city, can only come to fruition if they are played through players. Designers can only steer player possible behaviour in an action space but they cannot determine it. Steering is done through the design of affordances. These suggest actions to be undertaken by the player, but can also be appropriated to result in completely different actions. Effectively, the designers can create a space of possibility, within which the player is able to execute a multitude of actions, some desired, and some unexpected.

Players relate to urban games in the sense that they play these games. Here we introduced not the player per se, but an understanding of what it means for games to be played. This playing is understood as appropriative, carnivalesque, personal, expressive, and autotelic. These characteristics result in the player positioning themselves specifically towards the rules. Their sanctity differs per player and depending on this, the affordances can be followed according to the suggested approach or they can create their own rules. Especially when it comes to urban play, the affordances of the action space are

complemented by the affordances intruding from the urban setting or the expectations of a city. To map all these possible interactions, loops and metagames, coming together in loop groups, offer a system.

Finally, urban games themselves were characterised as games with a formative relation to space, approaching it as static treasure trove ready to be exposed. From this relation stem the formative characteristics of moveability, sociability, and defamiliarisation. The position the designer takes to these will ultimately shape the kind of game and the space of possibility. However, depending on what the player appropriates – which can be quite a lot given that physical urban space is full of existing signifiers – multiple forms of interactions can stem from one game. Charting all possible interactions with an urban game is therefore helped by the theoretical model of urban games and its approach to space.

With the first domain fully explained, the rest of the relations have to be explored. Urban games have been related to the city already, yet what the city actually entails has not been answered yet. Therefore, in the next chapter, we introduce the operative term of 'the city model.'

Chapter 2 – Creating an Operational Model of Cities

"City is what it is because our citizens are what they are" (Plato 1992, 195).[20]

Introduction

Players complicate logical process. Afforded loops can go against designer intentions for instance. This holds true for both playful appropriations and city interpretations. Plato identified citizens as radical agents already in his ideal city in 380BCE, due to their varying approaches to the city. This variability of the city due to player interpretation persists to this day. To illustrate this, follow this thought:

Think of a City. A particular one, or the more general term. What image came to mind? Was it a selection of high-rise buildings? A collection of densely packed strangers? A stark difference between rich neighbourhood and poor slums? Traffic jams and transport? The exact opposite of the countryside? The greatest aggregate of data ever? Community owned spaces? All are possible and all are valid. But if so many perspectives on the city are possible, how can a game designer be sure that their urban in urban games matches the urban of the player? Ever since Plato's *Republic* in 380BC there have been treatises on how a city should be shaped (Plato 1992). Ideas on the shape of a city have been expressed in art movements (Sadler 2001), marketing schemes (Komninos 2014), and political programmes (Light 2008). With the interaction with urban games and their design outlined, now we need insight into how the city is designed into the game and interacted with. This knowledge can help us assess if the design of urban games fit their ultimate civic goal, for we introduce discernible characteristics of cities and their goals. Therefore, this chapter will discuss how the design of city models into action spaces of urban game design can be canalised and compared. This is not a historical overview of different takes on the city (Hall, Pérez, and Levy 2014), but instead an exposition of the means to model discursive perspectives on cities as the *city model*, an identification of the dimensions of this model in urban game characteristics, and finally an inventory of general categories that these city models can take.

To ascertain these three aspects, this chapter will start in 2.1 by introducing the original concept of the city model. This is not a completely new concept, but instead an amalgamation and generalisation of existing attempts to characterise the discursive and mental images of cities. Unlike earlier approaches the consequences of 'modelling' will explicitly be considered. This now concept will further be made operational by explaining where and how to identify a city model and on what level.

[20] This quote is often attributed to Plato and his *Republic*, but its exact heritage is unknown. Still, as far as wise words go, this is a good quote.

Secondly, in section 2.2, with the definition of the concept clear, its particular manifestation in urban games can be discussed. The loops and metagames, introduced in the previous chapter, will serve as the main communicators of city model characteristics. These empirical design elements shape the possible interpretations and, we argue, can be translated into city model characteristics.

Finally, in 2.3, with the concept and the game version of city models clear, the remaining question is a way to organise the understanding of city models in urban games. The main recurring city models occurring in games will be analysed. This overview offers general categories of city models that often occur in specified form in urban games. Such an overview is necessary in that it illustrates the varying forms city models can take; ultimately needed to identify the general goal of a design, as well as the affinity of a design to alternatives (although the latter is largely beyond the scope of this thesis). What then follows in the next chapter is the operationalisation of urban games and the city models in order to see if the one matches the other – if they fit.

2.1 Understanding the City Model

2.1.1 Understanding the City

The concept of the city model functions as an alternative approach to cities, spurred by the trouble of defining a city, which has kept academics busy over the last couple of centuries. Different models have popped up throughout the ages but ultimately no completely holistic and integrated definition surfaced. This section will not attempt to define the city for that reason. We will deal with the several trends in discourses about the city that show the boundaries of its varied nature. The political, geographical, social, and interpretative are the ontological dimensions, we argue, that convolute understandings of the city due to mix-ups and overlap.[21] Disentangling this overlap first can make the existing trends more understandable and the need for a model approach more apparent. As defining the city can never do justice to the multiplicity, the city model as framework will be introduced to do just that.

The problem with approaching the city is that holistic definitions often focus on what it is not (such as not-the-countryside) or define the city as a collection of densely packed buildings, or a multitude of nameless actors (such as Georg Simmel's collection of strangers (2010)) and their relations (such as the level of familiarity with other people (Tönnies 1988)). Even if an inclusive definition is given, they are usually generalised in such a way that they touch on related subtopics, such as Shahed Khan and Atiq Uz Zaman's simplified, yet contextually appropriate definition "spaces that serve as physical, geographical and cultural contexts or containers for promoting certain lifestyles and notions" (2018,

[21]These discourses have been distinguished by new media scholar Michiel de Lange through informal communication. I refer to his distinctions with his permission.

218). Although a generalization, these fragmented approaches show that cities are harder to grasp as a singular entity and more likely to be addressed partially. There are several partial approaches that are overlapping, but address different aspects. Understanding the different approaches allows us to identify common underlying characteristics.

2.1.1.1 Urban

The first of the approaching to a generalised city definition is calling the city 'urban.' Strictly linguistic, the urban is the adjective form of 'city' that indicates that the designated element is not rural or in nature – it is in a densely populated and built upon place. Geographically the urban area is the city and any neighbourhoods that were built next to it. It is then larger than the city but smaller than the metropolitan area which also includes municipalities in the judicially controlled region.[22] These various uses amongst others spurred Neil Brenner and Christian Schmidt to argue that 'urban' is in a "crisis of epistemologies" (2015, 151). They argue that due to urbanisation, the internet, and capitalist transnationalism the boundaries between urban and rural have faded. Even if not living in a city, the services traditionally belonging to the city are available more or less everywhere. Brenner and Schmidt argue that 'the urban' is more a theoretical understanding instead of a clear physical distinction. As such, they deem it a process; a discursive term that is shaped in the context it arises in. An example of such a process of defining would be the distinction of the use of urban as city area from the subculture that identifies with the moniker of urban. The multiple interchangeable uses can result in further confusion when it comes to the city. While acknowledging this tension, in the following we shall treat the urban as synonym for the city, by relying on its malleable discursive form.

2.1.1.2 Political

Another approach describes cities as a political entity. In this case they are distinguished from other entities such as countries as separate legal entities with their own governments, elections, economic status and identity. As separate executive entities, cities are discussed in terms of new forms of governance (Barber 2013; Meijer 2015) or city branding (Banet-Weiser 2012; Bıçakçı 2012). Often, this kind of approach is identifiable through its metonymic address of the city as a human agent. These entities came to be in Medieval Europe through the possession of city rights – a bill that could be issued by the regional authority and which basically meant that the city could act as independent political and

[22] The exact nuances between urban and city go beyond the scope of this paper. A polemic, yet insightful distinction is provided in classical jokes on Urban Planning: "If you stand naked on the front porch and the neighbours can't see you, it's rural. If you stand naked on the front porch and the neighbours call the cops, it's suburban. If you stand naked on the front porch and the neighbours ignore you, it's urban" (Young 2012, 67).

judicial system, separating it from the regional authority.[23] City rights are no longer a prerequisite but the anthropomorphic address of cities as individual is often used in common parlance. For instance, in football matches, by saying that Rotterdam beat Amsterdam, the city is used to refer to the human actors of the football team, however the city is seen as representative.

2.1.1.3 Geographical

Next to a political anthropomorphic entity, cities are physical sites with a relatively large population, living in a high density and often in high buildings. Added to that are an infrastructure of roads or similar transport ways. From this view the city is more regarded as a system with distinct functional elements (living, working, leisure) and flows of agents. Approaches to the city from a geographical standpoint can focus on how cities should be designed (Lynch 1975) or how to maximise the efficiency of the system as a system (Batty and Longley 1994; Cresswell 2006). These perspectives often get criticised based on its effacement of human elements in the urban system (Jacobs 1992). While this perspective can overlap with the political focus, the geographical approach to cities focuses more on the physical form and flow of resources.

2.1.1.4 Social

As Plato already initiated in one of the earliest approaches to the city, cities are often characterised by the citizens. Usually from social sciences, these approaches reflect on city dwellers and their relations, arguing that they are different from people not living in cities. As said before, social relations in cities are characterised by anonymity, forming a collective of strangers or clustered groups of ethnicities. The particular ways of life are often the topic of the studies, which can overlap with the other approaches, such as the interaction of citizens with buildings in the study of street life (Jacobs 1992). Other studies focus on the practice of everyday life (de Certeau 1984) or mobility patterns of citizens (Cresswell 2006).

2.1.1.5 Interpretative

The final trend in city discourses talks more about the interpretation of the political, physical, and social situation. The high density of job seeking strangers makes the city a place ideal for experimentation or creativity for instance (Landry and Bianchini 1995; de Lange 2015). At the same time, a city goes paired with more filth, pollution and illnesses (Healthy Urban Living 2015). These interpretations of the

[23] In this case the Dutch city of Stavoren would be the oldest city, for it got its city rights between 1058-1068 while cities such as the Hague, the current political heart of the Netherlands, only became such an official city in 1806 ('Geschiedenis' n.d.; Bonaparte 1813). This definition of the city thus is hardly representative of any distinguishing characteristics.

consequences of the build-up of the city are signified through a specific topic like employment, health, or ordered chaos. The city is generalised into a single topical interpretation that explains the orchestration of all elements. This results in sweeping statements about the city and its capacity, often through monikers such as “the creative city” (Landry and Bianchini 1995) or the “algorithmic city” (Innocent 2016), amongst others. These larger monikers are useful when identifying different takes on the city, yet their one-sidedness should be explicitly acknowledged.

2.1.1.6 ‘The’ City

Despite these distinguishable approaches, a clear way of dealing with the city remains difficult. The approaches are ideal types, creating artificial abstractions of the city. In reality, aspects of the city often fall within multiple approaches. Take city walls in Medieval times, for example. These are a highly political construct as it determines who belongs to the city and who does not. In the process it acts as a geographical boundary of the city and its citizens. That means that anyone within those city walls is subject to certain social rights that make them a citizen. Finally, having these physical, political, and social city walls make the city a protected city, which characterises the city in a completely different context. There is significant overlap between the different discourses making a definition of the city almost impossible based on these discourses. These approaches have in common that they all take a particular perspective on the city, but are never complete.

These trends show that the city can be approached in various ways, ranging from empirically measurable categories like population density to interpretations such as a subcultural appropriation. The followed approach will influence the design of urban games. All of these are abstractions or simplifications of the entity. Thus, translating ‘the city’ into game design is not as clear cut as it seems, as there is not a singular understanding of the ‘the city’ but always multiple, connecting, and conflicting understandings as shown in Figure 8. Hardly any understanding of the city makes their partiality explicit. This could explain the failure in communicating the pursued perspective on the city that informs the citizen of the desired ideology, mental maps,

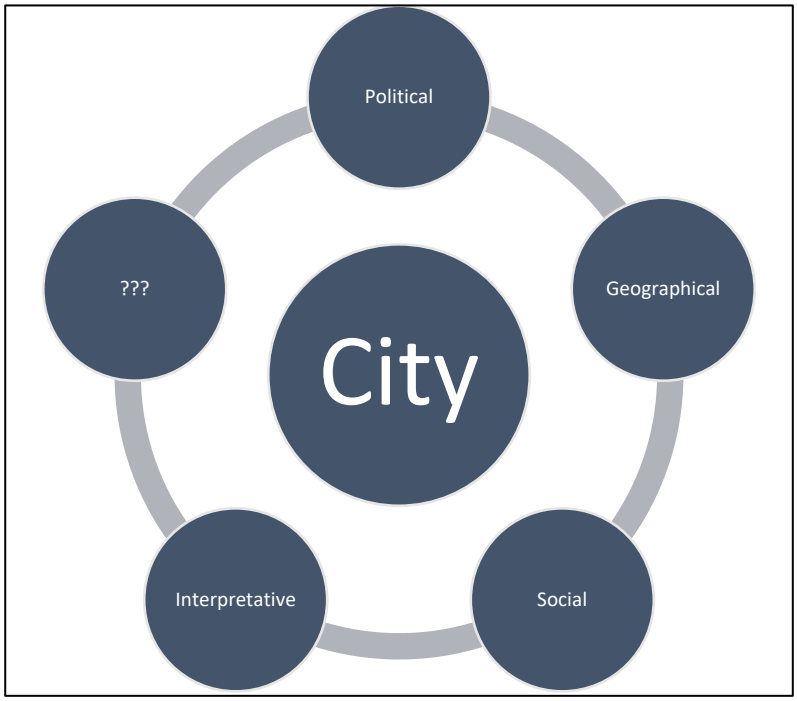


Figure 8 The Multiple Possibilities of Representing the City
There is not a singular understanding of the city. The concept itself consists of several abstractions that all describe the city. Here we have represented five possible interpretations of the singular concept of the city, but many more are possible. Source: Author creation

behaviour, interaction, etc. Understanding the specifics of the pursued city is essential for communication, but the dominant trends do not allow for such an explicitly communicated partiality. This can be better communicated by embracing the abstraction, let go of any semblance of holistic answers, and thrive on being a *model*.

2.1.2 Understanding the Model

2.1.2.1 Models

Many games are used to sketch or predict a future form the city should take, conveying an overarching idea, desired citizen actions, or a change in perception about what the city can offer. These predictions, instead of definitive, are partial and often ideologically motivated. The authors brandishing models refrain from ontologically explaining the limitations of their approach. Instead they discuss cities as a whole while ignoring the capacity of their own partiality. In order to take this partiality into account and actually thrive on it, we argue that the city can better be approached through models. By explicitly exploring the capacities of models, the different discursive approaches to the city can be understood in relation to each other and their scope.

Philosophers Mary S. Morgan and Margaret Morrison have studied models extensively, coming up with a unique approach that sees them as mediating instruments. Instead of just prototypes of theories or final projects, they are abstractions of complex systems manipulated to represent a specific system state (1999b, 36). Their approach presents a level of systematic detail when talking about models missing in disciplines such as physics, where models are often approached as incomplete theories, or architecture, where they count as a rough sketch. Morgan and Morisson's approach explains models in their own capabilities, instead of as dependent on something else.

As mediating instruments, models can yield knowledge by themselves as they take elements from both theory and empirical reality (Morgan and Morrison 1999a, 2). Theories are the general principles that govern large groups of phenomena, like an approximation of a city definition. Contrariwise, models are abstractions of empirical reality in order to satisfy the theory – a specified case of those principles (Morgan and Morrison 1999b, 12). In a city model then, elements from the city are selected to "[reflect] the changing emphasis on values and factors" and given new "perceived significance, relevance and applicability" (Khan and Zaman 2018, 218). Given the theory behind a particular idea for the city, a prospective description – the model – is made by highlighting choice elements while disregarding others. Such models are never perfect representation but, as Morgan and Morrison explain:

> Instead, a representation is seen as a kind of rendering – a partial representation that either abstracts from, or translates into another form, the real nature of the system or theory, or one that is capable of embodying only a portion of a system (1999b, 27).

As such, city models cannot pretend to have ontological credibility but instead "make use of the characteristics of partial independence, functional autonomy and representation to learn something from the manipulation" (Morgan and Morrison 1999b, 32). As epistemological tool the city model can help illustrate how the city is understood and what aspects are highlighted to fit the theory behind the model. It effectively offers a controlled situation – experimental if you will – in which the approaches to the city can be discerned and identified in urban games. Next to selectivity and representation, Khan and Zhaman outline ideological underpinnings of models when they say that ideas on cities can be "skewed by publications resulting from narrowly setup research questions promoting specific notions of cities that tend to overwhelmingly focus on certain dimensions" (2018, 224).

In line with this outline, we argue that a model then consists of an abstraction of a whole (the selection), values and factors informing the abstraction (the ideological underpinning), someone who decides on the abstraction (the ideology follower), a controlled ideal interaction (the satisfaction of the theory), and an instrument to convey the model (the translated other form). Our assumption is that such models form what Donald Norman calls "mental models" or "the conceptual models in people's minds that represent their understanding of how things work" (2013, 26). When designing a city into a game, designers will then follow these models. Next to these models, designers are influenced by a variety of biases. Batya Friedman and Helen Nissenbaum distinguish pre-existing, technical, and contextual bias, which mean traditional uses, physical constraints, and societal pressures respectively (Friedman and Nissenbaum 1997, 23). These biases shape the mental models, which ultimately inform how a city may be imagined. Although an epistemological tool, we believe that recognizing the specific choices and selections that go into defining the whole helps position and understand the function of separate models in a larger setting. This allows for the comparison of models, such as those designed into and those actuated from a game.

2.1.2.2 City Models

Based on the exposition of the city and the urban in 2.1.1, the model should account for the political, geographical, social and interpretative approaches while simultaneously laying bare what these fragments are based on, imply, and are trying to achieve. The city model is an abstraction of the city, presented in a carrier medium, dealing only with a segment of the whole. The abstraction is made by an agent who delimits the whole on basis of ideological values. Based on these values, an ideal interaction is presented to the citizen, which makes the abstraction – the model – fit the ideological whole – the city. These models then do not solely prescribe behavioural changes to citizens, but introduces an understanding about the city, what it includes, how it should be interpreted, and how it should be interacted with. Briefly put then: City models consist of an aspect of the city, an underlying ideology

along which this aspect should be addressed, a prescription of ideal citizen behaviour, a communicator, and a channel for discourse.

It should be clear that the city model is an epistemological tool. It is a means to give shape to a theory about the city as whole and its operationalisation in citizen behaviour and perspectives. Often these models are prospective, envisioning a future manifestation of the city but not ontologically describing the city in general. While criticism of such normative metonymical approaches of the city are increasing (Hollands 2008; Cohen 2015; Hajer 2016), comprehensive alternatives that contextualise these approaches are exceptionally scarce. We introduce the city model here without ontological claims, instead serving to test the prospective claims about the city and hold them against its actual formations through a player-focussed urban game design perspective. It should be understood as a prescriptive means to cities that sketch an explicitly incomplete, ideological image. The value of this concept is that it allows the study of various approaches to cities and citizens by focusing on *implicit* assumptions of the city that shape games and player interpretations. It is these assumptions that can cause discrepancies between a game and a player. As such, the city model highlights implicit conceptions of the city that are presented as truth, of which a great variety are possible. In Figure 9 the understanding of the city as interpreted from several discursive vantage points is translated into our understanding of the city model.

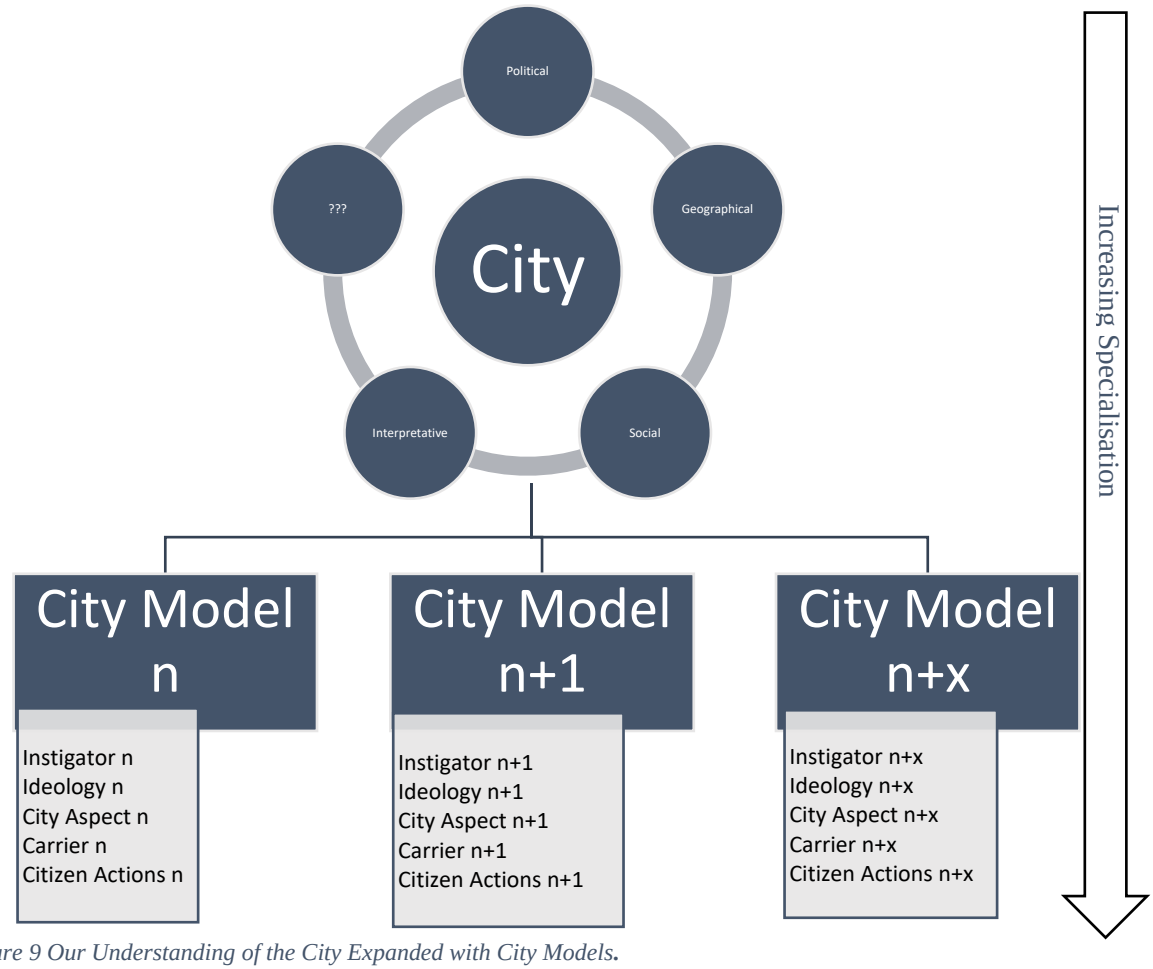


Figure 9 Our Understanding of the City Expanded with City Models.
The earlier understanding of the city as containing multiple interpretations can be modelled into a variety of city models, each abstracting different yet recurring characteristics. Theoretically, there can be unlimited (x) variations on a singular city model (here depicted with n). Source: Author creation

Each unique city model (here represented with n) has its own model characteristics. Furthermore, multiple models exist, each with their own characteristics (illustrated through the n+1 and n+x, representing the numerous possible versions).

The description of the IBM city simulator game IBM CITYONE (2010) is exemplary for the implicit description of the values that make up a city model. The game is described as follows:

> CityOne offers players the opportunity to **optimize banking**, **retail**, energy and water **solutions** via an online, sim-style game in which the player is tasked with guiding **industries** within a city through a series of missions. Players will make decisions to **improve** the city by **attaining revenue** and **profit goals**, increasing **customers'** and citizens' **satisfaction**, and making the environment **greener** with a **limited budget**. In parallel, players will learn how the **components of business process management**, service reuse, cloud and collaborative technologies make organizations in the **city system** more agile (IBM 2010; Emphasis added).

Mostly because of what is *not* said, CITYONE presents a city which is seen as an optimizable system, in which the people that matter work efficiently, work with money, and mostly know about entrepreneurialism, which may also contribute to a greener and more satisfied society (whatever that may mean). For this particular city model – the IBM Smart City – efficiency and business seem the main instigators of improvement. The entrepreneurial aspects of a city are generalised as the main action capacities of the city as a whole. Through the game, IBM metes the citizens out with beneficial actions that in truth improve only an abstraction of the city, falling between political city approaches and interpretations of the city as economic system. Through this description, IBM communicates a set of values that characterise the ideal city in their eyes.

The city model can then be seen as a set of ideologically charged assumptions that furthers an agenda, again represented in the representation of the Urban Game Design Process in Figure 1 on page 3. These assumptions are communicated by the designers and developers of the game by translating them into game design characteristics (step 1 in Figure 1), in the hopes that they are adopted by the players after reconstructing them during play (step 4 in Figure 1), which, as this thesis argues, may or may not be the case. Identifying the city models then becomes essential to see if a game fits its purpose. We argue that these models can be translated into game design characteristics and thus offer (possible mis)interpretable affordances.[24]

[24] For the sake of completeness, it should be said that cities cannot be translated directly from their own complexity into specific game design characteristics. Instead they are based on values that can be translated into game design characteristics according to Mary Flanagan and Helen Nissenbaum (2014). This escapade into values designed into games serves a sole epistemological function: it serves to show how city models can be designed into games. Apart from explaining this insight, values hold no further influence on the fit, yet for an explanation of the translation, see Appendix 1.

2.1.2.3 Relation to Other Approaches

The city model is not a wholly new concept but is based specifically on the concepts of 'notions of cities' and 'city branding.' Here we shall briefly detail the existence of these other approaches to cities – notions of cities in 2.1.2.3.1 and city branding in 2.1.2.3.2 – and their relation to the city model.[25] The city model also deviates on significant grounds from these precursors, making it more useful to measure its fit with the game and the act of play. The main benefit of the city model as approach to cities is its inherent acknowledgement of multiple versions, allowing for the player to (re)construct their own interpretation of the city model, next to the officially communicated models. In doing so, the city models also allow for the recognition of implicitly followed models, aside from explicitly communicated ones. These alternatives and their relation to city models furthermore show the consequences of being labelled a model.

2.1.2.3.1 Notions of Cities

The city model is mainly a generalisation of what Shahed Khan and Atiq Uz Zaman call "notions of cities" (2018, 218). They define their notions as "promoting distinctive features defined by their urban form, political and economic set up, social and cultural aspects, and environmental and technological aspects" (ibidem). Notions are formed on the basis of that "the underpinning shared value or purpose of all cities is founded on the prime objective of delivering optimum and most desirable urban experiences to its citizens" (2018, 218). This idealistic and broader concept is assessed by focusing on how societal circumstances and projects shape the city. Focusing solely on empirical domains contained in the city, notions of cities have a strong reflective and critical dimension, but lack the multiplicity as well as citizen-inclusion of city models.

Through their multiplicity, the city model acknowledges that "[the urban] is always coproduced and transformed through its users, who may strive to appropriate its actualized or unrealized potentials towards collective social uses" (Brenner and Schmid 2015, 177), giving the citizens the capacity to critically engage with the communicated models as well. Something the notion of cities leave too indebted to empirical factors. Realising that citizens can use the empirical means available to create their own model undermines the empirically rooted notions of cities.

[25] As the focus of this thesis is on determining the fit, the city model serves an instrumental function. As such, its positioning in its respective debate is relevant, but not the main focus here. Therefore, the detailed positioning can be found in Appendix 2.

2.1.2.3.2 City Branding

The city model further stands out through its focus on implicit expectations that are designed into games. As such, it stands apart from the associated term of city branding in that it includes looking at implicit values contained in a product instead of just the explicit ideal interactions. Sarah Banet-Weiser explains that a brand is an intersection between a product, the marketing of it, and the consumer, and that branding "impacts the way we understand who we are, how we organize ourselves in the world, what stories we tell ourselves about ourselves" (2012, 5). Branding then is a very explicit approach to the city, whose in-your-face nature is a necessity for retention. City models relate more to the implicit assumptions, values, and ideology that form a city, which can be used as marketing ploy but ultimately are more universally evocable. A city brand is based on a city model and has to compete with the models of consumers. By instead addressing this implicit and underlying partial model, city branding is one form the city model is poured into, just as urban games are another.

The city model differs from existing approaches to cities mostly in that it includes the citizen in the consideration of its formation, focusing on implicit assumptions that mirror through more actions than just explicit and calculated ones, and thus can take many different shapes. This allows the city model to offer a more granulated vocabulary on which to compare takes on the city in order to make negotiations more level. With its strengths and differences in mind, now we should direct our attention to where to find the city model.

2.1.3. The Locus of the City Model

Although the city model consists out of discernible characteristics, it still relies on implicit assumptions and player appropriations, and is thus not as explicitly visible. To unearth all the info needed to reconstruct the city model designed into a game, various approaches can be used that illuminate the adumbrated. Where to look in games is explained by game scholar Espen Aarseth. In his 1997 book *Cybertext* he describes the difference between an expressive layer and a coded layer found in videogames. Videogames have a "unique dual materiality" in which the "coded level can only be fully experienced by way of the external, expressive level" (Aarseth 1997, 40). In a later article on game ontology Aarseth elaborates. The expressive, or semiotic, layer "informs the player about the game world and the game state, through visual, auditory, textual, and sometimes haptic feedback" (Aarseth 2016, 448). The mechanical layer "is the engine that drives the game action, allows the players to make their moves, and changes the game state" (idem, 488) – the affordances as coded in the game programming that act as limit on visual and interactive possibilities but also the afforded actions the players can take. To ascertain the designed city model characteristics then requires looking at the semiotic or discursive elements, as well as the mechanical or technological elements (Figure 10).

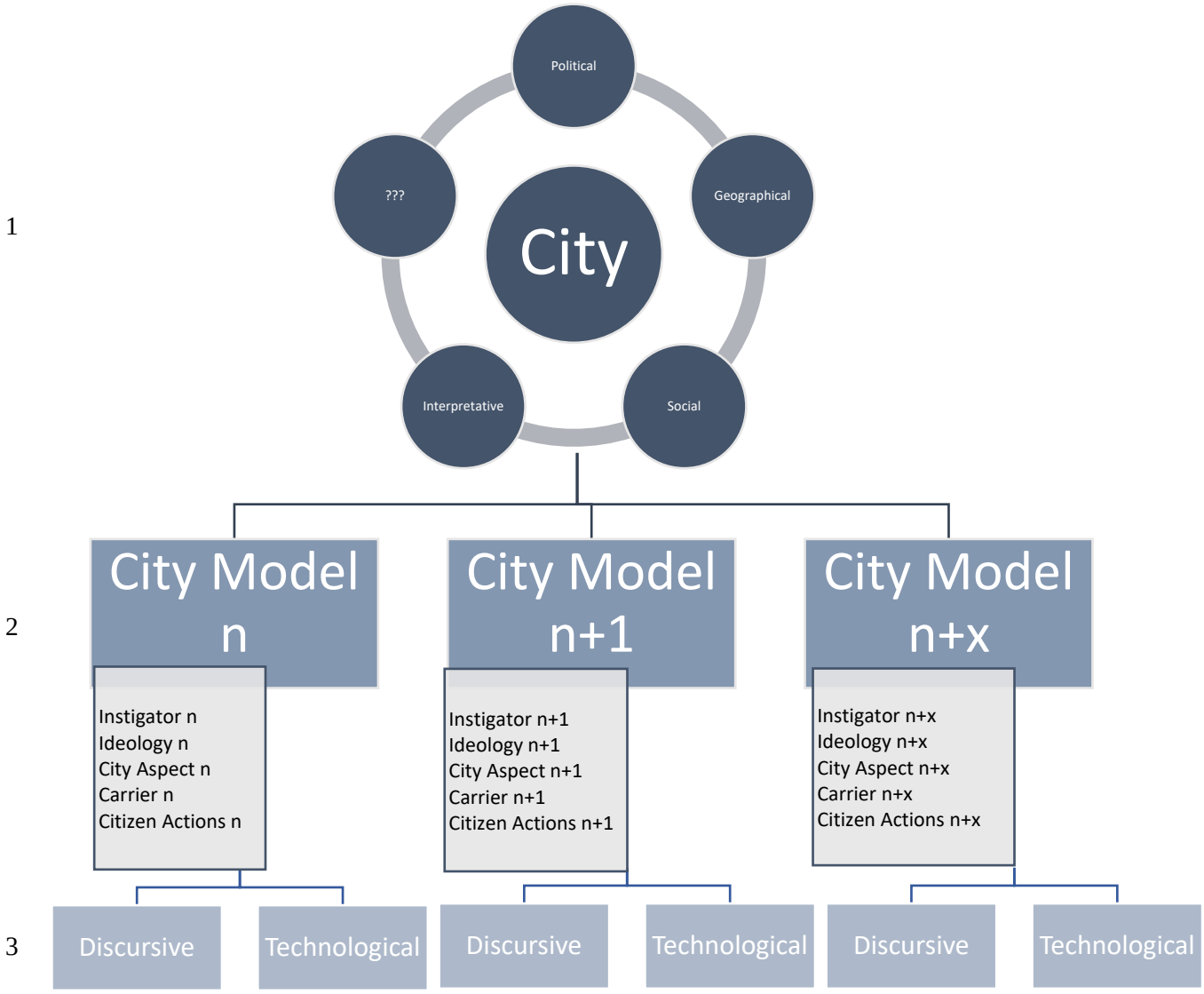


Figure 10 The gradual specification of the city as designed into urban games. The general idea of the city (1) is translated into specified abstractions as city models (2). These are subsequently designed into games in a discursive and technological form (3).

2.1.3.1 Discursive City Models

City models are discursive in that they are communicated through a form of discourse, such as writing, advertising, film material, created promises, and other discursive material. Khan and Zaman approach their notions of cities through a literature review as method to figure out what urban features make up the notion of a city (2018, 219). They focus on expressed and communicated aspects of the city, specifically commenting on the representations. The representation and delimitation are often brought forward in its discursive communication and are often quite explicit.

Such a discursive approach to the representation can highlight an interpretation of the city model, but does not highlight the underlying assumptions that serve as raw materials for the citizen to appropriate and shape their own city by. An example is first trailer of POKÉMON GO from September 9th 2015 (The

Official Pokémon YouTube channel 2015). The trailer starts with the words 'Discover Pokémon in the Real World' projected largely on the screen, showing players discovering hidden parts of their city or environment in search of Pokémon, guided by the app. The game promises to revitalise the city with Pokémon in hidden exciting places. Relying on the trope of the urban jungle, replete with shrubberies and hidden animals in ruins, the trailer starts to convey a city model that focuses on discoverability. The rest of the trailer is showing urban scenes focusing on social interaction, with players meeting playfully to battle, trade, or jointly attack a powerful Pokémon in Times Square, raising their phones in unison as the ultimate symbol of connectivity. Augmenting 'ordinary' play spaces such as skate parks or tourist hotspots with virtual creatures that are visible to every player makes POKÉMON GO a tool to socially redefine and appropriate space. POKÉMON GO presents a city model that involves increased social behaviour in an environment that takes on new meanings, acceptable actions, and inhabitants. Obviously rife with marketing conventions and a slightly utopian image, the POKÉMON GO trailer presents a clear conception of how the city will be after the game is launched. However, this is only one interpretation that hardly mirrors the ultimate forms of play that arose. The possibility to join together into battle against strong Pokémon and trading is a relatively recent feature for instance, and inter-player battles came even later, nor do players interact so happily when battling on a playground as it all happens asynchronously. While the explicitness of the trailer as discursive channel then provides an interpretation of the city – a specific city model – it brings us no closer to understanding how multiple models can arise from a single game. For that we need to dive deeper into the implicit assumptions.

Identifying these characteristics in discursive outings of the game can shed light on the values that colour the representation. As Khan and Zhaman already showed, literature analysis can lay bare these characteristics. A more specific approach could be a critical discourse analysis. Marianne Jørgensen and Louise Phillips identify formal analyses as the key to understanding the text which "give insight into the ways in which texts treat events and social relations and thereby construct particular versions of reality, social identities and social relations" (2002, 83). Aspects to analyse are wording, grammar and metaphors. Using these to discover the discursive markers of a city model can show what behaviour or interpretations are afforded, both explicitly and implicitly. These textual, or possibly visual or poetic elements, add discursive limits to the interpretation; they bring with them certain meanings attributed to events, which steers signification. However, not all aspects of the city model are contained in representations or writing. Some are also found in the object themselves.

2.1.3.2 The Technological City Model

The city model is also present in the physical product of the game itself. The choice of the technology will shape the possibilities and capacities of a game, and the programming can yield arguments as well as desired behaviour or interpretations. While the discursive elements are often addressed and judged on their value, actual analysis of the game itself is often ignored. An example of this can be seen in the

backlash to the educative game PLAYING HISTORY 2: SLAVE TRADE (Serious Games Interactive 2013) which featured a Tetris-like game in which a slave ship had to be filled as efficient as possible. A brief scene of this minigame featured in the trailer and caused outrage and was called racist and insensitive (Klepek 2015). The designer, Simon Egenfeldt-Nielsen, instead argued that "the game mechanics convey in a very powerful way one of the most important points with slave trade then and now: that you dehumanize and objectify people into bricks" (idem). While arguably not a strong enough argument, Egenfeldt-Nielsen's response shows that what is communicated by the game, the choices, and technology can convey different values than what is discursively communicated. As said in the previous chapter, technology is not neutral, especially not choice-operated technologies such as games. The interaction should therefore be analysed as well when determining the city model.

To analyse this interaction means to look explicitly at the two versions of possibility of choice. On the one hand, as games consist of a semiotic and mechanical layer according to Aarseth (2016), players always have the choice to focus more on either of the two domains. A more semiotic focused player will engage with the game to immerse themselves into the story or the world while a mechanical player is there to play the *game*; to master the mechanics and beat the system. The emphasis placed on either of the two systems can skew the types of city model characteristics possible and preferable in a design.

On the other hand, as was alluded to with the good user by Eric Gordon and Stephen Walter (2016) – or a user functioning in an optimal way as long as they follow the rules – the possibility of choice is more general: how much freedom of choice do players have. Mostly dependent on mechanics and the afforded loops, games with many "meaningful inefficiencies" (Gordon and Walter 2016, 261)– or room for the player to play or fill in interpretative or action gaps themselves - will allow players to experiment and therewith offer more room for them to appropriate city model characteristics into their own mental model, while still obeying the logic designed into the game. Designing city model characteristics into a game is then a consideration of leaving the player space to understand the model, or imposing it on them. Both have their merit, as too much freedom can lead to a detour from the intended characteristic. Yet the amount of freedom of choice allowed to the player can be destructive for clear communication, making it a salient locus when determining the city model afforded.

Through this focus on possible choices in technology, we purposefully stray from game scholar Ian Bogost's procedural rhetoric as approach to communication through games (2010). For Bogost the persuasive power is not in the content – which would relate more to Aarseth's semiotic, or the discursive nature of the city model – but in the design of procedures, or the series of executable actions. By making progress in the game only possible by selecting certain procedures, thus forcing the player to make meaningful and often controversial choices, a game can make persuasive content that will hopefully alter the player's stance on issues. Bogost gives THE MCDONALD'S VIDEOGAME (Molleindustria 2006) as example, where the only way to win is by using growth hormones, exploiting workers, and break

safety regulations. By highlighting a specific course of action, the game can present a series of events that should change the player's mind.

For Bogost it is mostly the "relevance of the interaction in the context of the representations goals of the system" (2010, 46) which shapes the message. This means that it is not the player's creativity or interpretation that shapes the game, but more the careful design and argument. True, Bogost does attest that the choice of mechanics is essential for the persuasiveness, but he ignores the player's alternative appropriation of it. This way, Bogost leaves the agency of forming an argument that persuades completely in the designer's ballpark. To better accommodate our player-updated understanding of urban games, procedural rhetoric will be recognised, yet substituted for the choice-based focus outlined above.

With both the discursive and technological dimensions of the city model outlined, we can now turn our gaze to the specific game design markers that communicate the city model in urban games. As outlined last chapter, loops and metagames offer a systematic approach to understanding urban games from a player-included perspective.

2.2 City Models in Urban Games

The city model is an epistemological tool to represents approaches to the city in a variety of forms. Depending on the delimitation, the agent constructing it, and the underlying assumptions, an idea of the city is conveyed from a designer to the citizen. The characteristics the city model is based on are woven into the discourse in and around the game, and shaped by the technology and mechanics. It should therefore be possible to identify empirical elements in game design that work together to communicate the city model characteristics. These elements will be discussed here. Note that although there is talk of the player, the approach outlined here does at no point rely on player interviews or designer notes. The findings are purely based on the created space of possibility through affordances designed into the game.

Loops and metagames, introduced last chapter, are fitting as analysis tool as they respectively "analyze all the actions designed in the system for player interaction, and (…) how the game object creates a particular context that also plays a role in the configuration of the play experience" (Sicart 2015). These heuristics allow for the study of both discursive and technological dimensions wherein city model characteristics can be designed. The following exposition of urban game elements will show the occurrence of the city model in urban games, which will be used next chapter to ascertain the fit.

2.2.1 City Model Characteristics in Loops

In the previous chapter the loops were introduced as the repeated actions the player has to perform to progress. Among the loops are core loops and secondary loops, whereas secondary loops are optional and add more depth to the play experience, and can be designed, or player formed. The loops then mostly relate to the possible actions when it comes to communicating city model characteristics and therefore represent more the technological dimension of urban games. However, the appropriated secondary loops formed by the player can result in different interpretations of model characteristics. As outlined in 2.1.3.2, the technological locus of the city model is the continuum between completely designed and determined loops versus loops that are largely appropriative, resulting in more player formed secondary loops. The game ONTDEK OVERVECHT (Play the City 2017) for instance is based on face to face pitching initiatives to improve the neighbourhood. While the act of pitching as primary loop is fixed, the way the player does so is up to them, creating a secondary loop of theatricality for instance. The appropriation of actions shows a general degree of determinacy. With these game design elements influenced by loops, this element can be used to communicate the key actors (who has agency), the carrier (the technology determines the action) and the possible actions. The content or meaning of these actions on a discursive level communicate other characteristics. This brings us to the metagame.

2.2.2 City Model Characteristics in the Metagame

Last chapter, Sicart's metagame was defined as "any aspect external to interacting with game loops that influences the play experience of a game," making games a "situated activity that is meaningful not just as an individual interaction, but within a particular context" (Sicart 2015). He identifies five different types: informational, fictional, economical, performative, and contextual. While these are idealised categories that in reality contain considerably overlap, they will be discussed here separately, in no particular order. The focus will be on how city model characteristics can be designed into the ideal interaction and how they can be shaped by the player through appropriation.

2.2.2.1 Informational Metagame

Sicart explains: "The informational metagame comprises all that information that is not strictly relevant to play the game, but that expands the experience of the game and affects the interaction with the loop" (2015). A city in itself already contains many forms of information that may be relevant for the game such as numbers of inhabitants, infrastructure, history and directions. This external information becomes an informational metagame if the prior knowledge of the city proves relevant for the game. This prior knowledge is indicative for the ideology and city selection characteristics. Even more depth comes with every player's personal take on the city, which, as Michel de Certeau explains, is rife with stories,

memories, and dreams: “Places are fragmentary and inward-turning histories, pasts that others are not allowed to read, accumulated times that can be unfolded but like stories held in reserve” (1984, 109). The interpretations brought up by the player can be acknowledged or ignored in the design, which determines what ideology is carried out and what part of the city is addressed in it.

For example, in city-wide scavenger hunts with quiz questions, such as those by DoeUtrecht (‘CityGames in Utrecht), the game specifically rewards preknowledge of landmarks. As the players have to traverse the landmarks and answer quiz questions about them as fast as possible, only the knowledge of landmarks and directions is presented as valuable, yielding, as David Bass calls it, “a moving postcard collection” (1997, 85) This makes Utrecht nothing more than a collection of experiences that can be consumed in the duration of a game. Room for player-added stories can add depth to the experience as it provides background information which creates a city model that ultimately encompasses a larger city aspect, and a broader ideology. The games themselves however are designed to convey a city model conveyed by a single instigator with a very limited, snapshot-like, view on the city. While not necessarily better or worse, a city model taking into account a more detailed city aspect and allowing for more player interpretations can give players a more detailed understanding of the city.

The informational metagame in physical urban games – set in the physical city – is substantial due to existing experiences and meanings attributed to the city. Digital urban games however have complete control over what kind of city is created and how it works. For these games YouTube videos can show gameplay hints or reveal hidden programmed items, providing gameplay advice instead of depth. The informational metagame then highlights the most efficient, or profitable winning strategy. In the city building game SIMCITY (Maxis 1985) for instance, the most profitable way to position housing and industry creates a very capitalistic structure of a city, leaving lots to be desired of human happiness. Molleindustria founder Paolo Pedercini explains that “The only type of city you can create is the modernist, car centered, grid based, North American city” (Pedercini 2014). The reference frames SIMCITY is based on inform the player experience, and what is seen as ‘good’ and ‘bad’ design to great extent. Player actions are very limited in this sandbox game. While in digital games players can make their own stories and follow different societal influences, the normative city model influences progress.

Finally, just like urban games are positioned spatially in a physical city, so are they temporally. This means that events occurring outside the game can potentially impact the game itself (and of course, if all goes well, vice versa). Urban games like ONTDEK OVERVECHT, in which groups of players together plan the distribution and use of space on an existing map, can be shaped by the informational metagame relating to knowledge of current events. If a new initiative is suggested, and a player is aware of a recent development of such initiatives, they can further elaborate on the idea, keeping the game going and resulting in more feasible results. In order for designers to convey a city model they can use this informational metagame by interpreting current events and working them into their design. By staying

up to date as a designer, the game can offer an initial signification that is in line with their desired model, thus coordinating the valuable societal influences with those of the players.

The informational metagame can then add depth to a game or give advice on gameplay. City models can be designed for by rewarding specific kind of information while disregarding others. It mostly has impact on the ideology and city selection characteristics with its exclusive and normative presentation.

2.2.2.2 The fictional metagame

This metagame "is the level of abstraction that can be used to understand the way in which fictions are used to wrap and communicate the game loops" (Sicart 2015). Mainly related to the narrative charge of the game, this metagame focuses on the signification and diegetic meanings. The fiction is made up of the setting, the roles of the characters, the history, and the main themes addressed.

In the Plethora Project game BLOCK'HOOD (2017) the designable narrative function of the metagame becomes unmistakably clear. In this game the player must design neighbourhoods by placing functional blocks. These blocks stand for city units such as houses, businesses, trees, factories, and so on, which differ in size but which all have a block shape. As such, cities can become a collection of stacked blocks with a housing district standing on top of the industrial district. In the story mode a young man befriends a wild boar. The man figures out a way to shape nature (blocks) in such a way that the boar will have a better life. He does not stop there however and fully develops a profitable city, with simple employee housing supporting polluting industry. Nature starts to die, animals flee and people dislike the city. Everyone leaves and it falls in disrepair. Now an old man, the player meets the boar again and starts to correct his mistakes, making sure he employs sustainable solutions and keeps nature an essential pillar of the BLOCK'HOOD.

Whereas the game allows the player to show off their architectural and urban planning prowess, the story mode presents a clear discourse that determines good and bad urban planning. By telling a story, the game presents interpretations as superior to others. In the case of BLOCK'HOOD a sustainable sort of city planning is promoted over a profit-centred or even a human-centred. The fictional metagame can then be used to present a preferred reading to the gameplay as it provides a signifying narrative for most actions. Whether and how players can interact with this signifying narrative is telling for the city model ideology being imposed or appropriated.

2.2.2.3 The Economic Metagame

Sicart defines this metagame as "all elements external to the game loops that can be purchased, either with in-game currency or with real currency, and that have an effect in the experience of the loops" (2015). The last chapter showed that this metagame denotes the form of productivity professed by the

game. This can be in an actual economic system or through a form that is positioned as public or private, and actual or symbolic.

Especially the key agents, ideology, and possible actions are communicated through this metagame, as the determination of what counts as success has to apply to someone, for some reason, and through some actions. The values professed by the key agents can be explained with reference to Sherry R. Arnstein's ladder of participation, whereon "each rung correspond[s] to the extent of citizens' power in determining the plan and/or program" (1969, 216). Identifying who is included in the plan can be used to solidify the instigator characteristic. Her ladder can roughly be divided into three blocks, of nonparticipation, tokenism, and full on citizen power. Using her ladder, the key actors can be divided in "haves and have-nots" (idem, 217). Nonparticipation keeps the agency completely in the hands of the 'haves' – those already in power, with one of Arnstein's rungs even talking about manipulation. Alternatively, it is possible for citizens to have actual impact on the urban event they are playing with, thus rendering them key agents. In ONTDEK OVERVECHT for instance, a member of the municipality is always present at a play session, to allow the citizens to immediately communicate their findings to an executive. The measure of participation is then a strong communicator of several city model characteristics, because it serves as a reflection on the inclusivity of the game, detailing who the instigators are, what they can do, and to what purpose.

Depending on the ideology, this capacity for participation can be touted as paramount or not, further allowing for reflection on inclusivity. Important to note here is the beneficiary of play. Does the urban game engage with public issues, or is it solely focused on individual lessons or enjoyment? Assessing the reach of the urban game allows the accurate identification of model characteristics and possible critique on them. A possible critique can be the reliance on 'playbour' in some urban games, a concept used by Julian Kücklich to explain the place of modifiers in the game industry. Playbour relates to unpaid production of assets by players on the ground that their work is considered 'just play' (Kücklich 2005). In urban games, such as FACE YOUR WORLD, the co-creation of the Staalmanplein game, extensive citizen research was done through the process of play. In this particular case the executives actually used the results for the benefit of the citizen. However, using play as a means to generate ideas, without monetary recompense, can be considered playbour. Characterising the expectations created with urban games and the actual key agents involved offers the economic metagame a critical potential to assess the characterization of citizens. Or, as Joyce Goggins adequately expresses through analogy, play in urban games can be judged on its use as a carrot to convince players to engage in an urban setting, or it is a facilitator that frames an activity as playful to improve interaction (2011, 266). Whereas the discussion on playbour by Kücklich and Goggin deal with clear exploitation, urban games are bit vaguer as whatever power relations occur, they take place in urban space and the individual's life is touched regardless.

2.2.2.4 The Performative Metagame

Performative metagame refers to the possibility of a game to be used as a performance for an audience, with the players performing skills and feats. As urban games take place in a physical shared setting, the chances of encountering an audience or playing as a public display are considerably higher. Playful performances or interventions thrive on this explicit address to an audience. Alternatively, it is also possible that players themselves appropriate the game in order to gather an audience. Simultaneously, the design of urban games affords the appropriation *by the audience* as well. These capacities then thrive on the communication of instigators (who is part of the game), the city selection (what is included), and the afforded citizen actions (hidden or overt).

Players have agency in their performance, with an audience or not, through the designed actions and their appropriation. As the social side of POKÉMON GO shows, players can appropriate the actions they are supposed to perform to exude different values than those designed for. For ideal communication, designers have to fit the possible actions to the values they want to achieve. A single player game focused on community building does not necessarily reach its goal. The option to perform has to convey the city model characteristics that should be pursued, otherwise the players will appropriate the actions for their own interpretations. If the urban game wants to communicate the ideal of clean streets (fitting with a sustainable city ideology for instance), then the actions the player has to perform should be somehow linked to this ideology. TETRABIN (Bai 2014) lets players throw away trash whereby the piece of garbage is translated in a Tetris block projected on the trash can. The NUART app (Geo Street Art 2013), striving to revitalise the district of Stavanger in Copenhagen through urban creativity, is played by wandering the space and finding places to graffiti, with the graffiti ultimately being the rewarded product. Contrariwise, Flora and Fauna Hackathon game and INGRESS-clone CATCH AND GO (Wageningen Universiteit & Research 2014) uses a scavenger hunt to communicate sustainability and environmental insights, to improve the involvement of players with their natural environment. The game lets teams of player solve challenges in nature, requiring them to move to specific, naturally relevant, places (such as the housing area of a unique squirrel) and solve a challenge – like a quiz question or tiny puzzle – in order to score points and be considered more involved. Searching and looking for elements relies on identification, but not to a deeper understanding of environmental responsibility. Furthermore, the challenges often are more arbitrary than in any way related to nature. Solving a puzzle or answering a question does not change behaviour or perspectives in the player – especially not if there is a score element that may motivate players for completely different reasons than natural involvement. In this game then, there is a misfit between the arbitrary challenges and its competitive nature, and the communal values pursued in natural sustainability. By ensuring that the performance of player actions embody the values pursued the game will ensure that the pursued value is achieved by the players. Regardless of whether the players interpret the same values.

2.2.2.5 The Contextual Metagame

The final metagame entails the physical context which shapes the experience of the game. Sicart explains that this envelops the setting in which the game is played – alone or with others for instance. We added the technological dimensions conducive for the design, as well as the platform that is used to play the game.

This is obviously a designed aspect of games but the values can also be shaped by the players. Depending on where players play the game – if it has multiple possible settings – can help them signify their play space themselves. Allowing players to determine the spaces where they play and with who will shape the model of the city in its action capacity. A game can for instance be seen as portable instead of mobile, making it more important that the platform can be taken to places where others are, more so than the actual movement, thus instilling a more social attitude (McCrea 2011). Alternatively, the players, in determining the play space, can indulge in place-making or "the set of social, political and material processes by which people iteratively create and recreate the experienced geographies in which they live" (Pierce, Martin, and Murphy 2011, 54).[26] This action adds "bodily sensual and socially meaningful experiences originating from the perception of the environment whilst in motion" granting social and experiential meaning to a space (Wunderlich 2008, 130). The carrier and possible action that are communicated are essentially linked to the space of play. If the player has control over this, then more leeway in interpretation is afforded.

We argue that the contextual metagame also relates to the platform, which is where the technological limitations and affordances communicate city models. Terry Harpold for instance explains how technical limits are masked within the game world through threshold structures that subtly delimit the playing space (2007). Depending on the type of threshold that masks the limitations certain characteristics can be more prominent than others. Some designs for instance strive for seamless design, making it seem like the game is part of everyday life, "tuning" the forms of gameplay more to everyday interactions (Coyne 2010). Other games strive for seamful design, thusly named by Matthew Chalmers in his approach to ubiquitous computing (2003), which elaborates on how artefacts can fit the context; in this case explicitly giving the player time to reflect on their actions (Broll and Benford 2005). Simultaneously, the selection of the platform limits certain possible actions, but also affords certain others. The technology chosen brings with it affordances and expectations. A mobile and location specific game like POKÉMON GO also offers the possibility of social connection through other apps on the phone, possibly explaining the social consequences not designed beforehand. Alternatively, and

[26] This concept has a longer history in the disciplines of architecture and urban planning (Harrison and Dourish 1996). Recently, it has also made its entrée into political economy discourses, as it touches on the question of what gets to attribute which meaning to space (Pierce, Martin, and Murphy 2011)

more disturbingly, through the use of data-tracking and location aware smartphones, POKÉMON GO benefitted from that Shoshana Zuboff calls "surveillance capitalism" (2019), which "claims private, human experience as its own commodity that can be translated into behavioral data which can be then sold and purchased in a new kind of marketplace that trades exclusively in predictions of our future behaviour" (Zuboff in Campbell 2019). This allowed the game designers to sell items that lure Pokémon to places such as restaurants – as they could predict player behaviour – or negotiate Pokémon spawning locations with businesses, such as Kijkduin, an area in The Hague in the Netherlands as the self-proclaimed POKÉMON GO capital of the Netherlands (Varghese 2019). This again comes down to the amount and type of freedom the player is afforded; can they interpret multiple forms of interacting or are they bound to a singular action in their daily activities, and is their behaviour merely entertainment or a source of revenue. Consequently, when analysing whether a game actually communicates the desired city model, the chosen technology should be included in the analysis as well, as it is never a neutral carrier.

With this flexibility of approaches, loops and metagames, which give meaning and depth, communicate characteristics depending on the following of the intended metagame or shaping of it by the players. As outlined above, each metagame is versed in communicating specific city model characteristics. Reconstructing a city model from the game design then means translating combinations of loops and metagame into city model characteristics, according to translation Table 4.

City Model Characteristic	Game Design Elements that Communicate these Characteristics
Instigators of the Model	Loops, Economic, Performative, Economical
Ideology	Informational, Fictional, Economical
Selected City Aspect	Informational, Performative
Carrier	Loops, Contextual
Citizen Actions	Loops, Economical, Performative, Contextual

Table 4 The combinations of loops and metagames that communicate specific city model characteristics. Source: Author creation

Through the loops and metagames, the city model characteristics can be discussed. This is done by interpreting combinations of loops and metagames according to the characteristics of the city model, to be illustrated in chapter three. Discrepancies between pursued city models and those afforded in the action space can then be traced back to the loops and metagames that communicate them. We now know

where and how to determine the city model. What remains is an organisation of what the city model can be, which leads us to exemplary categories.

2.3 City Model Inventory

City models can consciously be designed for by designers, focusing on the loops and metagames. The leeway afforded in the loops allows some of the metagames to be appropriated by the players. With these functionalities in mind the city model can now be coloured with examples and dimensions. In this chapter we have introduced the new approach to cities in the form of the city model and now we will introduce the forms this new concept can take in game design. After a limitation placed on our corpus in 2.3.1, and in 2.3.2 identify the axes of area of effect and involved actors that colour the possible interpretations. In 2.3.3, these axes give rise to eight intersections that represent general categories of city models. These categories provide searchlights to identify city models based on their characteristics even when not fully defined within the game. As shared mental models of cities, many games strive to appeal to one of these city model categories. Recognising these categories then gives a good inventory of what shapes city models can take; providing parameters for the analysis introduced in chapter three.

2.3.1 City Models of Participation

Having a model to discuss cities by allows us to theoretically assess and improve ludic approaches to any kind of cities. While making approaching the city more comprehensible, it does not delimit the possible ways of looking at the city. Technically this could mean that an exhaustive overview of the fit in urban games would require the analysis of urban games that in some way relate to the city, which would, to say the least, exceed the scope of this study. Therefore, this study will limit its focus, and therewith also its corpus, to those games that pursue some form of civic activation – 'games that make you do something.' While this can still take many forms as citizens can interact with the city for environmental, playful, efficiency, or political purposes for example, it eliminates games that are purely set in the city for entertainment purposes, such as ASSASSIN'S CREED (Ubisoft Montreal 2010). As games are an inherently interactive medium and the main gripe of this study has been the simplistic assumption of games as infallible influencers, focusing on this aspect seems the most pressing in the context of urban games. While effect analyses of urban games exist, this study looks at urban games from a more meta perspective, focusing instead on how the oft ignored player can problematise the communicated message due to underlying values related to the city that are appropriated. The focus on citizen interaction is then justified in order to critically assess the efficacy of games and the power of the player.

2.3.2 Dimensions of City Models of Participation

City models and their manifestations in games can vary in their size and flexibility. As discussed in the definition of the city model, many models select an abstraction of the city, spin a narrative around it, and suggest citizen action. Simultaneously, depending on the design of the core and secondary loops, a number of players are afforded to either adopt or appropriate the suggested models. Two dimensions can be said to shape the form of the city model: area of effect, and involved actors.

2.3.2.1 The Area of Effect of the City Model

The city model is an abstraction of the city focusing on a particular aspect that requires attention. Khan and Zaman, for instance, show how some sustainable city models focus more on economic feasibility, safety, or culture (2018, 223). Each of these models addresses an abstraction of the city, adumbrating certain aspects in favour of others. This determination of the area of effect does not solely relate to the quantity of aspects of the city addressed. It ties in simultaneously to the scope of the city that is imagined to be interact with in the pursued city model. City models that try to change individual behaviour or interpretations versus city models that pursue a societal upheaval are a world apart. This distinction does not reflect on the content of the effect, as that is specified in the individual characteristics, but instead looks at the broad distinguisher of how much of the city is actually incorporated in this model.

The area of effect of the city model can be seen as a continuous increase from two extremes we call personal and city-wide. A personal area of effect are those models that strive to change the individual behaviour or their interpretation of the city. Often these city models address citizens in order to make them take control over their daily experience. As these city models do not focus on upheaving larger systems, the aim is mostly to change awareness or experience. An example of this is the model proposed by the *dérive*, as introduced by the Situationists (Debord 1958). Drifting through a city, like trying to navigate Paris with a map of Berlin, is a mostly individual undertaking. By drifting through the city, this game strives to communicate a personal city model urging citizens to take in a more critical stance towards the manipulation through geography. Other personal city models are some versions of the playful city. Adriana de Souza e Silva and Larissa Hjorth argue for instance that “play is an intrinsic social movement emergent by the relationships between people” (2009, 604). For them, actions like the dérive, wandering like a *flaneur*, *parkour*, and skating are forms of play that imbue the individual’s experience with a more social character, allowing the retaking of space for personal uses.

The other extreme is a city-wide city model. This model communicates values about the city as a whole and professes to encompass all areas of everyday life. While at the beginning of this chapter it was said that defining the city as a whole is nigh impossible, these approaches do not define the city. Instead they

offer a holistic take on the city that works for multiple sectors or an approach that apparently holds true for the whole city. An example of this would be the fractal cities introduced by Michael Batty and Paul Longley who use mathematical fractals to understand city planning (Batty and Longley 1994). Other Science of Cities approaches, of which such a fractal view is part, use similar models from natural sciences, such as cell structure, as an analogy to understand and predict the functioning of the city (Townsend 2015). Such encompassing attempts have been going on since Plato first sketched his *Republic*, which explained justice, order, and even how to be a just human (1992).

There is always overlap between the type of city models. A city-wide model also affects personal existence, and the personal models facilitate a larger transformation if enough individuals adopt change. In the middle of this continuum then are what we call 'grouped' city models. These models impact on groups of individuals or groups of sectors, but ultimately remain short of city-wide claims. As an intermediate level, these grouped city models address collectives of actors to pursue a singular goal. An example of such a meso model would be "the Hackable City," as explained by Cristina Ampatzidou, Matthijs Bouw, Froukje van de Klundert, Michiel de Lange, and Martijn de Waal (2015). This particular model strives for democratic collaborative city making through new media technologies (idem, 9). This model comes with a selection of strategies that allow citizens to make use of digital technologies to interact more closely with institutions and infrastructures. Instead of arguing that the strategies and forms of interaction dominate all of urban life, this model specifically focuses on giving citizens more agency in their individual local environment during the process of city making through 'hacking' existing means. Simultaneously, the strategies exceed individual experiential changes as they interact closely with wider city processes that affect whole communities. The balance between personal and city-wide city models is formative in the hackable city.

This continuum provides an indication of the general ballpark in which the city models and their effects have to be judged when pursued through a game. Judging a grouping model on city-wide principles will yield disappointing results, as the city-wide extent of the influence is never reached. Simultaneously, a grouped city model might achieve personal effects instead, as the grouped pursuit of a singular goal requires personal interaction as well. This continuum then provides an initial interpretation to group and structure the analysis of city models in games.

2.3.2.2 Involved Actors in the City Model

The other variable that shapes the interpretation of the city model is the nature of the instigator. As already hinted at in the player-centric analysis model in loops and metagames, the key actor that shapes the values can differ, with sometimes the designer holding all the cards, while at other times the playing citizens have a certain degree of power. Urban games and the city model communication is more dependent on the influence capacity of the actor involved. In that case some games are single involved

actor while other games are multi-actor, wherein a mixture of designers and players can appropriate the model and interpret it in their own ways. The involved actor continuum then ranges from single actor to multi-actor when it comes to shaping the characteristics of the city model. The more actors can collectively shape the characteristics, like in performative games, the more it will differ from single actor games.

On the single actor side of the continuum, Hall, Pérez, and Levy for instance describe "alternative models of a good city" based on "the ideas of a few visionaries who lived and wrote long ago, often almost ignored and largely rejected by their contemporaries" (2014, 2). Fitting with 'great men history' these city models are seen as the brain child of visionaries, obviously realised with the help of many other parties, but ultimately instigated by singular geniuses. This 'singular genius' perspective is an overly simplistic approach to history, as especially something as large and complex as cities are never thought up by a single person. Furthermore, we have shown that a singular all-inclusive definition or perspective on the city is hardly the absolute and only truth to base a city on. By recognising these city models from 'singular geniuses' as single actor on this continuum informs the contextualisation of the critique offered against them. For instance, Such a visionary perspective allows ethical questions to be directed to designers, as happened with the low hanging bridges of Robert Mozes, which were accused of eschewing poorer families from the beach area due to bus inaccessibility (Winner 1993). With individual responsibility comes credibility, although this can also be more positive. Kevin Lynch for instance argues that cities can be shaped by molding "our image of the environment by operation on the external physical shape as well as by an internal learning process" (1975, 10). This molding has several elements, such as paths, edges, and corners amonst others, that are consciously orchestrated (Lynch 1975, 47). Or the way film directors engage with cities to give off different images of the city, from urban jungle to cosmopolitan metropolis (Kruth 1997), can be a commended form of cinematic artistry. Single actor models then incite more judgement but simultaneously are often more defined.

Multi-actor models can take many shapes. Which actors are addressed can vary from citizen collectives, to cooperating scholars, citizens, planners, and governments. Sabine Niederer and Ruurd Priester analysed the websites citizens have at their disposal to help, inform, and connect (Niederer and Priester 2016). They found that the citizens – so called smart citizens – had tools to mostly connect neighbours, thus turning the smart citizen model into a neighbourhood collective, but ultimately without much legislative connections. Alternatively David Sadoway and Satyarupa Shekhar analysed a multi-actor platforms for smart citizens in India: Transparent Chennai, a CISCO initiative that linked citizen concerns to the government (2014). Despite a government partner, this multi-actor initiative communicated stock problems which ignored local traditions and networks. The appropriation of the platform by neighbourhood communities ultimately resulted in a more locally attuned platform. The position on this actor continuum then offers an initial indication of the critical inquiries that can be

launched into urban games or platforms that are supposed to improve citizen life. These two examples of multi-actor city models display a lack of governmental contact and a lack of local knowledge.

The intermediate of this axis shows city models that thrive on networks of individuals that take action. Unlike multi-actor models wherein the citizens are connected as a functioning system, or single actor models where activity is just for personal living space, the intermediate level relies on citizens working together yet not as a connected unit in a larger picture. By analysing city models through the dimensions outlined in this chapter and then positioning them on the axes of these continua, the strengths and weaknesses of the models can be interpreted and judged.

2.3.3 City Model Categories

The combinations between area of effect and involved actors together give rise to means of distinction between city models, which allows for the identification of prototypical exemplary city models. All city models are derivations of these general categories, or combinations of these. Having such general frames of reference to call back on, the recognition of mismatching city models reconstructed from the game becomes possible, as well as significant in that the mismatches can be explained using a familiar vocabulary.

The two axes of area of effect and involved actors, when plotted against each other, create two gradually changing axes. These two axes form several categories based on the distinctions formed through the continua. The extremes and middles of the continua, when intersecting, provide recognisable categories of city models that characterise general tendencies among the models in existence, as seen in Figure 11. Manifestations of the categories of city models inform urban game design, arise in players' minds while playing, and will determine whether a game fits its goal or not. The pursued city model, provided by the designers or not, will approach one of the eight categories, thus offering handles to characterise the pursued city model and determine whether it is conjured by the design – whether it fits. Thus, the categories, and especially their associated loops and metagames that form the city model characteristics, are phrased rather general. This is because these categories serve as prototypical examples of a city model with a positioning on the two axes.

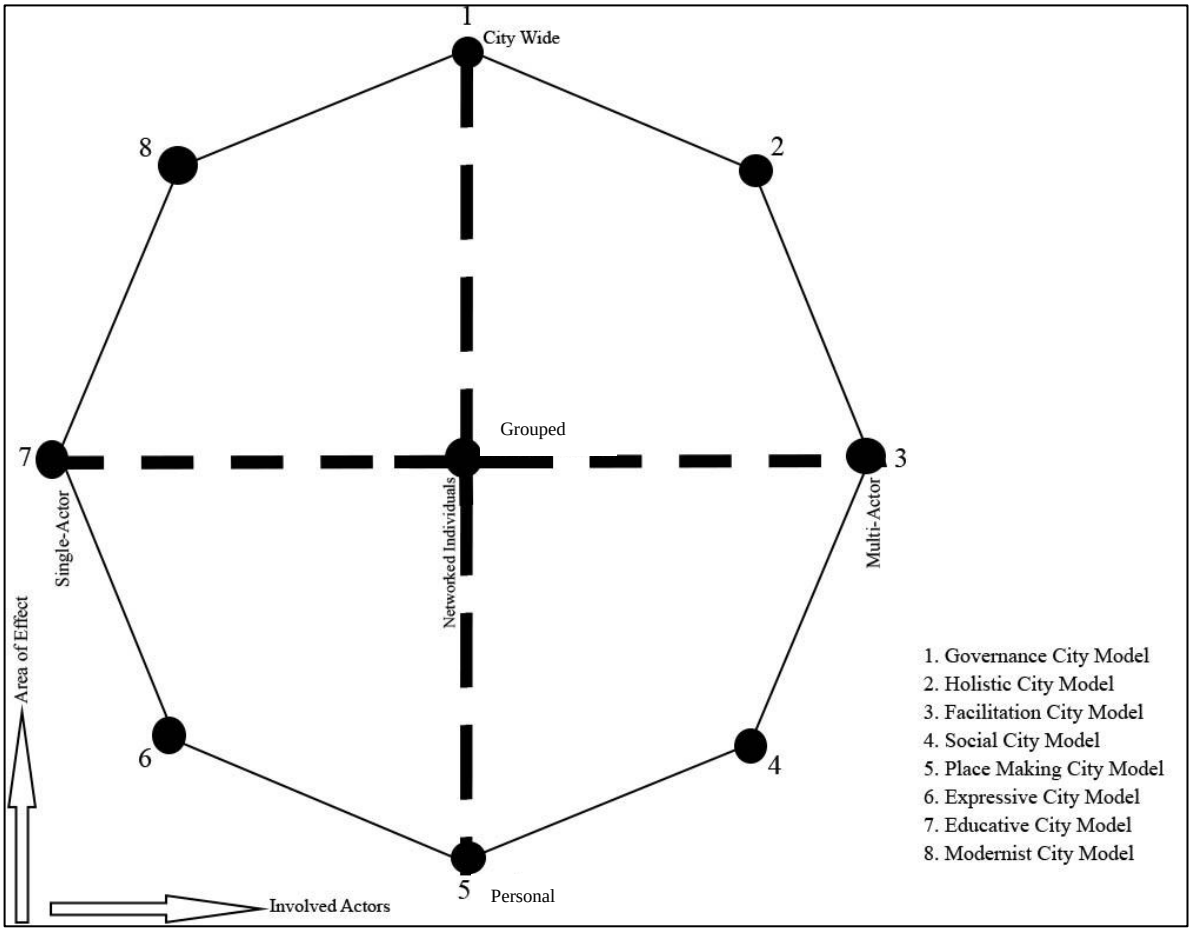


Figure 11 The General City Model Categories and their Position on the Distincton Axes.
The plotted intersections between area of effect and involved actors distinctions allow for the identification of general categories of city models. Source: Author creation

The monikers of the categories, also shown in Figure 11, have been based on a literary review of texts explicitly dealing with descriptions or city models. While they often deal with a specific focus, such as environment or economics, the descriptions of the city and the key words from the literature can offer insights into returning labels. From this analysis, the monikers, shown in Figure 11, are governance, holistic, facilitation, social, place-making, expressive, educative, and modernist city model.[27] The monikers are, because of this analysis, not wholly arbitrary, as they are based on a selection informed by the continua and the focus on urban games. Still, this selection is far from complete as these monikers solely have an epistemological function instead of ontological verity.[28] Here the selection is explicitly motivated by the identifiable place of the moniker on the axes of distinction.[29] Regardless of the

[27] As the positioning depends on the place on the continua, the exact middle is basically a combination of all ctegories – a bit of everything. Because of this, the intersection between 'neighbourhood(s)' and 'interacting individuals' will not require a moniker as all the others suffice.
[28] Since these monikers serve as reference frames for the gathering of possible city models, the full analysis and corpus of studied literature is not given here. For the overview of possible alternatives and the literature studied, see Appendix 3.
[29] As such, some monikers are disregarded because they overlap too much in the distinctions followed in this thesis. Other terms like Smart City have received too many conflicting definitions that pinpointing them on our axes becomes nigh impossible without extensive justification (Albino, Berardi, and Dangelico 2015). Other

selectivity, the selection of monikers allows us to name the intersections of the area of effect and involved actor axes. This allows us to get a general overview of what types of city models are possible and how they can appear in games.

A general overview of city models, and especially generally recurring categories serves three purposes. Firstly, this overview of recurring categories provides some much needed general examples of the forms a city model can take. After having introduced this concept in this chapter in more general or game design terms, some clarity on what shape they can take is valuable. Secondly, knowing what general types of city models exist allows for the assessment of a singular design. By figuring out what general cit model category the pursued city model in an urban game follows, the city models communicated by the afforded city models can be judged on their fit with this singular general ideal. In doing so, the general category of the pursued city model offers parameters within which, if contained within these parameters, afforded city models still effectively communicate the pursued message. In other words: a singular city model category serves as evaluative standard for a fit. Thirdly, an inventory of general city model categories allows for the fitting of afforded city models in urban games to all possible categories of city models, thus creating a complete overview of the strengths and weaknesses of a current design, as well as furthering alternative uses. As this thesis is pledged to the introduction and validation of the fit and its associated elements, this broader application exceeds the scope of this thesis as it requires the further positioning of the method in broader game design cultures. Instead, we use these city model categories to illustrate how the fit and its associated elements can grant insight into urban game design itself.

Below, we will describe the general dimensions of these city models, their characteristics, and the loops and metagames that communicate their characteristics. When discussing each category, the positioning on the axes is discussed, its strengths and weaknesses introduced, an example given, and its characteristics defined and translated into the formative loops and metagames. These characteristics and loops and metagames overviews are necessary for a systematic, qualitative, and quantitative comparison needed for the fit. In no particular order, we shall start at the top of the intersections shown in Figure 11 and continue clockwise.

2.3.3.1. Nr. 1: Governance City Model

Area of Effect: City-wide

Involved Actors: Networked Individuals

Examples: Barber's Civic Society (2013), *Meijer's Datapolis* (2015; 2018), *The Creative City* (Landry and Bianchini 1995), *Government enabled smart cities such as Barcelona and Amsterdam* (Cohen 2015)

terms like 'Datapolis' are too specifically focused on the content, which makes them less useful as general categories of city models.

The first category is that of governance. This does not mean all city models following this category explicitly deal with governance situations but instead denote the relations between citizen and city in such a way that they are best represented by the term of governance. This city model in its extreme is characterised by a claim towards the whole city, or a considerably large area of effect. However, it does not make use of a multi-actor framework. Instead it can be understood as a select party interacting with underlying subsidiaries to govern citizen behaviour, their interpretation of the city, and functioning of the city. This city model relies on clearly defined power relations and urban games mirroring this model will most likely have to function within the everyday bureaucracy.

An example of this model can be found in Boyd Cohen's trinity of smart cities (Cohen 2015). As smart cities 2.0, he identifies cities in which "the municipality–led by forward-thinking mayors and city administrators–takes the lead in helping determine what the future of their city is and what the role is for the deployment of smart technologies and other innovations" (idem). Benjamin Barber's *If Mayors Ruled the World: Dysfunctional Nations, Rising Cities*(2013) builds further on this governance focus.[30] Crudely summarised, Barber argues that "traditional democratic politics is caught in the comfortable box of sovereignty and has become irrelevant to new transnational realities that undemocratic bodies like banks and multinational corporations are addressing" (2013, 19), and he argues that cities, and mayors as their leaders, are less sovereignty focused than federal governments, rely more on cooperation with each other and their citizens, and are thus more suited to govern a globablised world. Barber specifically relies on mayors to oversee "[t]he cross-border civil society" which is "simply the global network of partnerships and associations already sharing common civic values" (idem, 7), mostly through enabling and facilitation. Based on these descriptions of the city model, the governance category contains the city model characteristics shown in Table 5:

City Model Characteristic	Signified Affordance
Instigators of the Model	Single party facilitating others
Ideology	Orchestrate the activity of subsidiaries
Selected City Aspect	City-wide or multi-sector appeal
Carrier	Through technology and citizen actions
Citizen Actions	International, participatory yet obedient

Table 5 Characteristics of the Governance City Model. Source: Author creation

These city model characteristics can be designed in games by specific formations of the loops and metagames, which allows us to compare the models from the game on out. If the loops and metagames differ between the designed category and the player appropriations, then different characteristics will

[30] Although technically Barber offers a critique on existing governance models. Instead of the nation state, he argues for a different key actor in the city model. Still, this nuance goes to show that categories are ideal typical formations that manifest differently.

arise. Using Table 4 from 2.2, we can reconstruct the loops and metagames from the characteristics on out, as shown in Table 6.

Formative Element	Description
Loops	Single player management actions, resource management
Informational Metagame	Knowledge of the skills of other(s) (sectors)
Fictional Metagame	Civic society, facilitation role
Economic Metagame	Actual public actions
Performative Metagame	Activating or facilitating the actions of others
Contextual Metagame	Agent within a larger network, dependent on communication

Table 6 The loops and metagames that together form the governance city model characteristics. Source: Author creation

2.3.3.2 Nr. 2: Holistic City Model

Area of Effect: City-wide

Involved Actors: Multi-Actor

Examples: Fractal Cities (Batty and Longley 1994), *Technology focused Smart Cities* (Townsend 2013; Cohen 2015), *Green City, Healthy City*

This category is characterised by a holistic image of the city, involving everyone in a grand masterplan. Instead of addressing citizens from a central position of power, many actors are expected to do their part in making everything run efficiently and profitable. The grand masterplan can also be a larger theory from which the functioning and interactions of cities are understood. A green city for instance, as discussed by Khan and Zaman (Khan and Zaman 2018), approaches all address sizes from the city from a framework focused on sustainability. Alternatively Michael Batty and other Science of Cities scholars try to predict and understand the functioning of cities by unleashing mathematical fractal equations on them (Batty and Longley 1994; Townsend 2015). This features a general understanding of how cities (should) function, from a decentralised viewpoint. Holistic approaches to the city often oversimplify, or lose contact with the individual citizen, leading to what Saskia Sassen called “deurbanised” technology and cities (2011). This means that the city is seen as a system wherein, if everyone fulfils its function, the grand plan is executed. However, such a filled in system often ignores play. Games following the holistic category then could benefit most from a control of the fit.

This category in its most extreme form is mostly hailed when it is criticised. Anthony Townsend for instance explains that “[f]or the giants of the technology industry, smart cities are fixes for the dumb designs of the last century to prepare them for the challenges of the next, a new industrial revolution to deal with the unintended consequences of the first one” (2013, 8), with efficiency being the new key word. This holistic view then sees technological solutions as the way to improve the city, adopting a

general framework that can be slapped on any city. Townsend, and others, criticise this point as it ignores the frameworks set by local communities and it closes the opportunities for "collaborative smart urbanism through debate" (Hajer 2016, 53). Generally, the criticism states that "we cannot continue to build cities on the default twentieth-century model that assumed centralized control via large public and private bureaucracies" (ibidem). It can be identified in the characteristics in Table 7, with its loops and metagames in Table 8.

City Model Characteristic	Signified Affordance
Instigators of the Model	Multiplayers with governing idea or tool
Ideology	Grand theory
Selected City Aspect	City-wide
Carrier	Data, key technology or framework
Citizen Actions	Follow the provided path to make the system function

Table 7 Characteristics of the Holistic City Model. Source: Author creation

Formative Element	Description
Loops	Data gathering and communication actions
Informational Metagame	Topic of the grand theory
Fictional Metagame	Topic of the grand theory
Economic Metagame	Completely public and actual interaction
Performative Metagame	Consume and follow the line
Contextual Metagame	Part of a larger system

Table 8 The loops and metagames that together form the holistic city model characteristics. Source: Author creation

2.3.3.3 Nr. 3: Facilitating City Model

Area of Effect: Grouped

Involved Actors: Multi-Actor

Examples: Smart Citizens (Hemment and Townsend 2013), *Hackable Cities* (Ampatzidou, Bouw, et al. 2015), ONTDEK OVERVECHT

The facilitating city model category accepts the specialisation of sectors and individual experiences that have to be addressed separately. To ensure as such, this city model is based on the carrier, such as a game, facilitating the functioning of each separate sector. This means communication, networking, and resource management is done through interaction between sectors instead of top down supply. The main focus of this category is to connect each actor to the others and facilitate useful communication and regulation, activating citizens to participate. As such, it is less an imposed ideology and more a removal

of obstacles for interaction to ensure social inclusion. This fits better with the understanding of the citizen co-creation smart city by Boyd Cohen (Cohen 2015) or the smart citizen which basically relies on "'bottom-up' innovation and collaborative ways of developing systems out of many, loosely joined parts" (Hemment and Townsend 2013, 2). While in the endeavour to engage everyone through facilitation there is a risk the individual local environment is sacrificed for the bigger picture, this category embraces more grassroots interaction, sustaining what makes cities liveable.

An example of a city model derived from this category is the Hackable City, by Cristina Ampatzidou et al. (2015). They explain that "[m]ost instances of hackable city making revolve around the organization of individuals in a collective or a public, usually through or with the aid of a digital media platform," which "allow members of a public to discuss issues, identify with other people or with a common goal, learn from each other, share resources, ideate and act together" (Ampatzidou, Bouw, et al. 2015, 70). Instead of interpreting the city from a hacking perspective, the hackable city is a means to facilitate the formation of collectives, made up of both citizens and institutional stakeholders. This city model is shown in Table 9 and deconstructed in Table 10.

City Model Characteristic	Signified Affordances
Instigators of the Model	Collectives of citizens and institutions
Ideology	Enabling and facilitation
Selected City Aspect	Multiple sectors dealing with an issue
Carrier	Digital communication media
Citizen Actions	Band together and work together

Table 9 Characteristics of the Facilitating City Model. Source: Author creation

Formative Element	Description
Loops	Debating, scenario building, and resource management
Informational Metagame	Desires and capacities of other sectors
Fictional Metagame	Introduced problem
Economic Metagame	Public and actual interaction
Performative Metagame	Debating and pitching are key
Contextual Metagame	Formation of collectives

Table 10 The loops and metagames that together form the facilitating city model characteristics. Source: Author creation

2.3.3.4 Nr. 4: Social City Models

Area of Effect: Personal

Involved Actors: Multi-actor

Examples: Neighbourhood Watch, Air Quality Measuring, Street Life (Jacobs 1992), *Radical Cities* (McGuirk 2014)

City models following the social city category encompass a wide variety of actors, yet keeps the activity local and individual. Whereas facilitating city models strive to enable different actors to form collectives and perform actions, the social city models focus more on the connecting of citizens who tackle their own problems. The product of these models is more the connections made along the way, or the organising for a shared purpose, but the ultimate reach of these city models is distinctly local. The interesting aspect of these city models is that they strive to let citizens cooperate on a topic that would not necessarily tie them together. An example, shown in the Sara Blom and Dorien Zandbergen documentary SMART CITY: OP ZOEK NAAR DE SLIMME BURGER (2015), is a device, shaped like a tree, that will emit free Wi-Fi as long as the air quality of a particular area is sufficient. Grouped around the value of air quality, a neighbourhood would cooperate and exert social pressure to use the car and other polluting utilities less. While these city models then can keep selections of citizens focused on a topic, applying the results on a larger scale proves difficult due to the lack of means or different citizen habits.

By focusing the citizens on a shared action or on their neighbours, reflection on their own actions can be the result. This can lead to a closer community or more efficient or sustainable behaviour or mindset. De Lange and De Waal for instance introduce the concept of "ownership," meaning "the degree to which city dwellers feel a sense of responsibility for shared issues and are taking action on these matters" (de Lange and de Waal 2013). They introduce this concept as a way to discuss "how to engage and empower citizens to act on complex collective urban problems" (idem). Such perspective of ownership highlights the city model adopted in Torre David wherein the inhabitants of a high-rise building, instead of leaving their homes for better pastures, turned empty desolate floors into micro neighbourhood that made the building more liveable again (McGuirk 2014). With nothing but help from their neighbours and an intricate knowledge of the space used, a building was revitalised with little help from governing factions. This city model then has the following characteristics (Table 11) and formative elements (Table 12).

City Model Characteristic	Signified Affordances
Instigators of the Model	Groups of citizens, app owner
Ideology	Social local interaction improves urban issues
Selected City Aspect	Smaller local problem or interaction
Carrier	Digital communication media, citizens
Citizen Actions	Band together and work together to improve own life

Table 11 Characteristics of the Social City Model. Source: Author creation

Formative Element	Description
Loops	Multiplayer, social persuasion
Informational Metagame	Social circle and empathy
Fictional Metagame	Introduced problem
Economic Metagame	Private actual actions
Performative Metagame	Peer pressure and social performance
Contextual Metagame	Local community

Table 12 The loops and metagames that together form the social city model characteristics. Source: Author creation

2.3.3.5 Nr. 5: Place-making City Models

Area of Effect: Personal

Involved Actors: Networked Individuals

Examples: Tranquilcity, Film, Branding, Art, Tourism, Scavenger Hunts

Place-making city models are focused on adding meaning to everyday spaces. They rely on the distinction between space and place, with Steve Harrison and Paul Dourish explaining that "Space is the opportunity; place is the understood reality" (1996, 67). Other authors have contributed to the concepts of space and place (de Certeau 1984; Lefebvre 1991; Dourish 2006; Lammes 2009), wherein usually space is seen as abstract arena through which one can move, whereas places are specific locations in space that have a personal or general meaning. While someone moves through space, they *are* in place.

Place-making city models then strive to imbue a space with meaning and feeling. Multiple people can create meaning for a place but it is ultimately confined to a particular place, and thus will not influence the whole city. Instead, these city models are focused on local areas, to be experienced by multiple *individuals*, instead of collectives. Which meaning is attributed to a place can be highly personal or imposed for a particular purpose. A dilapidated Carlsberg beer brewery in Copenhagen, Denmark was turned into a place with a new meaning by the artist collective Public Space on the behest of the brewery and municipality. Using an existing roof, a cornucopia of ropes were hung from the ceiling, resulting in the creation of "both active experiences and intimate spaces without spoiling the rare quality of the existing large covered public space" (Colom 2012). The ropes did not have any effect unless the citizens gave it a meaning. By allowing for play and appropriation – "unleashing your inner Tarzan" (Colom 2012) – citizens adopted the dilapidated space as a place to hang out. The Carlsberg space was successfully turned into a place and the perspective on the Valsby neighbourhood improved. The place-making city

models therefore rely on the citizens changing their perception, and has its own characteristics (Table 13) and loops and metagames (Table 14).

City Model Characteristic	Signified Affordances
Instigators of the Model	Placemaker, citizens
Ideology	Added by the citizens
Selected City Aspect	Specific location in need of redefinition
Carrier	Installations, media, space
Citizen Actions	Signification, appropriation, creativity

Table 13 Characteristics of the Place-making City Model. Source: Author creation

Formative Element	Description
Loops	Travel to locations, movement
Informational Metagame	Previous association with a place
Fictional Metagame	Accredited meaning
Economic Metagame	Private and public symbolic actions
Performative Metagame	Make meaning visible, provided means for appropriation
Contextual Metagame	Stand out place in a larger space, various technologies

Table 14 The loops and metagames that together form the place-making city model characteristics. Source: Author creation

2.3.3.6 Nr. 6: Expressive City Models

Area of Effect: Personal

Involved Actors: Single Actor

Examples: Personal Experience, Spatial Practices (de Certeau 1984), *Fitness routes, Dérive* (Debord 1958)

Expression exceeds mere creative production, but ultimately relates to every action a citizen can perform that expresses their presence in the city. Wayfinding, entertainment, exercise; all elements that can come forth in these models. These city models come forth from provided means in the medium presented and after the individual citizen has made them their own. It is solely for the individual but if the delivery of the city model is open to different interpretations, high level fits can still be achieved.

The expressive city models stem from the activity of spatial strategies as introduced by Michel de Certeau. This author explained *The Practice of Everyday Life* in his book of the same name. He argues that cities are built and planned based on an imposed 'Tactic' – a larger scheme along which decisions are made, such as a roadmap. However, according to de Certeau, citizens 'poach' these tactics by creating their own strategies, meaning that they give their own spin on the provided means, by taking shortcuts for instance (1984, 98–99). Parks with carefully crafted figure eights for aesthetic purposes can instead be used for exercise routes due to the fixed distance. While these city models are harder to determine due to their personal nature, they do stem from the affordances of the carrier and the provided means, allowing for a determination of the fit. The associated characteristics (Table 15) and loops and metagames (Table 16) are as follows:

City Model Characteristic	Afforded elements
Instigators of the Model	Citizen
Ideology	Adoption into everyday life
Selected City Aspect	Local individual environment
Carrier	Provided means
Citizen Actions	Appropriation, signification

Table 15 Characteristics of the Expressive City Model. Source: Author creation

Formative Element	Description
Loops	Single Player actions
Informational Metagame	Personal life values, existing tactics
Fictional Metagame	Personal narrative
Economic Metagame	Private symbolic
Performative Metagame	Poach existing structures and make them own
Contextual Metagame	Provided means are adopted to own perspective

Table 16 The loops and metagames that together form the expressive city model characteristics. Source: Author creation

2.3.3.7 Nr. 7: Educative City Models

Area of Effect: Grouped

Involved Actors: Single Actor

Examples: Education, Inclusion Practices, Contribution

These models are based on individual attempts to influence or steer multiple sectors of the city. This differs from governance as no singular person has this power. Instead, education offers the capacity to,

from a singular perspective, touch on several related areas. This could mean trying to contribute to society by relying on recycling more as an individual, or by giving back to the community with art. The difference here is that the contribution is aimed at a larger address range than just the individual's life. Letting one's voice be heard can be a call to physical participation, but different carriers can have different effects. Eric Gordon and Jessica Baldwin-Philippi explain that a virtual simulation of Chinatown in Boston – a completely navigable and 3D reproduction of the space – enabled players to voice their concerns without having to speak up. Each individual could then voice their concerns and contribute while at the same time eschewing the public stage (Gordon and Baldwin-Philippi 2014). The carrier of these city models can then have great influence on the fit. Still, as these city models rely on the individual communicating, educational executions are also possible. However, since they are not city-wide or integrated, their efficacy may remain furtive. These city models are made of the following characteristics (Table 17) and loops and metagames (Table 18):

City Model Characteristic	Afforded elements
Instigators of the Model	Individual citizens
Ideology	Contributing own perspective
Selected City Aspect	Several sectors or a larger community
Carrier	Voice, means of the carrier, digital representation
Citizen Actions	Educate, contributing, giving back, creativity

Table 17 Characteristics of the Educative City Model. Source: Author creation

Formative Element	Description
Loops	Creation or communication
Informational Metagame	Laws of community, missing elements to be contributed
Fictional Metagame	Personal lesson or meaning
Economic Metagame	Private and public symbolic or actual
Performative Metagame	Putting oneself out there, stand up
Contextual Metagame	Own role in larger community

Table 18 The loops and metagames that together form the educative city model characteristics. Source: Author creation

2.3.3.8 Nr. 8 Modernist City Models

Area of Effect: City-wide

Involved Actors: Single Actor

Examples: Le Corbusier, Brasilia, Nonoalco-Tlatelolco, SIMCITY

This sweeping term for a city model relates to those models that stem from an individual planner coming up with a fully thought out city. Whereas many authors describe their ideas for cities, these models focus on a top-down individual planning in which every section of the city has its own functions in a highly segmented whole. These city models differ from holistic city models in that the planning party here is singular, whereas in holistic city models a multi-stakeholder complex creates a machine in which everyone has their distinct function. The modernist city model instead sees an imposition of roles on the basis of absolute planning. It should come as no surprise that these city models mostly arrived around the turning of the 20th century, when nationalism and dictators were in large supply. Justin McGuirk explains that especially in Latin America dictator, under the guise of 'giving back to the people,' built large social housing projects. Ultimately these projects gentrified and did not reach 'the people' they so adamantly sought to reach (McGuirk 2014, 10). Instead, these projects often were from a high architectural staple and physically impressive, but hardly liveable. As a result, these cities touch on the double edged sword of modernity, as explained by Marshall Berman, wherein great change upheaves many of the established systems at the cost of communal tradition or culture (1988, 35). It is the citizen actions that often showed the fallacy of these models.

Despite this link to dictators and destructive modernism, these city models can have useful applications. Peter Hall et al. explain that "[t]he vision of these anarchist pioneers was not merely of an alternative built form, but of an alternative society, neither capitalistic nor bureaucratic-socialistic: a society based on voluntary cooperation among men and women, working and living in small self-governing commonwealths" (2014, 3). While the ideas were largely rejected by their contemporaries their impact on everyday city building cannot be denied. Regardless, these models return in sandbox mode games such as SIMCITY, wherein the player can exert absolute power over construction and planning. With these caveats in mind, the Modernist city models consist of the following characteristics (Table 19) which are made from the following loops and metagames (Table 20):

City Model Characteristic	Afforded elements
Instigators of the Model	Individual planner group
Ideology	Grand master plan
Selected City Aspect	Social housing, renovation projects
Carrier	Architecture
Citizen Actions	Following the plans laid for them

Table 19 Characteristics of the Modernist City Model. Source: Author creation

Formative Element	Description
Loops	Planning and building
Informational Metagame	City patterns, segmentation

Fictional Metagame	Master plan
Economic Metagame	Public actual, private symbolic
Performative Metagame	Social acts; displays of grandeur
Contextual Metagame	Idea before all; possibly dependent on environmental factors

Table 20 The loops and metagames that together form the modernist city model characteristics. Source: Author creation

2.3.4 Category Conclusions

City models can take a variety of shapes. Here we have introduced distinctions between most city models based on their position on the area of effect and involved actor axes. These axes serve an epistemological function and should not be seen as the sole organisation of city models. Alternative means of organisation, like historical (Mumford 1961) or individual (P. Hall, Pérez, and Levy 2014), are possible as well, yet here we have opted for those distinctions that are more attuned to the characteristics of the newly introduced concept of the city model. These axes furthermore provide insights into general categories of city models. These mental reference frames for most city models offer a handle for reconstructing the city models in games. Whilst designed city models obviously have nuances, identifiable through loops and metagames analyses, most city models will somehow strive to conjure up a category recognisable for most players. These reference frames show the understanding of the city and ultimately offer an initial roadmap when identifying pursued city models.

2.4 Conclusion

This chapter has set out to answer how the interpretations of the city that are designed into the game and those that are afforded for player interpretation can be modelled for comparison on their fit. We have shown that the introduction of the 'city model' provides a concept that can be used to chart and compare interpretations of the city. Consisting of an instigator, an ideology, a city abstraction, a carrier, and suggested citizen actions, these city models provide an explicitly partial take on the city that can have a multitude of manifestations. Game designers can translate these city model characteristics into empirical game design elements. The loops and metagames that make up the design of a game can collectively communicate theses city model characteristics. As such, in order to determine what city model is pursued through a game, a reconstruction of the city model from the formal game elements can offer a solution. Yet, these city models remain a reconstruction that is interpretable in several ways. Therefore, in the final part of this chapter, we have introduced general city model categories, to show the forms this new concept could take. Based on the two distinctive axes of the area of effect of the city model and the involved actors, eight categories could be identified. These categories offer the ideal manifestation of a city model following an extreme position on the aforementioned axes. Every other city model designed

into a game will show similarities with these more general categories and as such they serve as reference frame when reconstructing the city models designed into, and interpreted from games.

With the player centric interaction clear and the city conceptions introduced, the fit between the two can be discussed. Fitting a city model to the game is not a one on one activity. It is changed by player interaction and value appropriation. How can these be made to fit then? And what does it mean if they fit? Can we suggest a better fit? All fitting questions that we shall now try on in chapter three.

Chapter 3 – Reverse Engineering the Fit

Introduction

This study set out to determine a new interpretative metric to determine the efficacy of urban games. We have referred to a new metric called 'the fit,' which means the interpretative metric qualifying and quantifying the coincidence between the pursued city model as designed into the game and the reconstructed city models stemming from appropriation of affordances in the game by the player. Chapter one explained how urban games are designed and how the action space can be appropriated. Chapter two modelled the city and explained how these are designed into the games. This chapter shall discuss the fit itself as a prevaluative, quantitative, and qualitative metric that indicates the efficacy of urban games. Here we answer how an action space analysis can discover the fit values of the afforded city models with the pursued city model in urban games. We infer this new metric and its method by adapting the computer scientific method of reverse engineering into an action space analysis. This reconciles computer science with humanities studies in order to determine the fit, and thereby offer an alternative to social scientific statistical validation, by pursuing a different measure of efficacy.

Designing games is a costly affair and games focusing on the city as topic or physical setting and striving for citizen participation are often made from meagre municipal budgets or indie-developer's venture capital. Those games fitting their goals better are more likely to convey a fundable, purchasable, reproducible, and playable pitch. Currently, however, the vocabulary to discuss such a fit is conflicting, dispersed over several disciplines, and hardly linked to videogames. The assertion that the design of a game fits its goal is usually more intuitive among designers. By introducing and validating the action space analysis, we create a systematic and explicit procedure to visualise and scrutinise the design process.

This chapter will approach the metric of the fit from four directions. First, in section 3.1, we will determine what the fit is in general, and gradually specify it for urban games. Given the different relations between player actions, game design, and city model, different formations of the fit can be identified that each indicate different strengths and weaknesses of designs.

Section 3.2 will inspect why the fit is a necessary metric at this moment in urban game development. A literature review will outline the takes on the relation between the pursued and actuated goal introduced before, but will show that these more general concepts have alternative strengths and weaknesses that have to be emulated by the introduced interpretative metric of the fit. Essential is the identification of the complexity of assessing the efficacy of urban games, as it requires insight into players, designers, cities, and games. Due to this complexity, a multidisciplinary approach is required, which reverse engineering will provide. This section will therefore highlight which elements of social scientific and

humanities game design are lacking and need to be expanded through the engineering approach of reverse engineering. Here the relevance of the fit will be explained as prevaluative – a pre-evaluation offering an alternative to statistical validation based on a different measure of efficacy through gathering insights from the product itself.

Section 3.3 will adapt reverse engineering into the systematic method of action space analysis to ascertain the fit within urban game design. As reverse engineering is already an established method, it will have to be adapted to blend with the study of urban games, our understanding of city models, and to cater to the fit. In section 3.4 our understanding of action space analysis will then be outlined and explained, with SUPER MARIO LAND (Nintendo 1989) serving as example. At the end of this chapter, in 3.5, the fit as metric should be clear, as well as its usefulness. Furthermore, the fit as answer to a complex problem that used to be addressed superficially and overly specific, now accommodates multiple disciplines in its approach.

3.1 The Fit

This section will explore what the fit is. First in 3.1.1 we will give a general description of where the fit can be found and how it interacts with the player, game, and city. Then, in 3.1.2, our understanding of the relations between the three domains of game design, player appropriations, and city models will be outlined in order to guide our train of thought. This meta perspective on our understanding serves a mostly epistemological function in that it explains what are the knowns and unknowns for us as researchers of the fit. Finally, in 3.1.3, the different types of fit are explored. The explanation of the fit is first of all dependent on the relations between the analysed elements.

3.1.1 Description of the Fit

In this section we will explain how we understand the fit, where in the design process of urban games it is located, and which elements are related to it. To do so, we refer to Figure 1 which visualises the understanding of the design process of urban games. The elements and steps will be unpacked and explained to ultimately illustrate where the fit comes in. This explanation will remain rather general as the focus is on identifying how the fit should be understood. The dependencies and types of fit will be discussed in the next sections.

Game designers, when designing an urban game, always pursue a city model they try to convey. This abstraction and interpretation of the city propagates the behaviour and mindset best suited for their goal. For entertainment games this model differs and is possibly more implicit than with explicit civic goals, yet all game designers are led by this interpretation of the player or citizen behaviour or city

interpretation. Demarcated with 1 in the process of urban game design (Figure 1 on page 3), this city model is translated in the game design. As shown in the last chapter, this is done by designing the empirical game elements of loops and metagames that together can convey the characteristics of the city model.

The designed game, shaped by the considerations from the city model, however does not communicate a single message. Marked with 2 in the figure, the designed game affords the interactions required for the pursued city model *and more*. As discussed in chapter one, depending on the design, more or less different forms of interpretations are possible. This becomes important when the game is ultimately played, and it is confronted with (3) player appropriations. Depending on the playstyle of the player, such as rule abiding, rebellious or cheating, subversive or rule breaking, etc., the affordances of the game can be appropriated differently by each player. The moment of play is then a moment in which the designed game communicates its message, but which message is partly up to the player appropriation.

From the process of play a city model is communicated (4). This city model arises from interpretation of the affordances by the player. However, it is possible that the player appropriated different affordances than those the designers had imagined to convey the pursued city model. It may therefore be possible that the afforded city model does not match the pursued city model. This comparison is where the fit is determined, demarcated as 5. The afforded city model can fit the pursued city model, i.e. overlap in characteristics, or not, or partially. With a misfit or a partial fit, reflections on the design can yield insight into where the player appropriates an affordance differently, which then can be adjusted. If an afforded city model does not fit, this does not mean the game is poorly designed, solely that the design allows for more than one way of playing the game. If multiple afforded city models do not fit the pursued city model, then critical scrutiny of the design or even the use of games in general is required.

The fit is thus a comparison of multiple afforded city models with the pursued city model based on their similarities. To fully analyse the fit of an urban game then means determining the fit multiple times, once for each afforded city model. Knowing where and when the fit is studied is only half the battle. We still need to determine what causes changes in the fit, and what shapes the fit can take.

3.1.2 Variable Relations Underlying the Fit

The fit is the result of three elements: the city model going into the design, the design of the game, and the player's appropriation of it. When unintended affordances are discovered and exploited by players in one of these three dimensions, the city model that was intended to go into the game might not be the same as the one experienced by the players – hence a misfit occurs. Using our newly introduced affordance-centric design perspective from chapter one and the city models from chapter two, these relations can now be demarcated. Discovering how a change in one of the three domains influences the

other domains is then essential for finding and signifying the fit. This section will therefore outline the dependency relations of the three domains and present the city model as dependent variable. In this study we however only have access to some of these three domains.

The design is something out of the control of this study and most researchers, as the games have already been designed when they are studied.[31] Furthermore, accounting for all possible interactions by the players would rely on actual playtesting and statistical validation, which is a costly measure and one that, as we shall argue in 3.2, we are trying to avoid. Player interaction will be simplified, for the purpose of this study, in order to explain the interrelation; technically, we are black boxing the player, meaning that we treat them as standardised and effaced entities from which we have accepted the sociotechnical, and in this case agential, capacities, relieving us from having to analyse them in detail (Akrich 2010, 211). To do this, in what follows, the hypervariable of player actions will be regarded[32] as per the definition of urban play from chapter one, as an appropriative, carnivalesque, creative and personal activity shaped through loops and the metagame. This means they are capable of taking many forms that ultimately are a variation of agreement, negotiation, or rejection (S. Hall 1980, 122). This means that they can range from minimal and obedient interaction, to appropriative and disruptive forms that use the affordances of the game in novel ways. It is variable, but the variability is its constant value – namely utilising every possible affordance. It is accepted here though that the varying player actions can only range so far as is afforded by the game, thereby ignoring the outlaw form of play that creates completely new rules (Huizinga 2008, 12), for instance by hacking the game code.

With game design out of our control and the player being a dynamic, yet controlled variable, the dependent variable is then the city model. The pursued city model from the designers (or communicated to them by stakeholders) is translated into the design decisions that manifest in loops, metagames, and technology choices. This process is often hidden from view, giving the player access to the game only – the designed product that will not change but does contain several affordances. During the act of play players exhibit their varying behaviour resulting in several interactions with the game. Using the afforded player actions in the design, we can reconstruct all the afforded city models appropriated from the game using our understanding of city model from chapter two, by using an adapted reverse engineering method called the action space analysis, which we will introduce in 3.3. Comparing the pursued city model with the reconstructed city model(s) interpreted during appropriation is the way to determine the fit. It is thus the city model that is dependent on changes occurring in the acts of play due

[31] Unless the fit is determined as part of a design iteration. Yet even then, the beta of the game is momentarily regarded as fixed. See chapter five for a more detailed discussion of this point.
[32] As outlined in chapter one, interactions with a design can generally be grouped into an agreeing, negotiating, or rejecting stance. A negotiating stance can however take different shapes, which, as behoves play, can yield radically different appropriations. Some might not fit with the pursued city model at all, while others still overlap considerably. Therefore, we still regard the possible player appropriations to count numerously.

to appropriation and the opening up of the design with affordances. As the city models can change, a fit is a means to question and qualify the change.

3.1.3 Granulation of the Fit

As the fit is determined by the interaction of game design, player actions, and city models, different matches can occur. The different types and contributions will now be discussed based on how the three domains relate to each other. The consequences these types bring with it can help specify fixes for ineffective and unfitting games. An overview of different fits is represented in Figure 12.

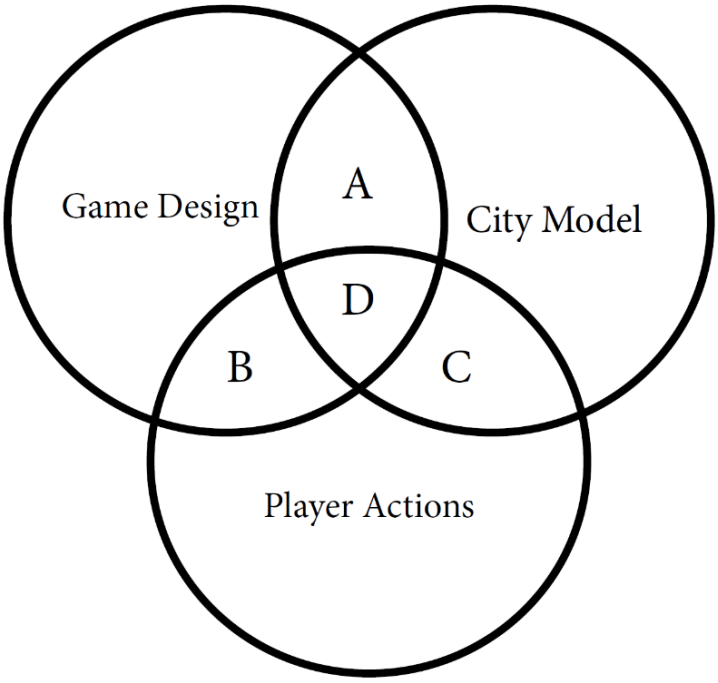


Figure 12 Types of Fit.
The different possible fits between the three related elements. A standing for the Procedural Fit, B for the Ludic Fit, C for the Civic Fit, and D for the Attuned Fit. Source: Author creation

A: Procedural Fit

In this relation the affordances in the design and the pursued city model of the designer fit each other even after reconstruction, but the players' appropriation is unaddressed. This means that when obediently played, the pursued city model is communicated, but none to hardly any of the afforded city models fit with the pursued city model. This kind of fit is reminiscent of the magic-bullet perspective on urban games: players only follow rules in order to learn the message. The city model may change when the players appropriate certain parts of the design or interpret the values differently, making a full fit impossible. This can mean three things:

- The pursued city model translated into the design does not match any city model arising from player appropriation. i.e.: the kind of city is too far from player experiences.
- The game does not reign in the affordances enough, resulting in a free for all space of possibility.
- The game reigns in the affordances too much, prohibiting the player from appropriating the city engagement to their own reference frame.

An example of this fit would be in the mobile game TOWNSHIP (Playrix 2013). A city and farm building game, the player has the option to build a city by constantly providing for the needs of the situation, citizens, and businesses. What makes this game procedural is that the decisions the player can make are binary. When confronted with a situation, such as a car fire, the player can use a fire truck to spray water or hit the gas to plough through the burning wreckage. Similarly for civic protest: instead of running

them over, the correct answer is the building of a doughnut shop. Since there is only one correct answer, this game denies the player any appropriation, forcing them to adopt the simplistic city model professed. This makes for a good entertainment or puzzle game, but becomes more problematic when dealing with real civic issues.

B: Ludic Fit

This fit is between the affordances of the game design and the actions of the player. In this case the design allows for multiple appropriations, basically anticipating player actions within the rules. However, these actions do not achieve any city model. The afforded actions do not have any bearing on the city. Players enjoy playing the game, but what happens in the game is more important, shifting the balance to more mechanical or game-focused play than to semiotic, or meaning-centred, play (Aarseth 2016). Players, for instance, play to win instead of trying to come to new agreements or a playground hosts a setting for multiple types of roleplay that do not survive beyond the playground. This can have several causes:

- The game does not have explicit semiotic elements that link it to a city
- The city model conveyed through the game does in no way match player appropriations
- The game revolves around or draws too much attention to ludic elements instead of second-order significations.

An example of such a ludic fit can be found in the game GRANARY SQUIRT (The Fountain Workshop 2015). This mobile app allowed players to control the 1000 water spouts at Granary Square, next to King's Cross station in London. Through this control, the player could play the classic game of Snake, following people on the square as collectibles. While this game has captivated many players around the square, its function of making the square gain a more communal function is not present in the game at all. Players play this game for the sake of Snake and getting people wet. There is no link to the city other than that it is set there. Still, although not contained in the game, the activity itself brings people to the square. So even with a ludic fit, games can still succeed.

C: Civic Fit

In this fit the afforded city models and pursued city model match. The actions of the players display the values of the pursued city model, even when appropriating. The game however does not contribute to this understanding. Think of a debriefing conversation being more insightful than the whole game or a game that does not allow you to do any of the actions you relate to your city life. While in this fit the goal is reached, the investment in the game is largely a waste of time and money.

- The game may not relate enough to a city context, due to lacking semiotic elements.
- The player is not allowed to do anything meaningful through the game
- The game does not restrict user behaviour enough to create a space of possibility with meaningful parameters.

Running games like ZOMBIES, RUN! (Six to Start 2012) can serve as example for this kind of fit depending on how complex they are. Later versions of ZOMBIES, RUN! and its sequel for instance add a resource gathering and virtual city defence aspect to the game. Run more and faster to gather the means for your city to defend itself from waves of zombies. However, the original gameplay of running while hearing a story of a zombie pursuit that provides directions to run can be enough for players. Instead of actually playing the game, the runners solely use the game as a guide for running, thus ensuring that the running goal is met, but that the game has little to do with it.

D: Attuned Fit

The procedural, ludic, and civic fit all show some attuned relations amongst city model, game, and player. However, ideally all the three domains are adjusted to each other. In this case the game steers players to expected actions that are designed to afford a specific city model. These actions are however flexible enough to allow players to appropriate the actions into their own version of the city model. Furthermore, the city model pursued is flexible enough to allow for alterations. This is obviously a difficult position to reach but it is a goal to strive for. In this case pursued goals are met, the game is an example of a well-designed and playable game, and the players adopt the intended city model and can appropriate it to their own experience.

A game that has achieved such a fit is REDESIRE (Rezone 2016). This is a negotiation facilitator for building projects that allows every player to present their desires for a new plot of land. By making these desires explicit, more common ground can be found based on the assumptions and wishes that underlie plans which usually are left unsaid. The game scores the desires on proven urban design models, like the street life focused city described by Jane Jacobs (1992). After hearing everyone's desires, the players will score these on the basis of feasibility, aesthetics, and efficacy. The closer the scoring matches the other players, and that of Jacobs (determined through an algorithm), the higher the personal score. This game is built to facilitate communication and does exactly that. Furthermore, it allows players to pursue a ludic experience by hunting a high score. At the same time, getting this high score fits the civic purpose of easing collaboration. Every element of the game is thus attuned to each other while still allowing for player appropriation, which benefits both themselves and the game.

Double Fits

The four fit types introduced above explain the fits and their consequences when they occur between two of the three domains. However, it is also possible that one of the domains fits with both others, but the others do not fit together, as shown in Figure 13. These types of fits are mostly the result of the extreme, maybe even Huizingaien outlaw-like, appropriation of the game rules, resulting in often alternative uses or understanding. This yields three other double fits that ultimately stem from the singular fits, but need elaboration nonetheless.

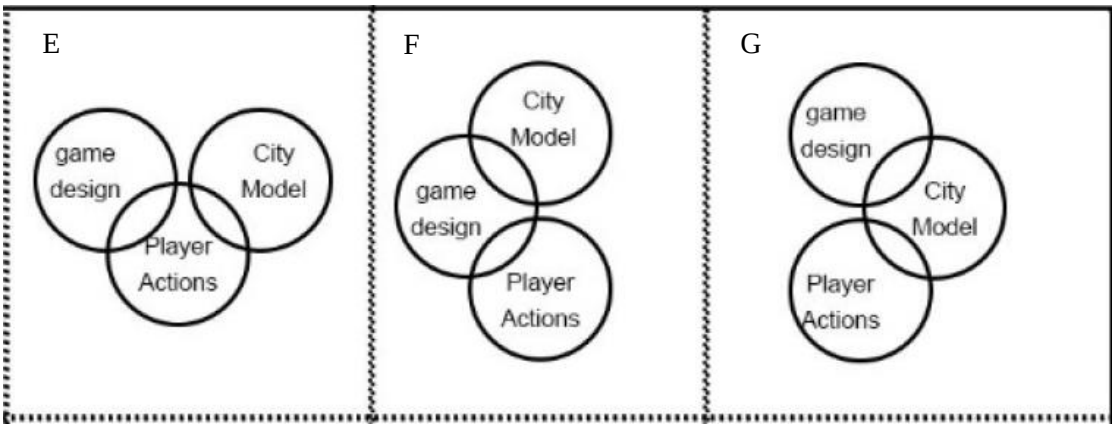


Figure 13 The Double Fits
Overview of the three types of Double Fits. E represents the Ludic-Civic Fit, F the Procedural-Ludic Fit, and G the Procedural-Civic Fit. Source: Author creation

E: Ludic-Civic Fit

In this form of the fit the design of the game affords the player to perform the actions they envision, thus allowing for relative freedom. Within these actions they perform, the players can shape their own city model in whatever way they see fit due to the freedom provided by the game. However, any pursued city model that informed the design is lost in the multitude of player appropriations. The freedom-based design thus does not fit with the pursued city model anymore (unless the pursued city model was the freedom to appropriate).

An example of this fit is POKÉMON GO during the Hong Kong protests of 2019. Players appropriated the design of the game, in which you have to walk around the city and go to specific places or PokéStops for activities. The walking around allowed them to skip checkpoints, as they were merely playing, and they used the scheduled raid battles happening at set times in gyms in the game (and thus at specific locations) to meet like-minded protestors without risking the surveillance in other social media (Vincent 2019). The game afforded the grouping and walking which the players used to convey – or at least protest for – a city model they found important. The designers of POKÉMON GO do not wish to side with

this political stance (ibidem), and as such the city model stemming from the affordances does not match the design.

F: Procedural-Ludic Fit

In this combo fit the link to the city *is* contained in the design, yet the players are able to ignore it, because the game offers plenty of gameplay options to appropriate. Basically stemming from recalcitrant players that do not follow the affordances and suggestions provided by the game, this fit arises from players conjuring up a completely different engagement from the afforded actions, possibly unrelated to the city.

The socialist revolutionary movement Situationists International are an example of these recalcitrant players. Described by Simon Sadler, one of their experiments was to navigate through Paris by using a map of Berlin (2001, 37). The game, or in this case the map, still affords its city model – the ground plan of the city. Yet the interaction of the players with the map does not arrive at this city model at all. Instead they appropriated the map to use in a different city, and thus learn something about the subconscious design of cities, or the psycho-geography (Debord 1958). This is still a perfectly afforded function of the map, as long as it can show the way. This type of fit shows that even with attuned game design, the player is a radical agent.

G: Procedural-Civic Fit

The final fit type arises from games that are designed thusly that they adequately afford the pursued city model but their affordances do not allow the players to use the game to reach this city model. Still, thanks to player appropriation, by breaking the rules or by appropriating elements outside the game, players still arrive at the pursued city model.

This fit comes forward most on a more meta level. An example would then be that, instead of playing a scavenger hunt for instance, this fit arises when players engage *with* scavenger hunts, like when they are making them. When making a scavenger hunt, the players do engage with the design of a specific scavenger hunt. They do subscribe to the city model professed by the scavenger hunt, but they create an alternative way towards it. What this particular fit shows is that a partial fit does not necessarily have to be detrimental to a game. Yet, in the case of a misfit, there has to be a detailed scrutiny of where the discrepancy comes from, in order to determine whether it is detrimental or not. How to do this will be discussed below.

Based on the type, alterations can be suggested or critiques offered in order to improve the fit. This granulation then serves as an indication of the critical potential of the fit on the process level, which will be put to the test in chapter four and elaborated upon in chapter five. The general idea what the fit is and what it can say raises the question of why it is necessary.

3.2 Looking at the Label – Questioning the Fit

Questioning whether a particular design will work in a specific context is prevalent in various domains such as politics, genetic engineering, education, and so on. This section will show that the vocabulary used to attune designs to their goals is dispersed, limited to general insights, and the value judgment can only be made after the game is already published. This makes these metrics themselves hardly illuminative. The fit builds on these traditions but instead of scrutinishing the game after the design is finished it systematically and explicty highlights the expectations and affordances going in and coming out of the design. Although useful in their own right, where the previous methods to ascertain the tailored adjustment fell short was the tackling of the problem from too limited a point of view. The fit here will be introduced as an interdisciplinary method that combines computer science methods to humanities game studies in order to provide an alternative to social scientific validation, with a different measure for efficacy.

In 3.1 the fit was introduced as a general concept. In this section it will be specialised for games through its positioning in reviewed literature. Central in this endeavour is the question why the fit as a metric is necessary and why it is necessary now. First, in 3.2.1 we repeat why the question of judging the attunement of urban games to their civic goal is too big of a problem for a single discipline to tackle. In 3.2.2 we therefore introduce our introduction of the fit as an intervention utilising the disciplines of computer science, humanities, social science, and urban studies. In this section, the shortcomings of single disciplinary approaches will be introduced. In 3.2.3 one of such shortcomings will be discussed when it comes to statistical validation. The fit will be introduced as an alternative to statistical validation, although based on a different measure of efficacy and instead accessible during design and allowing for broader generalisation. Then, in 3.2.4 the requirements when studying the game itself, both from a humanities perspective and engineering perspective, are introduced in order to present reverse engineering as useful addition to this debate. Finally in 3.2.5 the power of the fit as *prevaluative* metric is introduced.

3.2.1 Too Big a Problem

As seen in chapter one, we introduced the fit as a countermeasure to a magic-bullet perspective on urban games. This magic-bullet approach sees games as unfaltering communication devices that always communicate the desired message, regardless of the player. This is too simplistic an approach to urban games as it does not take into account the possible variations provided by the game itself, the players, and the city models. Such an underestimation of the capacities of urban games and the complexity of urban issues is regrettably also happening in academic approaches to urban game efficacy. To counter this academic underestimation, we argue that the problem of attuning urban game design to their civic issues relies on multiple disciplines if approached in its full complexity. This is because of the intuitive nature of the design process, which prevents it from being adequately documented and linked to the product, and because of the reliance on specialist knowledge after the game is finished, which limits the incorporation of multiple views.

The intuitive nature of game design, often based on trial and error through many iterations (Fullerton 2014), makes the efficacy of urban games lack clear foundations to build on. Complicating this even more is that while some game designers are guided by proven concepts, game mechanics, or new technology, others, such as those following the trends outlined by Tracy Fullerton are mainly guided by the search for the player experience (idem, 16). In doing so, game design has to be analysed from an unknown product-centred point of view while simultaneously address a human emotion that is also related to a concept of the city. Although 'the fit' as a metric sounds physical, the games have to cater more and more to an experience economy, making their message less concrete. Daniel Solana argues that with the coming of the digital age, brands and other message-centred economies are more focused on what he calls "yin" behaviour – tying the consumer to the brand through experience and positive associations (2010, 36).[33] This is how the attention economy functions, which, as Solana argues, is spreading more and more into the real world, with 'experiences' popping up everywhere. For something to fit somewhere then does not solely rely on the provision of an idea (like the magic-bullet theory argues), but instead requires more user-appropriative terms (Solana 2010, 73). The fit offers a new approach, reconstructing possible appropriations from the game up, thus keeping it grounded and controlled. Still, this fit will have to be determined from a perspective that takes these intuitive, experiential, product-centred, and urban associated topic into account.

However, most of these specific elements that go into judging the experience from a designed product are limited in their scope. Especially previous approaches to efficacy of games – the statistical validation approaches – are lauded and lamented for their specificity. While this will be discussed in 3.2.3 in more

[33] Solana is not the first to identify this experience economy. As early as 1998, B. Joseph Pine II and James H. Gilmore distinguished experiences from the service industry (1998). Whereas Pine II and Gilmore cleverly identified the forms of this economy (entertainment, education, escapist, and aesthetic), Solana expands their description with new concepts that are adapted to an active audience era, wherein the experiences, such as urban games, have to provide an appropriative experience.

detail, the control of efficacy is too reliant on specialism. Amri Yusoff, Richard Crowder and Lester Gilbert identify the necessity of expertise in validation research in games. They argue for instance that education games have to be validated through both pedagogical experts as well as game designers (2010). While social scientists can validate the games on their efficacy, they need specialist parameters in order to provide measurable parameters. Such specialist parameters are not always easy to come by, as they require various disciplines to be consulted. If specialists from all different domains have to be consulted (in our case game studies, urban studies, validators, etc.) large scale validations are made less likely. Furthermore, in an urban setting where the specific function of a game, and thus the expertise, might be hard to pinpoint due to the fluid nature of the city, validation might be even less attainable. What this shows is that testing the efficacy of urban games through traditional methods needs a great variety of specialists, already indicating that this problem is too big for one discipline. Therefore, validation research is encountering problems that limit the scope of its answers. These problems are interdisciplinary and need a more integrated approach.

While a fully encompassing approach is impossible, the fit here is introduced as a more inclusive metric. This metric needs to be validated, while at the same time staying broad enough to take varying context and player attitudes into account. We take this broader perspective through our focus on affordances as this implies the player and designer in product terms. However, since we have no access to the player or designer, we need to be able to dive deeper into the product itself, and from there on out learn more. This is where our intervention of the fit, as gathered through reverse engineering, comes in.

3.2.2 Interdisciplinary Intervention

The ontological make-up of game studies disciplines complicates the cross-applicability and uses in a broader context. Here we will unpack the three domains of game studies and illustrate how an engineering addition of reverse engineering to humanities and social science game studies can offer appropriate handles on the fit.

As outlined by Frans Mäyrä in his approach to game analysis, there appear to be three main areas in game research, focusing on either the players, the game itself, or technical aspects (2008, 156). Later, José Zagal expanded on these three areas by discerning social scientific, humanities, and industry/engineering approaches, that look at the effects of games on people, the meaning and context of games, and the development and design, respectively (2010, 13). While there is overlap, no discipline looks at all three dimensions of the fit in relation to each other.

According to Mäyrä, the humanities focus mostly on the game, its meaning and its formal elements as text, making it useful for affordance analyses (2008, 154). Zagal elaborates on this by stating that humanities studies “the meaning and context of games” and see “games as artifacts in and of themselves” (2010, 13). Especially this latter characteristic makes humanities particularly suited to discern the

afforded actions contained in the design – intended or not. Humanities approaches are thus paramount for the affordance-centred design perspective needed for the fit.

However, the humanities' greatest strengths, subjectivity and signification, are also the largest points of criticism, as it complicates the representativeness. Game scholar Clara Fernández-Vara explains that in order to provide a systematic and structured vocabulary to make sense of games, game analysis relies on "an inductive method (that is, extracting general principles from specific examples), [to] find overarching concepts that allow us to understand a wider range of games" (2015, 12). The mostly qualitative research methods manage to parse out significations patterns but the subjective induction is criticised for lack of validated proof. As it still touches on validation of the effects of design, the fit needs a more validated and repeatable approach to remain a systematic mapping of urban game possibilities. The fit should be a systematic category and humanities methods thus come short. While some quantitative interpretative research is performed (see Peer, Hakemulder, and Zyngier 2012), the majority of methods deal with hard to prove approaches. Fernández-Vara points out that "game analysis is not an exact science, but a critical and subjective exercise" (2015, 178), which does give it a much-needed edge to any test of efficacy, so it should not be discarded. Several humanistic approaches to urban games, and to their link to urban issues, have called for validation. Raphael et al for instance, after a detailed "small-scale qualitative study" admit that "researchers who strive to use controls, use larger samples, and measure learning more systematically will be in a better position to identify the influence of any remaining contextual factors" and are "also more likely to influence educators, policy makers, and game designers" (2010, 222–23). Humanities methods are an essential approach to the fit due to its access to the meanings and motivations of the afforded actions of the artefact but ultimately lack the validation to provide a systematic metric to judge games by.

Zagal explains that such systematic validity is more the prerogative of the social sciences, wherein the effect of games is more the focus (2010, 13). Often relying on "methods such as surveys and controlled laboratory experiments," the social sciences have delved into the effect of games (idem, 14). The effects of games in an urban context allows for the ascertaining of the city model – the effect created by the game. In other words: it can serve to validate whether the desired citizen behaviour or mindset is achieved. However, as will be explained extensively in 3.2.3, validation research requires expensive, large studies, with large target groups. Next to that, these validations come after the publication, negating any prevaluative value.[34] Furthermore, the validation of effects determines *whether* an effect is achieved, while any contextual knowledge about why is missing. The findings sketched by statistical validation are thoroughly checked but are hard to upscale, holding true for a specific test group at a specific time only. Varying appropriations, covered by humanities research, or design faults, are not covered by this

[34] While validation is possible during design, often in the form of playtesting, this would require academic influence on the design process, or significant social scientific expertise among the designers. Iterative design would take the findings of such mid-term validation and adapt the design, for a further round of testing. This is common in design studies, but does not yet reflect explicitly on the fit.

validation. Still, the systematic and experimental nature of the social sciences should not be relinquished, but it should be complemented.

Reverse engineering can access player appropriation and ensures systematic, validated credibility of city effects. Such an inclusive method is not found in the social sciences or humanities alone, but instead in what Zagal calls the industry and engineering approaches to games (2010, 13). Described by Eldad Eilam as "the process of extracting the knowledge or design blueprints from anything man-made" (2005, 3), reverse engineering presupposes that from the final product and its interaction, more insight about its design and its original goals can be determined. This method is often ignored in social sciences and humanities as it is more attuned to the industry and engineering approaches on the product and the design, where it is mostly used for unpacking technological innovations or design improvements (Zagal 2010, 17). As such, reverse engineering is more often seen as "the process of discovering undocumented internal principles of a piece of code" (Dolan-Gavitt et al. 2015, 1). Often solely product focused, reverse engineering occurs mostly in the natural sciences, in the hopes of gaining mastery of a system in order to improve or copy it (within different levels of legality) (Thayer 2017). The documenting nature and product focus makes this method highly applicable as a bridge between disciplines. By starting from the product, reverse engineering can be complemented with both humanities and social science insights. The product focus allows for attention to affordances, thus including player appropriation and signification from humanities. Simultaneously, reverse engineering allows for a systematic and repeatable unpacking of a game, explicitly exploring the post- and pre-conditions of the interpretation of the city, mirroring the social scientific experimental setup. This method will first have to be adapted to deal with the main demands of the other two disciplines, discussed in 3.2.3 and 3.2.4. Reverse engineering itself will be explained and adapted for an interdisciplinary context in the 3.3. First we will discuss why an interdisciplinary approach is required as extension to social sciences.

3.2.3 Social Sciences Intervention: Statistical Validation Alternative

The complexity of the problem, and the interdisciplinary nature of the question illustrate the need of the fit, but what is the benefit of the fit over others? As the fit deals with checking which goals are achieved within specific designs, it touches most on validation approaches or seeing if a game achieves the intended purpose *after publication and testing*. This (mostly) social scientific methodology studies the pre- and post-conditions in order to determine effects and correlations. How does the fit relate to this more social scientific approach to validation?

The standard metrics governing validation research are "effectiveness in task completion or efficiency in error rate" (Nacke, Drachen, and Göbel 2010, 40). The task is however a fluid category. Entertainment games for instance are checked on their sales – validated in terms of their economic viability – while other games or apps are subjected to validation research to see if they fulfil their function as effectively

as possible. Although an established methodology, it has its shortcomings on a structural and temporal level when studying the fit.

Structurally, statistical validation wrestles the influences of context thoroughly under control by relying on experiments. This is a far cry away from the vibrant and dynamic context of the city, as it only reflects on the validity of the effect for a particular test group at a particular time of study, with few generalizable findings. The fit instead checks what is possible with a game in a great variety of contexts. The limitations in the upscaling of statistical validation makes it a less suited metric for the study of urban games. The fit focuses on possible variations instead of singular correlations. Furthermore, the fit is solely object oriented, only working with an implied player, sidestepping the question of representation in a specified test group. This allows the emphasis of the fit to be on probability instead of correlation. It allows for the prevaluation – a pre-evaluation – of the possibilities of a design, further discussed in 3.2.5.

Regardless, experimental research such as validation studies, is not closed to innovation, and a metric such as the fit can replace these otherwise useful studies in their search for (different) demonstrable effects. Ruud Jacobs (R. S. Jacobs 2016) shows that there are demonstrable effects of persuasive games. Recognising the problems outlined above, he gives pointers to increase the generalization of validation research for persuasive games:

> [A] diverse toolset should ultimately be used to elevate the study of persuasive games to generalizable levels, linking game elements to effects to be able to predict future games' impact, and linking all of the factors in game, player, and play session to differential processing routes matching scales exist, it is better to develop tailor-made scales that exactly fit the game and to subsequently perform factor and reliability analyses validating their sensitivity and specificity (2016).

An essential step in overcoming this limited scope of experimental validation research is "to create tailor-made scales that exactly fit the game," according to Jacobs (ibidem). Notwithstanding his explicit call for attention to a fit, he continuously references linking and predicting effects to game elements, as well as game factors to the player. The city models, from designers or players, can all be read in his call for tailor-made scales. The fit then functions as an alternative to validation research, including context and measures of tailoring. It exchanges minute correlations for general possibility, looking at all that is possible, instead of what is happening at one moment, but measuring efficacy through different metrics. This allows the fit to upscale possible future validations.

Lennar Nacke, Anders Drachen and Stefan Göbel further substantiate the need for an alternative category that manages to balance context, players, and game interface. They argue that serious games are mainly judged on how their user interface is interacted with, while there are no metrics that validate whether the serious goal is effectively reached (2010, 40). In effect, Nacke et al.'s critique echoes the

criticism on the magic-bullet theory from chapter one, in which the interaction with the interface is deemed unilaterally leading to the desired goal. Nacke et al. argue that a framework is needed that takes "1) The requirement for addressing human needs beyond the instrumental; 2) Affective and emotional aspects of interaction, and 3) The nature of UX [user experience] itself" (2010, 43). They further elaborate on the specific alterations that Jacobs suggested, opting for a more player-centred perspective. A tailor-made human-centred perspective on the game itself should be added to validation research. The fit can provide in this measure as it focuses on the game from a human-affordance perspective and takes into account multiple appropriated (possibly through emotion) alternatives. Within validation research there is therefore a legitimate need for a metric such as the fit.

Validation research is encountering problems that limit the scope of its answers. There is a call for tailor-made scales as well as a more object oriented approach. While the fit offers an alternative to statistical validation, it does so by measuring a different form of efficacy. This means the fit does not replace statistical validation but instead offers distinctive additions and alternatives to validation. Chief in this is the product-centred perspective. However, both from an engineering and humanities point of view, this also needs scrutiny, as the fit has to cater to the capacities of the product.

3.2.4 Unfitting Game Design

Within engineering and affordance studies, games are presented as in need of closer attention to multiplicity and closer attention to design when validating the efficacy. With the surge of the experience economy, preconditions for studying the fit have been published before, as will be discussed in detail below. These preconditions explicitly go against the magic-bullet theory, add critical potential, and forward game design as key influence.

The Laboratory for Semantic Information Processing from Bamberg, Germany (Matyas et al. 2008) explicitly calls for the acceptance of multiple interpretations in design. They argue that many location-based games are actually veiled "games with a purpose," and that through the game mechanics, the players could be made to perform monotone and repetitive tasks – often in order to gather GPS data (Matyas et al. 2008, 244). They highlight a central question that needs more scrutiny in games in general: "Is a game particularly designed for the purpose of collecting geospatial data still perceived as entertaining?" (ibidem). Fitting a game to its purpose of data gathering relies on a different city model than a game for entertainment. Despite the difference in city models, depending on what basis it is judged, the game can be a success or not. In this case the game could fit its purpose, or it could fit the player enjoyment. Matyas et al. ultimately identified in their studied game that the primary goal of the data gathering was hardly ever achieved due to discrepant values of the data gathered and the value of the data for research. Secondary goals such as entertainment were met, showing that the game they analysed fit its entertainment goal. From Matyas et al.'s analysis we conclude that the fit needs to

acknowledge alternative outcomes, outside the desired goal. As such, the fit can serve a critical purpose that goes beyond simply checking whether an effect is achieved, but more checking *which* goal is achieved *when*.

Deriving from this is further attention to misfits. These have been identified more often, recognising the acknowledgement of alternatives while simultaneously recognising and discerning strengths and weaknesses contained in the design. Girlie C. Delacruz, Gregory K.W.K. Chang and Eva L. Baker (2009) "examined how the inherent nature of mobility, location and interaction within LBMGs is what will make them particularly more useful in education and training environments" (Delacruz et al., 2009: 265). They discovered that critical thinking, problem solving, collaboration, and communication were specifically well suited for location-based games due to the blend of real and virtual. Engaging in a fictional space in the real world urges you to problematise existing situations and offers freedom to explore and experiment, all the while relying on interaction with your environment and peers (idem, 258-259).[35] Other characteristics attributed to these games, such as learning math skills, were deemed less attainable. Their findings advocate for a recognition of strengths in designs; an idea that goes against the magic-bullet theory. The fit as a category can be a means to qualify and quantify which designs suit which city models better, and even if games serve targeted uses at all. As a metric, the fit dives deeply into games and reflects on the foundations efficacy claims are built on. When fulfilling the call for more product-centred validation, the fit then has to cater to the further call to design specificity, thus justifying a deeper scrutiny of the game from the product on out.

The most direct mention of the fit comes from the discourse on advergaming – ludic content created for the purpose of advertising or brand marketing. Khim-Yong Goh and Jerrie Wenjie Ping look at "the extent to which the advergame matches with the theme or image of the advertised brand" (2014, 398). Goh and Ping show that a message coherent with the in-game representation – so with a fit between game and message – is essential to make design choices such as interactivity or originality contribute to brand recall (idem, 411). However, in doing so the end goal should not be the sole focus; the game design should receive ample attention. When Goh and Ping test the fit in games, they skip any selection criteria regarding how the match is determined. They for instance argue that the energy drink Red Bull fits with racing games due to their fast pace, but an explanation leaves to be desired (2014, 398). While they mention and use the fit beyond superficial relations, Goh and Ping do not contribute to the systematic and game design sensitive discussion of the fit. The game itself should be part of the analysis, instead of treated as a black box.

The fit then has been recognised as a useful and poignant category in game design due to its multiplicity and in-depth reflection on design. The fit has to cater to these lacunae that have been identified in the study of game products. As these authors have identified game design as main actor in the efficacy of

[35] For more information on these kinds of findings, see chapter five.

these games, the fit should start from there in order to tackle experiences. We have now seen how the fit is needed within social scientific methods and engineering studies, but the humanistic and urban studies link to the city is still missing.

3.2.5 Urban Fitters

Why the fit is useful when studying games is clear now. Yet why such a metric also finds its demand in *urban* games has a historical tradition. The vocabulary for tweaking the match between game and city is hardly coherent. Precursors of the fit can help refine it, as well as offer insight into how our understanding of the urban game positions itself in the call for a fit. Key to this position is an object-oriented and "seamful" understanding of urban games (Chalmers, MacColl, and Bell 2003).

One such precursor is 'appropriate technology,' which illustrates the need of the fit to be determined from the object on out, instead of the political climate. For a long time "scientists and engineers thought that what works in an American lab will work anywhere in the world" (Banks 2016). Only in the 1960s, "[a]ppropriate technology," so named by British economist E.F. Schumacher, starts to focus on "technology tailored to fit the psychosocial and biophysical context prevailing in a particular location and period" (Willoughby in Banks 2016). Appropriate technology turned into a set of philosophical tenets about the social role of technology in political economies. Jennifer Daryl Slack and J. MacGregor Wise rightly criticise appropriate technology in the 1960s as solely a countercultural outing wherein maker spaces produced local artefacts, bringing a semblance of control back to the more well-off citizens (2015, 90). What was 'appropriate' in technology was judged by arts and craft movements that functioned in a context that favoured the highest aesthetic outcome for technology and artefacts. This made the appropriate technology approach highly dependent on the ideological conflict of control that appropriated technology to go against profit-minded corporations (Slack and Wise 2015, 91). The main tenets liken a fit-like concept but it are still highly judgmental and political. Appropriate technology as precursor to the fit still ignores the larger biotope and other possible reactions. While it is impossible to claim impartiality, the fit counters this individualistic political focus by assessing the match from the artefact on out, looking instead at the city model (that informs the appropriateness) the designers pursued, and the actual functioning in the public setting through the affordances. By taking the object as starting point the appropriateness is tested from affordances on out, instead of an ideological magic-bullet conviction. The fit then focuses analyses on the technology itself, and not just the context when talking about the city. The context is still addressed when accepting the multiplicity of interpretations of design. In doing so, both games in general as well as urban games call for a more product-centred approach when it comes to matching games to their goal.

Another precursor is ‘seamful design,’ which stresses the importance of a focus on the limitations and appropriations of the game. Seamful design, thusly named by Matthew Chalmers in his approach to ubiquitous computing (2003), elaborates on how artefacts can fit the context. Seamful design is an answer to Mark Weiser´s seamless design (idem, 11). The latter would try to guarantee a persistent globally correct game-state by hiding and glossing over “the technical cracks and bumps in the joints between those components as well as the user’s experience of them in the system” (Broll and Benford 2005, 157). Seamful design on the other hand “tries to reveal inevitable seams in [ubiquitous computing] systems and use them to increase the awareness for system infrastructures, their heterogeneous components and otherwise neglected yet useful information within the system” (Broll and Benford 2005, 156). These seams are usually caused by limitations of technology that do not blend perfectly with the physical reality. By drawing attention to these seams the focus is replaced from the task to the tool itself. Instead of blindly staring at whether the goal is achieved, focusing on the seams can show what the game makes the players focus on and what this can achieve or not. A seamful approach to urban games then studies the places which the player can appropriate and therefore the city models stemming from that. In doing so, a decontextualised object-oriented engineering approach is expanded with humanities signification.

The fit offers a systematic explanation of the goal and possibilities of a game, clarifying any intuitive decisions or expectations. Calls for appropriate and seamful/seamless understandings of contextualised technology makes the fit a necessary means to discuss the rising tide of urban games. The relevance of the fit as metric for urban games should now be clear. But even as an alternative to statistical validation, with a completely different focus, its value as a whole should be specified. This means introducing the fit as a means for *prevaluation*.

3.2.6 Prevaluation

The fit must be understood as an epistemological category that will shed light on urban games and their relation to serious goals. It allows “think[ing] through” the measures that shape and give rise to success in urban games in order to understand them better, identify duds earlier on, and improve future designs (Ferri et al. 2018, 16). Many game designers already consider these questions more intuitively. The fit instead provides a metric that charts these decisions explicitly, systematically, and academically supported. It is a means to *predict* probable functioning constellations of game and issue, more so than proving any causal success after publication. As such, the main capacity of the fit is *prevaluation.*

The neologism is a portmanteau between prediction and evaluation, effectively predicting whether a game design *could* work to achieve a particular urban goal, *before* the game has been published and submitted to various validation and effect studies. Instead, ascertaining the fit allows for charting the general ballpark of city models the urban game can conjure, showing whether a designed game in its

current form affords the city model amongst the possible interactions. Through the charting of pursued and afforded city models through the loops and metagames, the fit can highlight the conditions under which a particular city model can be conjured through the players' interaction with the game (possibly amongst other models as well). By looking at the designed game, the fit can prevaluate what actions the players are capable of doing under which consequences and whether these actions match the city model intended. It is thus a conditional metric.

Furthermore, the fit allows for the identification of the conditions that facilitate the attainment, and possibly discover design patterns that are stronger when pursuing certain city models. This fulfils some of the faults of validation research in that it explicitly pursues the context, leaves space for player appropriations or emotions, and specifically focuses on the game, while simultaneously leaving room for specialist reflection.

The epistemological nature of the fit diverts it from validation research that searches more for correlations. However, in the context of urban games, the prevaluative character may prove a boon. Christina Ampatzidou et al. reflected explicitly on the object of study by "thinking in terms of separate game mechanics, which when used in balance, create a successful player/participant experience" (2015, 185). One of their findings was that proving that individual mechanics cause the communication of specific values is close to impossible due to interfering variables. Their approach instead sees the *combination* of various game mechanics and their affordances as formative for the capacity of games to foster civic engagement. They acknowledge that establishing a connection between game mechanics and participation tool can improve the capacity of games to foster civic learning (idem, 195). As such, exactly the lack of a focus on correlations can be a strong suit for the fit as a metric. By building on the exploration of combinations of mechanics, as in the loops and metagames, the fit provides an overview of combinations that may yield particular civic consequences. How the fit should be looked for can now be discussed.

3.3 Interdisciplinary Reverse Engineering

We now know what the fit is, what forms it takes, why these forms exist, and why it is a valuable metric. Now we shall discuss how to find it. In accordance with the interdisciplinary necessity when addressing this problem, reverse engineering will be forwarded as the best method for the job. To adequately compare and contrast development cycles and their consequences for urban games a method is needed that can jump between the different levels of play, design, and city models. In doing so, computer science methods will enrich humanities game understandings and social science validation research with an approach to games that allows for the careful dissection of the layers of the life cycle of an urban game. In this section we will introduce reverse engineering in its general and engineering form. First in 3.3.1,

the main benefits and contributions of this process of reverse engineering will be discussed. Next, in 3.3.2, the general epistemological build-up of a reverse engineering is explained with reference to E.J. Chikofsky and J.H. Cross' life cycle outline (1991). To exceed its usual focus on the product and software, reverse engineering should be complemented with interrogations from the humanities and social sciences. This epistemology shall be used to adapt reverse engineering to fit the interdisciplinary approach to urban games, adding humanities and social/urban science approaches. Ultimately this adapted structure of reverse engineering will be used to form a method of determining the fit in the next section.

3.3.1 When to Reverse Engineer

Reverse engineering manages to make the decisions going into design visible, unpacking the often intuitive process. Reverse engineering is useful in that it is conducted from the product on out, recovers the design and its influence on the product, and re-documents everything that has gone in and come out of a product. These three uses of reverse engineering make it suited as a structure to investigate the fit as it focuses on the affordances, looks for city models, and charts it systematically for comparison.

First of all, reverse engineering is product centred. Engineer Ken Thayer defines reverse engineering as "a process that examines an *existing* product to determine detailed information and specifications in order to learn how it was made and how it works" (2017; emphasis added).[36] The focus on existing or man made products distinguishes reverse engineering from natural scientific research which tries to understand the build-up of the natural world (Eilam 2005, 3). The benefit of the focus on the product is that it gives on-hands access to the material, from which the design, decisions, and underlying goals can be reconstructed. This means sidestepping the game designers or developers for answers. The benefit of this is that it makes ascertaining the fit and prevaluation more accessible to everyone in possession of the urban game and relieves scholars from trying to contact busy designers who often have more urgent matters to attend to than an academic study.

Next to logistical benefits, product-centred approaches fit in with the affordance-centred design perspective. As explained by E. Chikofsky and J. Cross, and shown in Figure 3 on page 11, the finished product grants access to the unplanned ramifications (the afforded play) as well as to the existing design. Finding out the decisions, the alternatives rejected but (possibly) afforded, and the overarching issue or city model is then the purpose of the reverse engineering analysis. From the start then, reverse

[36] This practice has a long history wherein users tried to figure out how mechanical or electronical equipment worked – such as those tinkerers that build their own radio. With technological advancements software became the main product of analysis, dissecting the code that made the programme. This happens both illegally by hackers with the goal of copying a product or legally within the industry to gain a competitive edge or gain more control over their own (often outdated or messy) software. This code gained a metaphorical dimension when also natural phenomena were assessed through spectrometers or after genetic engineering.

engineering is not based on the assumption that whatever design decision is made, the desired goal will be achieved. Quite the opposite, it starts with all possible actions and affordances and strives to reconstruct what decisions contributed to this. As such, the product centred reverse engineering goes against a magic-bullet theory and instead relies on affordance analyses to find out what kind of city the urban game can achieve – an analysis usually left to humanities scholars.

Secondly, reverse engineering focuses on the documentation of the capabilities of urban games. While partly due to copyright protection measures, the lack of documentation stems partly from the intuitive nature of game design. Trial and error approaches, coupled with repeated alterations through playtesting, makes the process of design less organised (Fullerton 2014). Next to that, the entire functioning of the design strategy at some point becomes a given and does not need further documentation. Even when studying the game in the humanities, charting the design of a game ultimately yields an exclusive image of a whole due to selective choices. Reverse engineering instead allows for what Andrew Huang calls "eavesdropping" (2003, 119),[37] virtually sitting in on the designers when they made their decisions, but this time, actively writing it down.

This documentation has further added benefit since, as explained by Jacob Krüger et al. (2018), the designers of the games often hand over the source code of a game to developers. These "start with a single product that they clone and adopt for new customer requirements, which is referred to as clone-and-own approach" (2018, 1). Due to the many clones built on top of the source code and thus diverging from the initial understanding, the documentation of the game becomes outdated and lost. Through reverse engineering one can return to a software-product-line – a recurring base structure to which features can be added – from which the original can be recovered and documented (ibidem). The many scavenger hunts with various purposes discussed at the beginning of this thesis suffer from this dilution through stacking. Figuring out what purpose these games served initially can be essential to dispel any overly simplistic adaptations of urban game forms. The documentation possibility then is essential for the fit for its use as metric against magic-bullet oriented clones.

Thirdly, for the fit, such a documented look into an urban game is important, but is not enough, as it misses the aforementioned attention to the city and the afforded forms of play. Chikofsky and Cross expand re-documentation with what they call design recovery exactly for such purposes, by including "domain knowledge, external information, and deduction or fuzzy reasoning to the observations of the subject system to identify meaningful higher level abstractions" (1991, 15). Basically, design recovery delves deeper into the documentation, contextualising and signifying every discovered element. Reverse engineering then offers inroads for social scientific and humanities research while unpacking a product.

[37]Some might call this spying or espionage. Reverse engineering does not have the best reputation within engineering research, as it can be used to copy and steal programmes, or create malware (Eilam 2005). The legal status of reverse engineering is not a focus of the current study as we shy away from code-level reversing and stay on system-level (idem, 16). For more information on the legal dimension of reverse engineering, see (Huang 2003; Dolan-Gavitt et al. 2015).

So while reverse engineering offers a structure to identify design elements that shape the fit, a fair degree of interpretation is still necessary. Indeed, Eilam explains that "[e]ventually, it is always up to the reverser to extract anything meaningful from that information" (2005, 10). As such, there is still a subjective measure in our analysis of the fit. A further reflection on the subjectivity of our method will happen in the next section.

Reverse engineering is then a useful structure to follow when ascertaining the fit as it starts from the product, documents the actions and design choices, and contextualises these in a larger domain of knowledge. The output of the product and the documented choices can then be compared to determine the fit. Humanities and social sciences approaches overlap with steps from reverse engineering. In order to pinpoint and position their exact contribution, the epistemological tenets of reverse engineering are illuminative.

3.3.2 The Epistemology of Reverse Engineering

Chikofsky and Cross have outlined the underlying mental map that governs reverse engineering. This mental map of life cycles and abstractions will be outlined and appropriated to incorporate afforded play and the city model. Ultimately, this mental model shows the debt of reverse engineering to humanities and social sciences.

Every object that is reverse engineered – the subject system – is the result of what Chikofsky and Cross call a life cycle. This is a directional graph depicting the development of the product. While game development is often iterative and less linear than these graphs, Chikofsky and Cross argue that "its general directed-graph nature lets us sensibly define forward (downward) and backward (upward) activities" (1991, 14). This life cycle is divided into several layers that represent forms of abstraction, with the start referring to general concepts and goals the subject system must fulfil, and the end referring to the concrete measures of implementation, as shown in Figure 14 (ibidem). Reverse engineering spins this life cycle around, which means working back from an implemented system through its design to the general concepts that informed design decisions. As the life cycle approach is a model – a means to understand a complex phenomenon – the levels of abstraction will not be ontologically representative.

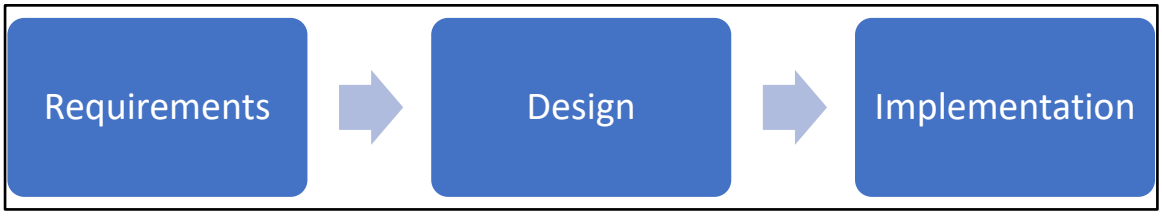


Figure 14 Chikofsky and Cross' model of a forward life cycle. Requirements are designed into elements that make a game. Then the implementation is the actual shaping of these elements into a game format: the programming and building. Source: Author creation

As Eilam already states, the reverse engineering only provides information; how to make sense of this is up to the reverser (2005, 10).

The levels of Chikofsky and Cross are attuned to software analyses. These are general enough to adapt to the subject system of the fit. The following three abstraction levels form the life cycle of a product, outlined in Figure 14 according to Chikofsky and Cross (1991, 14):

- requirements (specification of the problem being solved, including objectives, constraints, and business rules)
- design (specification of the solution)
- implementation (coding, testing, and delivery of the operational system)

The requirements, design, and implementation levels can be appropriated to form the life cycle of urban games. The first level, the requirements, or "specifications of the problem being solved" (ibidem), can be understood as the city model. As a set of rules, objectives, and expectations of what an urban game should achieve, the city model lays down the requirements that are pursued. The empirical characteristics of instigator, ideology, aspect, carrier, and citizen action, have to be identified when designed into the game. If afforded models still fit largely with the pursued city model (or its general category of city model, discussed in 2.3.3), the game can still fit with its design. Note that this requirements layer is initially shaped by the *designers* and is often inaccessible to the user and thus has to be reconstructed (Eilam 2005, 10). Building on the validation research of social sciences, this first step of the reverse engineering relates to the pre-study situation that outlines the goals and its reconstruction is therefore paramount when ascertaining the fit.

The second layer of abstraction is the design layer, which represents the series of decisions that lead to design specifications for a product. The required city model characteristics are translated into game design elements. In the case of an urban game as we under understand it, these elements mean a collection of loops and metagames. This translation is done by designers, and thus has to be reconstructed in order to become known. As explained in chapter one, these design decisions solely account for an imagined ideal interaction. This is different from the layer of abstraction described in Chikofsky and Cross' version as they solely regard the *speculation* of the solution. Their interpretation implies that speculation directly translates into implementation (the next layer of abstraction). However the implementation is not solely formed by the speculation as ideal decisions have consequences in the shape of affordances. Hence the moniker of design is used here. This is the most industry and engineering approach aspect of the reverse engineering because here the object itself is examined, side-lining the player.

The final layer of abstraction – the implementation – re-introduces the player and relies on humanities approaches. For Chikofsky and Cross the implementation layer of abstraction means the actual product,

the coding, the material; the interface the user gets to see. For urban games, the implementation is quite similar, but reintroduces the player by looking at the side effects. The product is appropriated through play resulting in unanticipated actions. These side effects are essential in order to see whether the game, in its implementation, actually meets the requirements – actually fits the pursued city model. Based on what is afforded, reconstruction can show how different requirements are met, which is where the first semblance of a misfit can be found. Identifying the side effects means discerning all signification attributed to the game through appropriation. An opening for humanities methods, the implementation layer of reverse engineering charts all afforded elements that are needed to reconstruct the life cycle of the urban game.

Above we have described the forward life cycle – from idea to product. Reverse engineering urban games means going up the ladder of abstraction, from implementation to requirements, from the game and its affordances on out. It is therefore possible that the reverse engineered abstractions do not correspond to those initially pursued. As outlined in the previous chapters, the city model that makes up the requirements could differ from the reverse engineered requirements due to side effects or afforded design. By reverse engineering the requirements (the city model) from the implementation (the afforded game) on out, the city model(s) that is/are actually contained in the game can be discovered. With the reconstruction from player appropriation on out, reverse engineering requirements yield the city models that *would have* informed the design *if* the appropriation by players was actually the pursued interaction. The reconstructed city models (*the as ifs)* can subsequently be compared to the city model present in the requirements that informed the design layer (the pursued city model), which is reconstructed from the signified interaction in the design. This comparison is what will illustrate the fit.

Turning the structure into a method requires hearkening back to the previous chapters. The explanations of human-centred urban game design and city models will inform how to 'engineer' the pursued concepts as will be shown in the next section.

3.4 Action Space Analysis

The structure and openings for adaptation of the reverse engineering are now clear – traversing the levels of abstraction ultimately ending in comparison – but how to go from one level to another? This section will adapt the steps of reverse engineering into what we call an action space analysis by explaining a) the implementation step, or how to identify and organise the afforded actions in the implemented product in 3.4.1, b) the design step, or how to identify the explicit design decisions from the affordances in 3.4.2, c) the recommendation step, or how to create a collection of city models from the afforded interactions

in a game in 3.4.3, and finally d) the comparison, or how to compare the forward engineered city model with the reverse engineered city model in order to determine the fit in 3.4.4.[38]

An important specification has to be made about the purpose of the action space analysis, specifically the sensitivity of the method described here. This study set out to answer how action space analysis can investigate the fit between the pursued city model and the afforded city models. Implicit in this objective is prevaluative focus on singular designs; the action space analysis looks at how well a design fits its own pursuits. As such, the sensitivity of the action space analyse measures the fit against the pursued city model and its corresponding city model category only, as that is the main unit of succesful communication in a singular game. A higher sensitivity for the action space analysis can investigate the fit between the afforded city models of a design and alternative categories of city models, beyond the singular pursued city model. This higher sensitivity would check which city model categories are communicated in the current design, possibly informing alternative uses. This is however beyond the scope of our prevaluative use of the fit presented here. As such, our exposition of the action space analysis here assesses the fit in relation to the pursued metagame within a singular game.

3.4.1 Implementation: Charting Affordances

Reverse engineering starts with the final product from which a table with all the afforded loop groups organised in different rows will be formed. Software reverse engineering is an in- and output query. Using other programmes, all possible inputs are added to a product and the outputs are gathered (Huang 2003, 120). The in- and output links are used to reconstruct the code that explains the in- and output couples. However, in urban games, in- and output are the result of appropriations of affordances by human actors in a specific context. This is where humanities research must complement reverse engineering.

To reiterate, “an affordance is a relationship between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used” (Norman 2013, 11). The affordance then is not a feature of the game, nor is it a skill of the user. Affordances arise through the interaction between the capacities and limitations set by the design, and the ability of the user to appropriate these to their own liking. Altogether, the affordances create an action space, which is a finite collection of possible activities and meanings made possible by the design.

[38] The structure of the method is an epistemological model. As Chikofsky and Cross also admit (1991, 14), game development is not as linear as depicted here. Often there are iterative processes and a variety of testing moments. These elements are black boxed in the current model. Furthermore, the player and the designers are not included in the process but are instead implied in the affordance appropriation and explicit design structures respectively. While reverse engineering is used for opening black boxes, the creation of black boxes is a prerequisite for adding structure, and, in our case, combining the different disciplines together to determine the fit. As we are interested in results or origins of the circular process, black boxing the actual iterations is justified.

We have seen that the designer can suggest but also unknowingly add affordances when making design decisions about loops and metagames. These offer *observables* that form the space of possibility. Loops and metagames offer a contextual approach to games and direct the affordance analysis, but is not the only taxonomy of game elements. Many authors have offered their own curated overviews of game elements (See Avedon 1981; Salen and Zimmerman 2010; Fullerton 2014). As such, no selection of game elements is going to be as expansive to encompass every possible affordance or as objective as the compilers in software reverse engineering. Regardless of the selection, the humanities embrace the subjectivity when discerning the significations given to acts of play. The focus should therefore not be on the selection of observables but more on their function within urban play when it comes to structuring the analysis of affordances. In this method, loops and metagames offer a taxonomy of observables in urban games that are more attuned to a contextualised use than abstracted outlines of formal elements. Identifying affordances can then be done by framing the afforded relations in terms of loops and metagames.[39]

As the loops are the repeated actions of the player that lead to progress (in the game or in skill) and the metagames depict the contextual relations relied on by the player, the game will be adequately represented if all affordances are found and phrased in these categories. As explained by Sicart (2015), the loops, and especially the core loops, are dominant for the formation of the other loops and metagames. As the main action of the game, it determines what contextual relations and optional actions are afforded as well. Therefore, the entry point of the collection is the specific core loop. Each core loop is then paired with its secondary loops and metagames forming loop groups, before identifying a new core loop or the same core loop with different afforded loops and metagames. As such, the rows of the table form different afforded groups of actions and relations.

Collecting the afforded interactions must be monitored by the expert. However, the exploration play can be outsourced to playtesters who are instructed to simply explore all possible forms of interaction with the game.[40] Spaces of possibility can be considerably large and therefore it is recommended that the expert enlists playtesters to discover affordances. The appropriative nature of the player, we argue, will ultimately lay bare a great variety of loops and metagames. It is possible, although more time intensive, for the expert to chart the affordances themselves. Regardless, the expert must record the exploration

[39] For full clarity, our gaze is guided by several categories designable into urban games. These categories stem from Gabriele Ferri et al's PLEX/CIVIC framework (2018) and they serve as searchlights when grouping affordances. The categories are: individual impact on player's life, agency on real cityscapes for the player, relatedness and empathy to others, participation in actual processes, empathy, awareness and understanding of the roles of others, changing perspectives, scenario building and exploration, and actual action (Ferri et al 2018, 6). These categories help identify and group afforded actions but holds no further bearing on the repeatability of the method.

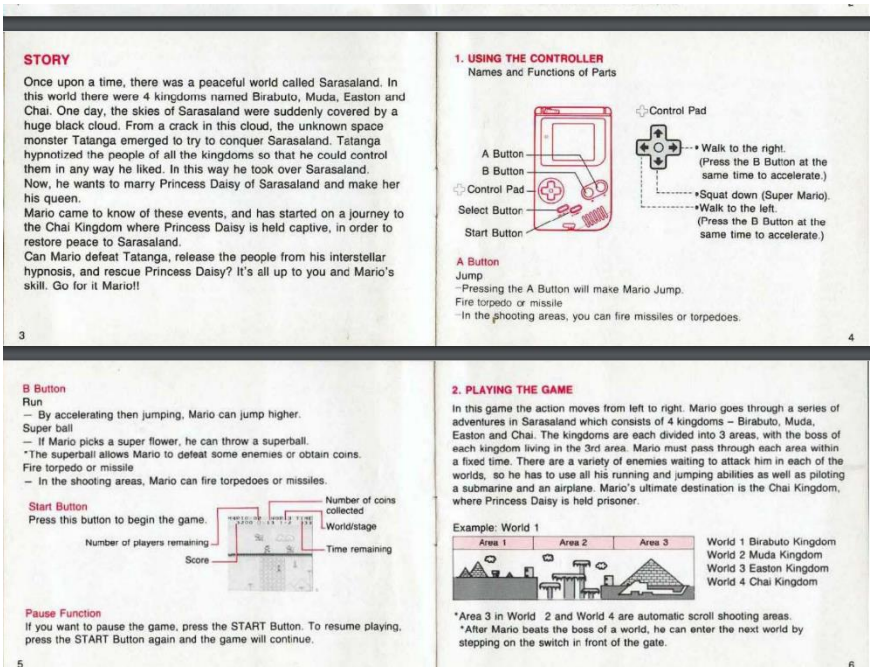
[40] Depending on the purpose of the fit that is required of the game (prevaluate prototypes, reflecting on designs, etc.), this inclusion of the player at this point in the method can be used strategically. By selecting the playtesters from your target audience, or interpreting the affordances through a persona can make the scrutiny of a specific fit stronger.

activity and subsequently identify the loops and metagames discovered during play. This identification requires familiarity with the framework and is thus a task for experts.

3.4.1.1 Loops

First, the core loops, as the repeated actions to progress, must be identified. Since they are related to progress and an ultimate end state, the core loops implicitly contain the main rules and goals of the game. The core loops can be made apparent, as many games explicitly instruct the player to perform said actions, however depending on the appropriation of the player, other unapparent core loops may arise too. An explicit loop can be found in game manuals, for instance in SUPER MARIO LAND (MARIO) THE player is instructed to move to the right and jump by pressing the A button (Figure 15), if the empty space on the right of the screen was not enough of an indication. Yet such highlighted loops in no way encompass the complete breadth of affordances.

Secondly, charting the affordances also means looking closer at optional secondary loops, and the player-added secondary loops. The designed secondary loops are usually explicitly made clear in the game as well in a manner similar to the core loops. Player-added secondary loops were introduced in chapter one as secondary loops in a game that have not been explicitly designed or foregrounded in the game but that the player creates within the space of possibility to enhance their experience. With these categories in mind the expert can collect the afforded actions. The next step becomes to determine the afforded metagames that make these actions possible and give them meaning.



STORY

Once upon a time, there was a peaceful world called Sarasaland. In this world there were 4 kingdoms named Birabuto, Muda, Easton and Chai. One day, the skies of Sarasaland were suddenly covered by a huge black cloud. From a crack in this cloud, the unknown space monster Tatanga emerged to try to conquer Sarasaland. Tatanga hypnotized the people of all the kingdoms so that he could control them in any way he liked. In this way he took over Sarasaland.
Now, he wants to marry Princess Daisy of Sarasaland and make her his queen.
Mario came to know of these events, and has started on a journey to the Chai Kingdom where Princess Daisy is held captive, in order to restore peace to Sarasaland.
Can Mario defeat Tatanga, release the people from his interstellar hypnosis, and rescue Princess Daisy? It's all up to you and Mario's skill. Go for it Mario!!

3

1. USING THE CONTROLLER
Names and Functions of Parts

A Button
B Button
Control Pad
Select Button
Start Button

Control Pad
• Walk to the right. (Press the B Button at the same time to accelerate.)
•Squat down (Super Mario).
•Walk to the left. (Press the B Button at the same time to accelerate.)

A Button
Jump
–Pressing the A Button will make Mario Jump.
Fire torpedo or missile
–In the shooting areas, you can fire missiles or torpedoes.

4

B Button
Run
– By accelerating then jumping, Mario can jump higher.
Super ball
– If Mario picks a super flower, he can throw a superball.
*The superball allows Mario to defeat some enemies or obtain coins.
Fire torpedo or missile
– In the shooting areas, Mario can fire torpedoes or missiles.

Start Button
Press this button to begin the game.

Number of coins collected
World/stage
Number of players remaining
Time remaining
Score

Pause Function
If you want to pause the game, press the START Button. To resume playing, press the START Button again and the game will continue.

5

2. PLAYING THE GAME
In this game the action moves from left to right. Mario goes through a series of adventures in Sarasaland which consists of 4 kingdoms – Birabuto, Muda, Easton and Chai. The kingdoms are each divided into 3 areas, with the boss of each kingdom living in the 3rd area. Mario must pass through each area within a fixed time. There are a variety of enemies waiting to attack him in each of the worlds, so he has to use all his running and jumping abilities as well as piloting a submarine and an airplane. Mario's ultimate destination is the Chai Kingdom, where Princess Daisy is held prisoner.

Example: World 1
Area 1 | Area 2 | Area 3

World 1 Birabuto Kingdom
World 2 Muda Kingdom
World 3 Easton Kingdom
World 4 Chai Kingdom

*Area 3 in World 2 and World 4 are automatic scroll shooting areas.
*After Mario beats the boss of a world, he can enter the next world by stepping on the switch in front of the gate.

6

Figure 15 Manual of SUPER MARIO LAND
The manual of a game often explicitly details the core loops. Image by replacementdocs.com

3.4.1.2 Metagames

As said before, the metagame dimensions should be seen as connected to the loops. The five metagames (informational, fictional, economical, performative, and contextual) give meaning to the actions of the loops. To delimit the meaningful metagames it serves to start from the core loop and its associated secondary loops and determine what they specifically constrain – when are these actions *not* possible. Again, this is done by the expert who charts the circumstances the playtesters function in or how they signify their actions. From this limitation, it becomes clearer what is actually afforded and intended. Therefore, to brave the supply of afforded metagames, it is recommended to start searching for those fitting with the loops.

Only by adding specific meanings to actions does the desired end state come forward. These metagames can further be used to judge the ease of access to some loop groups. This ease of access can help identify the strengths and weaknesses of the design. As metagames remains circumstancial descriptions however, it is more fruitful to chart the *range* of manifestations of metagames instead of minutely detailed descriptions per loop group. This way comparison becomes more consistent and interpretation is facilitated.

Ultimately, the implementation step will yield a collection of afforded actions and their associated metagames. This collection basically is a dissection of the implementation layer of abstraction and an in-depth analysis of the subject system. The loop groups are given meaning through their metagames, which explains different interactions while consisting of the same mechanics. When we introduced the loops and metagames that shaped MARIO in 1.2.2 we technically already performed this step of reverse engineering. As shown earlier, the results of this step for MARIO can be found in Collection 3. The meanings attributed remain a matter of interpretation, yet with the mapping of all possible affordances all means for interpretation are at hand. A start of this interpretation is already in the ease of access, which shows which loop groups require the least amount of investment – physical or appropriative – by the player. The high score secondary loop in MARIO is more likely to be followed as it requires less external knowledge of shortcuts, while simultaneously following only a minor variation to the core loop, as the player only needs to jump a couple more times to get coins. The implementation step charted the affordances of the game. In the next step, the reverse engineering really begins, as we take all the afforded loop groups and try to distil the ideal version from them.

Core Loop	**Secondary Loop**	**Informational Metagame**	**Fictional Metagame**	**Economic Metagame**	**Performative Metagame**	**Physical Metagame**
Walk Right (Right+Jump)	High Score	Locations of Coin Blocks	Less relevant. Focus on	Private Symbolic	Display Skill. Beat	Single Player, but

			Player Stories		competitor scores	demonstrable to others
Walk Right	Speed Run	Shortcuts	Irrelevant	Private Symbolic	Time as mark of skill	Single Player but demonstrable

Collection 3 The results of the implementation step of the action space analysis for SUPER MARIO LAND. In the first column are the possible core loops (in this case only one). The second column shows the secondary loop that expands on this core loop. The other columns show the metagame that give this core/secondary loop combination its specific meaning. Other games might have multiple core loops, each with their own secondary loops, thus providing a larger collection of afforded actions. Source: Author creation

3.4.2 Design Step: Finding the Pursued Interaction

With a detailed overview of what an urban game has to offer, the design – or the explicit design decisions – can now be reverse engineered by the expert. This is the collection out of all the afforded loops and metagames that is most likely to be encountered by players due to its ease of access and explicit signification. This means identifying, out of all afforded loop groups, which is propagated most by the game itself as if it is the desired interaction. This step of the reverse engineering will yield a subset of the collection with affordances identified in the implementation step – a single row containing actions and circumstances – that are forwarded *through the design itself*, which will be understood to mean the pursued interaction intentionally propagated by the designers.

Determining the ideal design requires looking for signified affordances; those actions that the game orders the player to perform and tries to draw attention to. Signified affordances can be found in texts such as tutorial levels or manuals, in interfaces, technology choices, or with minimal play – as it usually is the only way to even progress. Usually the signifiers explain what the game wants the player to do, what they should not do, and what the ultimate goal is. This step then requires the expert to identify the signifiers and constraints influencing the afforded loops and metagames, and use them to determine the intended interaction. In MARIO the signified loop group is easily discovered by looking at the expressive manual. Here walking right and jumping are emphasised, as are actions that deal with defeating enemies. The core loop is clearly defined, and the high score secondary loop can be inferred from the focus on defeating enemies. Based on this identification, the specific limitations and signifiers of the metagames can be sought out. This design step will then outline a selection of the affordances: the dominant loop group (for MARIO the walk right + high score loop group). This specialisation, as well as all the other affordances, are carried over to the next step. Note that this reconstruction of the signified interaction is not yet a city model. It is a reconstruction of the decisions that went into signification.

Although a new layer of abstraction, the benefit of this step in the reverse engineering process is that, as we are dealing with decisions, the pursued findings are finite. They are the most likely to occur due to the explicit signification. Whereas these are the signified designed interactions, this does not mean that they always fully match the city model pursued by the designers. The reconstruction in this step solely represents the designed and signified affordances. Furthermore, the other affordances also can occur,

which may highlight design elements that convey a completely different city model. In the next step, the pursued interaction, as well as the other interactions and design characteristics will be transformed into city models – the step before ascertaining the fit.

3.4.3 Requirements: City Models Informing Affordances

The third step of the reverse engineering method is turning the afforded loop groups into the city models they communicate. This also means translating the signified interaction into the pursued city model. These city models represent the requirements level of abstraction, depicting the communication goals that are required to be communicated through the game. By reconstructing the city model from an afforded loop group, we will gather the requirements that are needed to communicate this model through the current design. Whether this city model matches the pursued requirements is what will be judged through the fit in the next step. Reverse engineering shows all other possible requirements that can be distilled from the game. Identifying which different city models can be communicated through the same game can be used to understand why alternative interactions take place or how dominant the ideal interaction is. Since every city model pursues a largely general engagement, guiding the translation through the city model categories outlined in chapter two can help the identification of the city model from its loop group. The category serves as the broadest possible understanding of the city model, thus specifying its characteristics during the interpretation will yield the city model.

To translate the afforded loop groups into the requirements a cypher is needed that explains which loops and metagames translate into which of the six characteristics of the city model. As explained in chapter two, game design decisions (so the loops and metagames) can inform the key actors, the aspect of the city discussed, the ideology behind the city, a main instigator behind an ideology of the city, a carrier to disperse the message, and the actions the citizens must perform. Translating the loop groups into these characteristics follows the relationships explained in chapter two in Table 4 on page 78.

Simply filling in this table with the data from the loop groups from the collection of affordances created in the implementation step will not necessarily yield any insightful results. The loops and metagames are phrased as actions or descriptions such as 'Private symbolic with corporate stimulus.' Just adding them together will not yield anything comprehensive. This step in the method requires *interpretation*. Given the loops and metagames corresponding to a city model characteristic, the researcher has to interpret the affordances *through the lens of the characteristic*. This step therefore requires expertise more so than the other steps. The general city model categories can come in useful here. When translating the pursued loop group from the design step, the following considerations can be discerned: The ideology is shaped through any external information added to the game, combined with any narrative spin presenting a particular relation between public and private and their beneficiaries. The city model categories provide general descriptions of the city model characteristics. Knowing which

general description fits the city model category can guide the interpretation by providing parameters within which the characteristics have to be specified. Such interpretations will create city model characteristic descriptions, per loop group. It is up to the expert to determine how specialised the reconstructed city models from all the loop groups are in relation to the characteristics of the category.

Although MARIO is strictly not an urban game, it can serve as an example of the interpretations. MARIO is a purely entertainment game, solely focusing on individual symbolic engagement. As such it fits best with the expressive city model category due to its position on the area of effect and involved actors axes. The characteristics of the expressive city model, shown in Table 21, are general manifestations of the characteristics of the pursued city model. Now the loops and metagames combinations can be interpreted to form a specified version of these characteristics. For the ideology for instance, the informational, fictional, and economic metagame together form this category. For MARIO and its signified high score loop group this means that insider knowledge of score points, player stories, and private symbolic interactions form the ideology characteristic. The expressive city model category characteristic of 'adoption into everyday life' hints at what type of characteristic is possible. Interpreting the metagames of MARIO then shows an ideology focused on individual skill-honing for personal entertainment. This is a specification of the expressive city model in that the adoption of the game provides an individual experience with personal relevance. In a similar way, the other characteristics can be determined, shown in Table 21 for MARIO.

City Model Characteristic	**Expressive city model**	**SUPER MARIO LAND pursued city model**
Instigators of the Model	Citizen	Individual skilled players
Ideology	Adoption into everyday life	Individual skill-honing for personal entertainment
Selected City Aspect	Local individual environment	Competitive personal environment
Carrier	Provided means	Personal skill and insider knowledge
Citizen Actions	Appropriation, signification	Skilful, show-off engagement

Table 21 The inventory of the pursued city model of SUPER MARIO LAND. In the second column is the general category the specific pursued city model is based on. Source: Author creation

Translating all loop groups into their city model characteristics shows all the possible city models arising from a design. On itself, this overview presents all possible uses of the current game design, which could be useful when wanting to communicate a certain city model but are still looking for game design inspiration. The overview of city models then serves its initial function as charting of the capacities. However, when validating or evaluating a game, just knowing which models are afforded is not enough. In this case the final step will be to compare these models to determine which correspond to the pursued city model and on what bases they differ. In other words: to determine the fit.

3.4.4 Comparison: Fitting City Models to the Pursued City Models

Reverse engineering usually only contains the three steps outlined above. To determine the fit, we add and adapt another step. As a means of distinguishing our new approach to the fit from classical reverse engineering, we label our method 'action space analysis'. To reiterate, the fit is a qualification and quantification of how closely the afforded city models match the pursued city model in a designed urban game. The many afforded city models can highlight what parts of the requirements are communicated well, and which are open to, possibly disruptive, appropriation. The pursued loop group and its city model, have been identified in the design and requirement phase. Without any player appropriation, this would be the standard communicated city model. Comparing the pursued city model and its general category to the other city models then will reveal what the game manages to communicate properly, but also what new elements are added or left out. In other words: how well the afforded interactions fit with the pursued goal. The degree of fit can yield insight into the design, the pursued city model, and the player appropriations.

The comparison is again dependent on the interpretation by the researcher. This takes away the necessity to contact the designers, as all elements have been reconstructed from the design at-hands. Comparing the characteristics of the pursued city model and its category to those from an afforded city model will first yield a superficial evaluation of the fit. This evaluation can show how some characteristics coincide, some differ, and some overlap. Based on this initial comparison, it may be clear already on what levels afforded city models fit with the pursued city model and its category. However, the superficial check may need more nuance to determine the fit, especially when combo fits are involved. To fully explain and understand the fit, subsequent quantitative and qualitative offer solace.

3.4.4.1 Quantitative Analysis

Quantifying the fit can help explaining overlaps or mismatches, looking deeper into the characteristic. This is done by diving into the build-up of the characteristics, namely the mapped loops and metagames, to see if they fit individually. Here some interpretation is allowed to account for some overlap or distinction. The formula for quantification is based on an attribution of value to each characteristic, purely serving an epistemological function. Each characteristic stands for 20% of the fit, with each of the loop and metagames of the characteristic making up its associated portion (e.g. in the case of three elements per characteristic, each matching element adds 20/3=6.67% of fit). Calculate the fit values of each compared model by adding up all matching elements per category. The higher the value, the larger the possibility of the afforded interaction communicating the pursued city model. Since the loops and metagames of the categories are more general, the expert must decide if the loops and metagames of the afforded city models coincide with pursued city model completely, or more with the general descriptors of the category, or not at all. Limited overlap, or only an coincidence with the category can be indicated

with a portion of the possible percentages (e.g. in the case of three elements per characteristic, a partial fit or category fit give 3.34% of fit). The complete formula of quantifying the fit then is as follows:

Fit value = ∑(Loops and Metagames overlap of city model characteristics)

=

(Overlapping Instigator elements) + (Overlapping Ideology elements) + (Overlapping City Aspect elements) + (Overlapping Carrier elements) + (Overlapping Citizen Action elements)

=

(Overlapping loops, economic, and performative metagame) + (Overlapping informational, fictional, and economical metagame) + (Overlapping informational and performative metagame) + (Overlapping loops and contextual metagame) + (Overlapping loops, economic, performative, and contextual metagame)

In the case of a 100% fit, the formula would be as follows:

Fit value = (6.67+6.67+6.67) + (6.67+6.67+6.67) + (10+10) + (10+10) + (5+5+5+5) = 100 %

In the case of MARIO and the afforded speedrun loop group, the loops and metagames coincide, except for the fictional and performative. The fictional metagame does not match the pursued focus on player stories due to its purely mechanical focus, and the performative metagame only partly matches due to its different focus. This means the fit value of MARIO is calculated as follows:

Fit Value = (6.67+6.67+3.34) + (6.67+0+6.67) + (10+5) + (10+10) + (5+5+2.5+5) = 80%

The fit is a relational qualifier, meaning that it does not insomuch say anything ontological about a loop group. The percentage of the fit represents the degree to which an afforded city model from the game design matches the pursued city model. The higher the percentage of the fit, the better the communication of the pursued message. This allows for the general interpretation of a game, or pursued interaction, as being useful or not when conveying a specific message. Those loop groups with a low fit can for instance be prevented in order to streamline communication. But what makes a 75% fit better than a 70% fit? Qualifying the fit can give insight into such nuances. To qualify such a difference requires two steps: determining the type of fit and scrutinising the different loops and metagames.

3.4.4.2 Qualitative Analysis

The height of the fit will show which affordances are most conducive to a successful communication. Qualification of the fit can dive deeper into what the different quantifications mean. This qualification is essential in order to act on the fit as it will help understand what parts of the design of an urban game contribute to a (mis)fit.

The first step in determining what a different fit means is the determination of the type of fit. These types depend on the relations between the domains of game affordances, city models, and player appropriation. When discussing the categories of the city model, each characteristic has their own influences on these domains, with some catering more to a specific relation than others. However, qualifying the fit based on the city model characteristics does not always offer insight. Despite the differing metagames, in MARIO the other afforded city model (from the speedrun loop group) has the same characteristics and the pursued city model. The quantitative fits however differ, so it is possible that even with this distinction, the different fits show no considerable difference. To get to the root of differences and to be able to implement change on a game design level, the type of fit must be interpreted using the building blocks of city models in urban games – the loops and metagames.

Each game has an emphasis when it comes to dealing with the city. Games can be first and foremost a game before they deal with any civic topic. Other games are solely there to present a desired engagement with the city, while again others can be understood better as a toy, open to player appropriation. Determining this emphasis or affinity of a game can then explain why an otherwise well-fitting afforded city model still scores lower than others. Going even deeper than the characteristics, the loops and metagames also display a favouring towards positioning in one of the three domains. The specific affinity of each metagame and the loops are shown in Table 22. For instance, based on the descriptions from chapter two, the fictional metagame, dealing with the narratives, is mostly involved in ideology creation and storytelling about a specific city. Stories do not define games nor do they govern player actions, but they do focus on civic activities. Again, if the pursued city model and the afforded city models coincide on this metagame, the chance of a civic fit is higher. For MARIO on the other hand this means that both criteria for a procedural fit have been met, while the others miss a complete match. The informational and economic metagames in both games coincide, meaning that the game properly communicates its pursued city model, but in doing so limits the capacities of the player; they are stuck with the system provided and cannot deviate. Finding the emphases of a game can explain why some efficacies are higher than others. The speed run loop group deviates slightly from the procedures set out in the game, thus resulting in a lower fit. These emphases can help when parsing out why certain designs work better for specific functions, as will be discussed in chapter five. The explanation of the difference is then in the affinity to the focus points in the game; points that most likely touch on all aspects of the game design.

Formative Elements	**Associated Fit**
Loops	Ludic
Informational Metagame	Procedural
Fictional Metagame	Civic
Economic Metagame	Procedural
Performative Metagame	Ludic
Contextual Metagame	Civic

Table 22 The type of fit corresponding to which matching loops and metagames. Source: Author creation

With the type of the fit qualified, an explanation can be sought. Knowing the type and the emphases of a

game allows for the questioning of why this emphasis is in place. This can highlight distractors in design, like a focus on single player mechanics for a community function, or manuals that give conflicting instructions. Another source of discrepancy may come from the city model category most prominently presented in the game. Due to misinformation, players possibly were expecting a different reference frame. If commercials and other discursive materials profess a different model than that found in the game, a limited fit can be explained. That is why the discovered city model must be complemented with the city model as communicated in the paratext of the game.

Discourse analyses looking at press notes, descriptions, trailers or other explanatory material can highlight which aspects of the game are imbued with value and what effects it can conjure. For the city model in this method, the discourse analyses should be attuned to the identifying characteristics of city models, to offer an initial prevaluation of whether the designed city model is within the realm of expectations. For MARIO, the procedural fit emphasis – the focus on playing the game according to the rules for a specific goal – can be explained due to its nature as an entertainment game. These games are focused on communicating a specific player experience (city model in our case). In the case of MARIO other afforded actions can only fit this similar player experience, making it a more structured game with only limited possibilities for player appropriation or alternative play styles. Despite the limited fit type, the fit value of MARIO is still high. The combination of this quantification and qualification shows that despite the quality of the fit being limited, the game is well designed to account for similar experiences. The limited yet flexible gameplay opportunities keep the player exploring a bountiful but limited system. Depending on which fit is discovered, it can serve different functions depending on the case. The fit can offer a proof of criticism, it can offer evidence for treating the game as exemplary, and it could identify matching designs that exhibit similar fits, which will be discussed in chapter five.

These are the four steps that make up the action space analysis method in pursuit of the fit. It makes use of engineering methods and humanities and social scientific interpretations and quantifications. With this new method outlined, a pursued answer to the objective of this study can be specified. We look into how action space analysis can investigate the fit between the pursued city model and the afforded city models, with a sensitivity focused on the prevaluation of the design of a single game. To answer this question then means illustrating that the action space analysis can yield relevant insights into the fit of a game. This requires the discovery of varying fit values within a singular design, as well as insights into what these values mean; i.e. relevant quantification and qualification of the fit. If the action space analysis can be shown to be sensitive to misfits within a singular game, and offer guidance in providing an explanation, the metric of the fit and its action space analysis can be argued to be a valuable means of investigating urban games.

Especially the interpretation of the fit values provides access to deeper insights into the efficacy of the design of the game. While not the same as statistical validation, this focus on different metrics – the quantified and qualified fit – offer a novel way to test whether an urban game has a chance to be successful. The closer scrutiny of the affordances further shows what aspects of the design contribute to the communication of the city model. Applied here to SUPER MARIO LAND as an illustration of the steps, this method has only yielded limited results as MARIO is not an urban game. A series of case studies of urban games can better outline the outcomes and possibilities of this method, and illustrate that it actually works for complex games.

3.5 Conclusion

This chapter has introduced and expanded on the concept of the fit, specifically looking at how reverse engineering, in the shape of an action space analysis, can help to assess the fit between the city model pursued by the game designers and the city models actuated by appropriation of affordances in the action space. We explained the fit as measure to gauge and prevaluate whether and how the design of a game affords any city model that has to be communicated. This chapter has introduced the different dimensions the fit can take, its origins and capabilities, and an action space analysis to attain it. Furthermore, the fit and its action space analysis are a unique interdisciplinary measure that introduces engineering research to humanities and social science game research in order to offer a product-centred, re-constructable metric of player appropriated urban games. It provides an alternative to statistical validation in offering a broader searchlight that shows possibility of results in a broad range of contexts.

Whereas the action space analysis has superficially been shown to be of value, methodological restrictions are still in place and should be considered. Sensible to prevaluating a singular design only, action space analysis requires further cases for improving its findings. Furthermore, validation through audience studies is preferable as well as a comparison between the action space analysis results and statistical validation. The fit is by no means the best measure for all studies into urban games, but it does offer useful insights and focus. As isolated case introduced here, its full use may not come to the fore. A broader application and further comparison is necessary.

The method itself has yielded several insightful pointers that can prevaluate urban game design. While SUPER MARIO LAND is limited as a case study, it serves to illustrate the steps of the method. The next chapter will apply this method and determine the fit for a variety of urban games in order to show the various results the action space analysis and the fit can provide. Furthermore, it will show what repeated use of this method can yield.

Chapter 4 – The Fit in Urban Games: Case Studies

Introduction

Do you want to feel healthy? There is a game for that. Do you want to let your voice be heard in city planning? There is a game for that. Want to build your own city? There is a game for that. Want to add a little *pizzazz* to your daily commute? Rinse, repeat. Urban games can take a great variety of shapes and pursue a plethora of goals. With the action space analysis outlined the previous chapter we can now see how this variety caters to pursued goals. This chapter will use the action space analysis to analyse four urban games to show what insights the metric of the fit can provide when analysing said games. It will study how the heuristic of the fit and its action space analyis can be validated through the assessment of the fit of a design with its pursued city model only in the cases of GEOCACHING, ONTDEK OVERVECHT, CITIES: SKYLINES, and POKÉMON GO. The fit is shown to highlight the demarcation of circumstances of success, the identification of the cause of a misfit, the determination of alternative uses, and the reflection on player freedom efficacy.

This chapter consists of two steps. First, in 4.1, a selection has to be made of which games to analyse. As indicated earlier, there are an abundance of possible urban games and analysing all of them is impossible in this format. Therefore, the first section will introduce a practical categorisation of urban games for the purpose of this thesis to justify selected case studies. The categorisation is based on the axes of symbolic presence and specificity of space deriving from our understanding of urban games discussed in chapter one.

Secondly, in 4.2 and onwards, the four cases are reverse engineered to determine their fit. The goal of these case studies is to illustrate the validity of the fit as insightful metric and further judge the efficacy of the method. Each case study will therefore follow the four steps of reverse engineering (implementation, design, requirements, comparison). Through these four steps each case study can show how the fit can give insight into the importance of circumstances, proper signification, alternative uses, and control over player freedom. This chapter focuses on showing how the fit can be applied on micro (game) level. Chapter five will look at the macro context of design and society.

Finally in 4.6, after showing the varying capacities of the action space analysis and the fit, we will show the validity of these results. Using more traditional validation methods than the illustrative hands-on cases, the action space analysis will be shown to arrive at the same (and more) results as those discovered through tested methods. At the end of this chapter then, the method and the fit will have been put to work and put to the test, providing a veritable approach to urban games.

4.1 Urban Games Organisation

To breach the forest of urban games some organisation has to be done. To illustrate the validity and usefulness of the fit, case studies can offer exemplary illustrations of what the fit can provide and foreground. Still, just four random case studies will not necessarily test the fit to its full extent. Therefore, based on our understanding of urban games outlined in chapter one, two axes are introduced that help us group urban games more specifically according to our outlined explanation: the two axes of degree of symbolic presence, and specificity of setting. The perspective on urban games, their distinctions, and their types outlined here serves to create an informed organisation that, when analysed, will give a comprehensive and more-or-less complete illustration of the capacities of the fit and the action space analysis. It is therefore not an absolute ontological claim but imposes order for epistemological purposes. The axes introduced here allow for the widest range of distinction among urban games according to the categories within which we understand them. The two axes will briefly be introduced, with some poignant examples, in order for us to introduce the four case studies that will be used to validate the efficcacy of the fit.

4.1.1 Degree of Symbolic Presence[41]

The first distinction we make is about the closeness of the action to the actual setting. The term symbolic presence, as opposed to physical presence, relates to the degree of physical consequences for the city or more symbolic ones, through a virtual representation or more imaginative manifestation. This category then distinguishes between games that pursue actual impact, like exercise games in which the act of playing has a physical result, and symbolic games to which the results should be found more in personal development or signification.[42] This is partly dependent on how the game is designed, as physical games have to deal with strikingly more metagames than fully controlled symbolic presences. As such, symbolic presence is a key determinant for grouping urban games.

4.1.1.1 Physical Presence

On the one side of the continuum is physical presence, which means that the actions of the players have a direct physical consequence in the city. This means that the act of playing already constitutes the execution of actions with real repercussions. Understandable as 'Actual Action,' the physical presence

[41] Presence as a concept has a longer heritage both on performance studies (See Fewster 2010) and computer science (See Houtkamp, de Boer, and Kramer 2014), all having a specific interpretation of how the experience of 'being-there'is defined, designed, and measured. Here we do not position ourselves in these academic traditions, as our use of the term is more binary than experiential; is the player physically present or virtually?

[42] Described as such, this continuum could bring with it a value judgment, with physical presence appearing more successful than symbolic presence. This is a misunderstanding. At times a symbolic presence allows for freedom to experiment in a safe environment (de Lange 2015; Schouten et al. 2017) and can even avoid obstacles or include more people than any physical setting ever could (Gordon and Manosevitch 2011).

games thrive on simply being played by the rules. Think of running games like ZOMBIES, RUN! (Six to Start 2012); regardless of how the player intends to avoid the zombies from the story or how well they do, players will be running either way, improving their health. It is possible that the actual action itself is the main benefit, such as running, or that the game is "intentionally designed to have a purposeful impact on the players' lives beyond the self-contained aim of the game itself" (Mitgutsch and Alvarado 2012). Regardless of the shape games in this category take, they are what Konstantin Mitgutsch and Narda Alvarado call "purposeful by design" (idem).

4.1.1.2 Facilitating Presence

Moving down the continuum from complete physical presence on out increases the symbolic presence, possibly resulting in an increased virtual dimension to players' actions. A mix of these presences facilitates actions, meaning that players, through the act of play, are provided with the means, the ideas, the contact, or the freedom to set up follow-up actions. Games designed to facilitate communication between citizens and municipal members in a neighbourhood, bring players into contact with relevant stakeholders to voice their ideas for the physical space. Contrariwise, the game SUBMERGED (Korte and Ferri 2018) asks players to use a fictional scenario to think outside the box for the real problem of rising water levels. Urban games can therefore tread a variable line between how physical the action must be or how symbolic the reflection should be. All in all, this middle ground provides games with a more flexible position than solely distancing from reality or engaging with it.

Instead of relying on the limits set by physical reality, or by symbolic representations, these facilitating games rely on the players having their way with the urban games. The main informers of this presence are de Lange (2015) and Schouten et al. (2017), as they identify how urban games can be effective due to fostering secondary benefits. De Lange for instance explains that players can "act on a wide range of specific urban issues through role-playing, building trust, forging collaborations and tapping into crowd creativity" (2015, 430), mainly because "[p]lay offers a safe space for experiment and collaborations in which failing does not immediately have grave consequences" (idem, 434). This reliance on other forms of interactions is what characterises this form of presence. It should be noted though that the facilitating presence still leaves the door open to actual action. The other extreme, symbolic presence, does not.

4.1.1.3 Symbolic Presence

The symbolic dimension arises from a symbolic representation being used to access the physical reality of a city. This symbolic representation can be a complete virtual simulation of a city, such as in SIMCITY (Maxis 1985), wherein the player can experiment with the construction and functioning of a city in a computerised setting. Alternatively, the symbolic representation can be a narrative layer placed over physical reality, making any interaction have a symbolic meaning instead of a physical result. POKÉMON

GO for instance is set in the physical world but ultimately only engages with it through the symbolic representation of the Pokémon world on the smartphone. Hence symbolic presence is the extreme of a continuum. In a symbolic setting, players are more restricted by their representation in the action space. At the same time, designers often have more control over the space, so the setting can be equipped with more signified affordances.

The value of games of the symbolic presence is that they can emphasise reflection on the city through simulated scenarios or situations. An example of this occurs in ecogames, or games designed to encourage sustainable action. Game scholar Joost Raessens argues that "ecogames, provided that they are well designed and used, can inform players, can incite players to cooperation, and can change or reinforce attitudes and behaviour" (2018, 243). Something as macro as saving the planet is approached through these games through a more symbolic activity; focusing on information, incitement, and attitudes instead of direct actions. Imagining and reflection are the main values of these games, making their ultimate efficacy more dependent on qualifying terms.

The symbolic presence axis determines the closeness of the effects of the game to the game setting. The degree to which the game actions are physical will delimit what means are available for appropriation and how much control the player can have over a space. This distinction has however focused solely on the back end – where do player actions have effect. The second axis of categorisation – the relation to space – looks explicitly at the position of the player in space, focusing more on the affordances made available and the limitations placed upon them.

4.1.2 Relation to Space

Games playable everywhere differ considerably in their affordances compared to games tied to specific locations. Literally using a game outside of its designed context could then spell doom for its goal. Distinguishing the positioning in space is therefore a key selection criterion to categorise urban games. Again, this stems from our acceptance of appropriation by the players, but also from the limited affordances designed into the game that spatially delimit the action space. The relation of the player to space shows similarities to Filipa Matis Wunderlich's approach to moving through the city (2008). Wunderlich's distinction between purposive, discursive, and conceptual walking is a tested understanding of a citizen's approach to space. Below these categories will be discussed and translated into the continuum, wherein Wunderlich's walking will be interpreted as broader movement-oriented play in order to also include virtual games.

4.1.2.1 Purposive or Location Independent Games

Urban games that fall on this side of the continuum do not necessarily thrive on a specific place, but rely on a shared (physical) setting for urban games. The player's relation to space is akin what Wunderlich calls "[p]urposive walking' [which] is a 'necessary activity' performed while aiming for a destination" also called "'walking to' or 'walking towards'" (2008, 131). The focus in this relation is on the destination, leaving the space encountered during the journey unassessed. As the destination is king, players can be grouped together at this particular goal, whisking up social mobs in order to play at ad hoc locations. An example of such a game can be PACMANHATTAN – real life Pacman - (Lantz 2004), wherein it does not matter where exactly the players are running since their main target are other players. What matters to this game is that it happens in a public setting.

Interpreting this broader, virtual games such as SIMCITY, can be meaningfully understood under this category as well. These games about cities see players interact with the city – moving about, ensure movement from resources, building – without regarding specific locations. All aspects are analysed from a functional point of view wherein specific locations are merely a cog in a larger system. With its focus squarely on a different aspect than the space, these virtual games can be seen as location independent.

4.1.2.2 Discursive Walking, or Hybrid Games

Whereas in location independent games the location did not matter, when sliding up the continuum, the location begins to matter more. While not location specific yet, a closer relation to space results in hybrid games that are engaging with a virtual layer, but specifically set in a defined urban space. This echoes Wunderlich's discursive walking, which is "a participatory mode of walking, during which we half consciously explore the landscape while sensorially experiencing it passing by," in which "the journey is more important than the destination" (2008, 132). The act of movement through physical space is what is valued in these games, which can ultimately deepen the familiarity with the environment. As the focus of this type of game is on the space walked through, but not any particular places reached, a game like POKÉMON GO would fit in this category as Pokémon appear everywhere. While certain locations function as PokéStops or Gyms, these targets mostly facilitate largely unguided movement in the search for Pokémon. The affordances of these games are designed into a virtual layer such as the catching of Pokémon, or take the shape of social presentation of yourself in the case of *flaneur* (Wunderlich 2008, 132). Urban games of this category can add a new layer to the space traversed, but ultimately do not redefine specific locations.

4.1.2.3 Conceptual Walking, or Location Based Games

Finally, the relation to space can be highly specific when the physical location specifically signifies and structures the game. In this relation to space, also called conceptual walking, a "reflective mode" which

“inspires and influences creative responses to places, governs interactions; it is a process of becoming acquainted with a space or even a form of intervention in itself” (Wunderlich 2008, 132). This reflection allows for interacting and redefining space into a meaningful place. This ultimately requires the location to be specifically chosen, or that it is “choreographed in the sense that we think about it before we actually go about performing it” (ibidem). The choreography holds for both game designers and the players: which places are visited is carefully considered. This category lends itself well for appropriation. Particular locations can be used as a setting for a game to simultaneously reflect on the state of the setting, as happens in many urban games in the building sector. However, the location itself can also be completely instrumental, as is the case in scavenger hunts. These can only happen when they are location specific as the prize is only in one place. This category has as benefit that it can shape the image of a particular place. Especially through augmented reality, building sites can be given a new shape, prospecting the potential, as is done in REDESIRE (Rezone 2016). Even completely digital games like ASSASSIN’S CREED: BROTHERHOOD (Ubisoft Montreal 2010) rely on the specific locations of (in this case) a simulated Rome to set their story, as well as bring history to life. The more dependent on specific locations, the closer to this conceptual and redefining approach to space.

We have introduced the presence and relation axes to organise our understanding of urban games. These axes were derived from the forms of urban play explained in chapter one, as well as our understanding of urban games. With these two axes we can form four categories that organise urban games. This division of a multitude in only four general categories allows us to determine case studies to illustrate the fit. The categorization simultaneously helps to pinpoint in what setting the cases should be understood, which obviously has consequences for the fit.

4.1.3 Case Study Selection

For the purpose of this study we have simplified the scope of existing urban games into four categories, shown in Figure 16. These categories, with their formative dimensions explained above, ensure that case study analyses will cover adequate variations of urban games. This way the full scale of the capacities of the fit can be highlighted, as well as testing the action space analysis in different contexts. While obviously one case from each quadrant is not enough to do justice to all kinds of urban games, these exemplary games are enough to test the capacities of the fit. The games of GEOCACHING, ONTDEK OVERVECHT, CITIES: SKYLINES, and POKÉMON GO function as exemplary cases for each quadrant. We

will outline each quadrant based on its characteristics and mention their exemplary case. The full motivation of the case selection comes during the actual treatment of the case below.

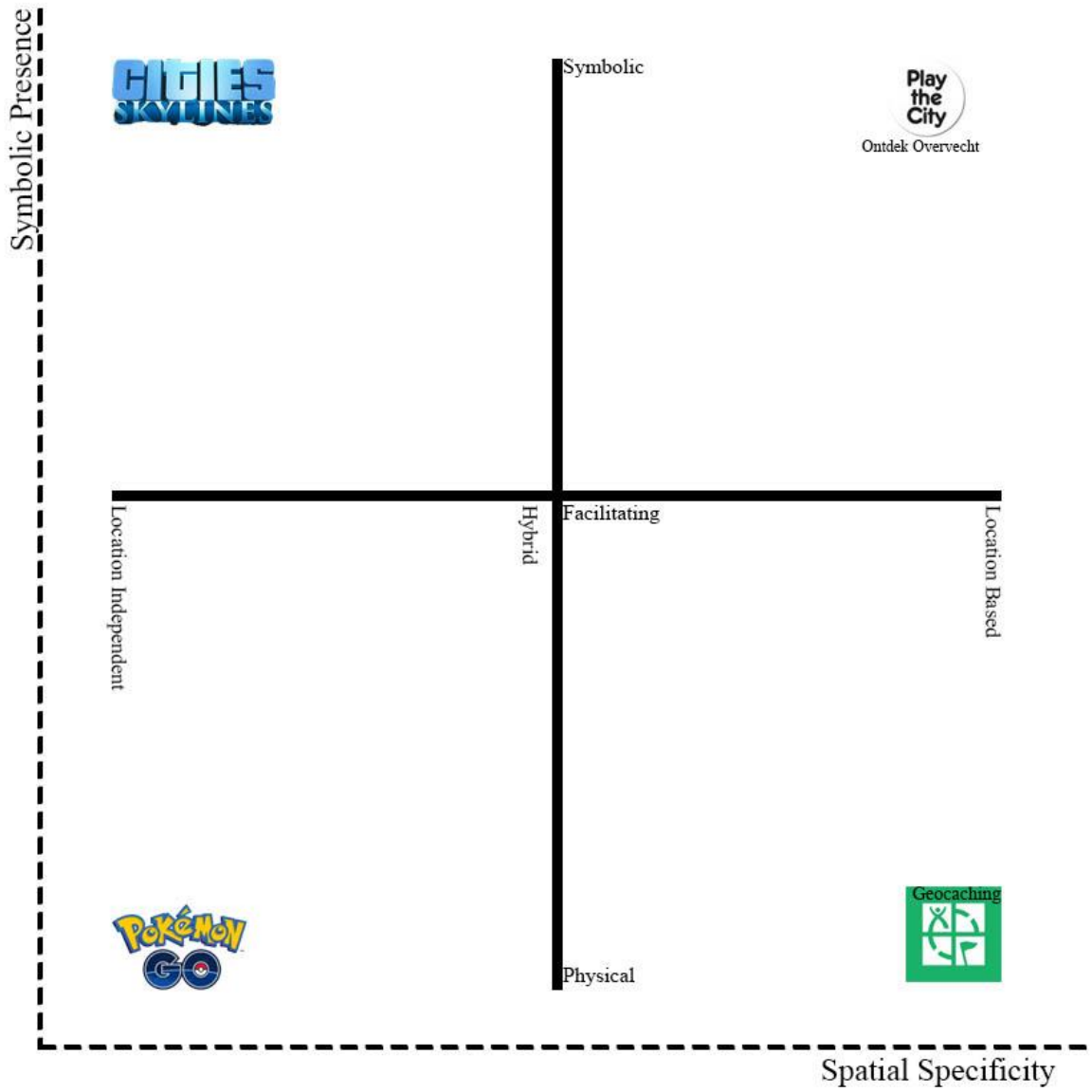


Figure 16 The Urban Game Distinction Axes
The two axes of distinction forming general categories. Example cases are placed in each category. Source: Author creation

4.1.3.1 Quadrant 1

The first quadrant (top right in Figure 16) contains games that have an increasingly closer relation to space and are approaching symbolic interaction. This means that the games engage with specific locations yet the interaction associated with it has little or only few repercussions for the actual physical reality, instead remaining largely symbolic. This ensures that reflections and bold propositions can easily be suggested in these games in an attempt to corroborate and let one's voice be heard. The reflective capability can be solely symbolic, but could be used for facilitating ends.

For this quadrant, the game ONTDEK OVERVECHT shall be analysed. This game is exemplary for its flexibility in its playthrough. While focused on a specific location (Overvecht in Utrecht), it is played on a symbolic representation – a blown up map. Next to that, the players interact within the space of Overvecht itself, but can gain a more spatially specific experience if shared with people dealing with Overvecht professionally. As such, this game, due to its flexibility and contextualised nature, is capable of engendering the whole of this quadrant.

4.1.3.2 Quadrant 2

Proceeding clockwise, the second quadrant contains games that are still largely location specific but this time mostly directly influences the space in which it is performed. This can mean that the actions performed in the game have direct consequences for the space of play, or the search for the specific location itself is the main value that is communicated. Most touristic scavenger hunts fit in this category as they rely on the exploration of specific places.

Instead of looking for an exemplary tourist scavenger hunt, this quadrant is better represented by the treasure hunt game GEOCACHING (Geocaching 2000),[43] due to its broader application and reach. GEOCACHING encompasses multiple forms of interaction that both rely wholly on location specificity but also leaves the interpretation and value of interaction up to the player. Sporting both construction and discovery, as well as an active community, this game is an aleph of interactions with scavenger hunts and as such can be seen as exemplary for this quadrant.

4.1.3.3 Quadrant 3

The third quadrant will be discussed in an analysis of POKÉMON GO. Games from this quadrant can possibly be used for direct effects, but this time the location these activities are taking place in is of little to no concern. While there can be a slight link to space – such as in specific directions or a specific experience – ultimately these games can be played everywhere. The main point of these games is not *where* they are played, but more *that* they are played. In this sense, urban games have the capacity to make people *move*, so running games fit here. Yet games in this quadrant can be more complex than solely making an activity take place outside.

POKÉMON GO wholly relies on the players walking around catching Pokémon, although where physically does not matter. As such, the physical movement is still actual and its reliance on location

[43] While technically more often credited as recreational activity, GEOCACHING is not always considered an urban game. As it is a crowdsourced activity, maintained by players, it does not fit the traditional game publishing forms. However, since the company Groundspeak has collected, commercialised, and monopolised several hide-and-seek formats it is starting to gain more traditional game forms (GPSgames 2010). Regardless, the verb 'GEOCACHING' can refer to any kind of scavenger hunt, yet here we focus on the consolidated Groundspeak GEOCACHING.

based activity still shapes it. Yet, this game interestingly mixes the physical interaction with a symbolic engagement. The fit can show whether games in these categories rely too much on actual physical interaction when the game does not afford it.

4.1.3.4 Quadrant 4

The last quadrant are games *about* cities. The games in this category have little relation to the space they are played in and the interaction is largely reflective and symbolic. While some facilitating actions can be performed, most games here rely on interpretation and experimentation with city settings in order to explore more general structures. This category will therefore contain more digital games as these can facilitate experimentation and simulation better than a physical setting can. Exactly the lack of a link to a physical reality makes these games useful for reflection.

Many city building games fit in this quadrant as they specifically rely on experimenting with city infrastructures, positioning, and processes. Games like SIMCITY have made city simulations available to the general public. Yet these games are more toys than actual simulators and their capacity should therefore be critically assessed. To this purpose, this quadrant will be represented by CITIES: SKYLINES, the newest SIMCITY clone. However, this game is exemplary due to its verisimilitude, control of large crowds, and reliance on internal interactions, more so than other simulator games.

4.1.4 Case studies setup

The selected case studies will be regarded as representative for a large portion of urban games. For each quadrant, the fit can show different insights, although all are based on the possibility of afforded interaction meeting expectations. What these fits mean per quadrant remains to be seen though.

The following four case studies are all reverse engineered to determine their fit, according to the action space analysis introduced last chapter. Each case will look into how these games fit their pursued goal, and what this means for the efficacy the design of the cases. The first question is a general test, looking into how the action space analysis functions on different games. The second question instead expands on the findings, in order to see the action space analysis yields. Note that the focus of these analyses is still on the fit of a singular design to its own pursued city model and not its attunement to alternative city models. To do this, each case study will follow, after a description of the case, the four reverse engineering steps of determining the implementations, the design, the requirements, and finally the fit through comparison. At the end of these case studies, the functioning of action space analysis should be more than clear, and the capacity of the fit to reflect on the design of a game and offer insight revealed. After the case studies, a more traditional form of method validation will be compared to the findings gathered here in order to validate the method further.

4.2 Case 1: GEOCACHING

Whereas a multitude of scavenger hunts exist, GEOCACHING is the arguably the most copied, as well as the barest bones version. Analysing the scavenger hunt in its basic form will highlight the affordances of games of this calibre and explain what does not necessarily fit these types of games. As our inquiry into the fit started from an identified misfit in the many scavenger hunts in existence, studying the capacities of the start of the software line will help determine what uses do fit and which do not. GEOCACHING offers an exemplary case of urban games, as it functions as the inception of software line that ultimately gets appropriated for multiple purposes, often adding new secondary loops and changing metagames (Krüger 2008). Ascertaining the adaptability of this game sheds light on the fit of many games that came after. This case study will therefore study the afforded fits and what this means for scavenger hunt design. We will argue that GEOCACHING is rather independent from its actions, meaning that scavenger hunts by themselves do not convey any message. It is their contextualisation that makes a difference and in GEOCACHING the value is in the community formation as well as co-creation possibilities – although not without redesign. Ultimately this fit analysis will show the difficulty of cloning scavenger hunts for different purposes.

While several functions were added, the game is still based around the principle of treasure hunts. Of all the possible scavenger hunts, GEOCACHING is said to be "arguably the most successful location-based game to date based on its longevity, user participation, and global presence" (Neustaedter, Tang, and Judge 2013, 336). Added to that, it ultimately takes the principle of scavenger hunts, undertaken so often in analog form, and blends it cleverly with a digital interface, as well as networked interaction (O'Hara 2008).

4.2.1 What is GEOCACHING?

GEOCACHING, found its origin in the Ludo-Military complex in the year 2000 when an employee from a discontinued software project hid a bucket full of trinkets in the woods and shared the GPS coordinates to spur a search (Gram-Hansen 2009). The searching of a container with trivial contents on the basis of GPS coordinates has remained the core gameplay of GEOCACHING since then, only now consolidated in an app and on a website run by Groundspeak.inc. Players create an account and are shown a map of their direct environment with the hidden caches positioned at their coordinates. The player can now select a geocache, navigate to it through the GPS coordinates or with the navigate function of the app. When the player reaches the exact coordinates, the searching begins. The containers range from micro size – a screw with a piece of paper (Figure 17) – to large, such as ammo boxes. However, despite being at the appropriate coordinates, the caches are hidden, often in ingenious locations. The aforementioned micro cache is disguised as a magnetic screw but other containers are hidden in fake rocks or even in 3D printed pinecones. The website or app page of the selected cache has a description and info about

the size, and occasionally a hint, but it is completely up to the player to inspect everything at the GPS location for the container. Searching both serves to raise awareness about the searched space (for natural beauty for instance) and to distinguish players from non-players, or mugglers (after Harry Potter's Muggles as antithesis to the player names of cachers). Once discovered, out of sight of mugglers, the next phase of the activity can begin: the logging.

Figure 17 A Micro Cache
A micro cache in the shape of a magnet screw with a rolled-up logbook inside. Source: Author photograph

Every container, regardless of size, contains a log: a piece of paper with the names and dates of the cachers that found this particular cache. The player has to sign the log and may exchange content of the cache for something of equal value, and then hide the cache in the same location unseen. Logging the finding of the cache on the physical log needs to be complemented with logging the cache on the website or the app. Failure to find a cache is digitally logged with a DNF – Did Not Find. This will yield the player badges on their profile. The player is encouraged to comment on the cache; the experience of finding it, the state of it, difficulty with mugglers, who you were with, etc. These comments can be indicative for other players to see if the cache is still present, or can communicate the state to the owner of the cache, as it is up to the players to maintain their caches. With this logging done, the player pursues the next cache, with the found/DNF cache represented by a coloured smiley on the in-game map.

Over time different types of caches were added but regardless of the types of caches, the activity remains the same. Multicaches follow the same principle, but the contents of a found cache reveals the location of the next cache. Mystery caches provide puzzles that have to be solved to find the right coordinates. Earth caches are educational in that they lead the player to a site of geological interest, offering

information in the description. Virtual caches are more classic touristic tours organised through GEOCACHING, offering no real container but an experience. Finally, the player can also hide their own caches and log them in the system, yielding even more badges.

With the functioning and main elements of GEOCACHING made clear, the action space analysis from chapter three can take off. Taking this game as a case study and ascertaining its fit and flexibility can yield insights into whether adaptations of the format are a fruitful endeavour. The final result will elucidate the capacities of the metric of the fit.

4.2.2 The Implementation Phase of GEOCACHING

The first step is the charting of affordances in the game and grouping these according to loop groups. Despite being a simple premise – hunting for hidden treasure – the implementation of GEOCACHING yields a great amount of affordances, mainly because of the simplicity. In this charting of affordances, the GEOCACHING app will be studied as it yields similar information as the website, yet integrates it more with the smartphone device due to the mobility. The afforded core loops of caching and hiding come to the fore when playing the game and interacting with the interface of the app. Furthermore, following the player interviews of Kenton O'Hara (2008) and Carman Neustaedter et al. (2013), our pursuit of loops and metagames can be directed and streamlined.

4.2.2.1 Core Loops

The core loops of GEOCACHING are discovered in the interface, seen in Figure 18. This main interface is a map with markers, denoting hidden caches which can be organised and filtered through menus (available ones are in green, grey ones are only for premium members). The loop forwarded here is then closely related to finding these caches. Tapping on caches whips up a new screen (Figure 19) detailing the uploader, the description, GPS coordinates, terrain, size, and challenge level, the option to log the cache as found or not, and a navigate function which adds a vector to the map instead of a detailed trajectory. The main interaction afforded is the search, or cache loop. This loop starts with selecting a cache on the map followed by navigating to it. On location, the search begins and can result in a find or a DNF. This step of the loop can then be summarised as 'result' as it can take an affirmation or negation shape. The penultimate step of the loop is the logging of the cache on the player's profile, thus completing the cache search and therewith the loop. This core loop can now repeat itself with a new cache.

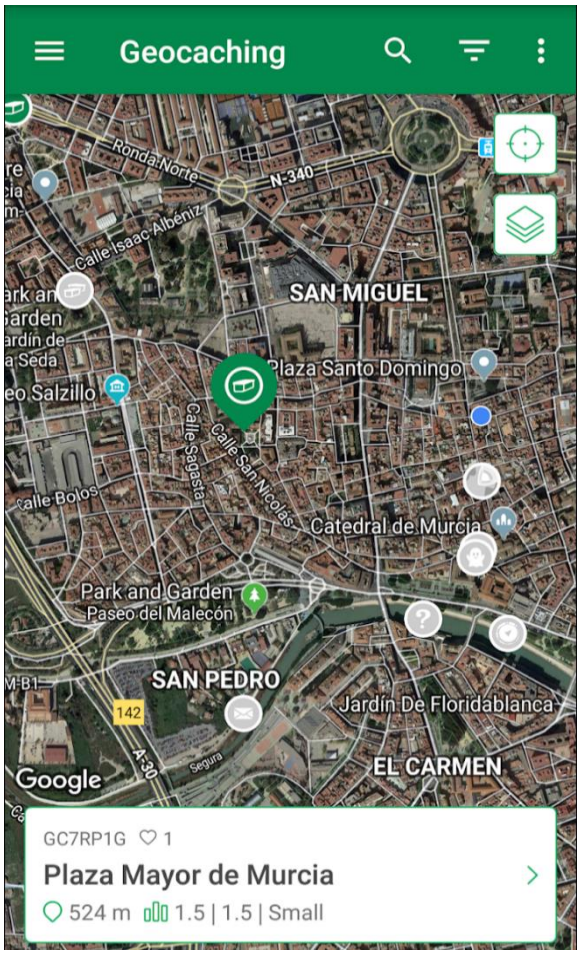


Figure 18 The Main Map of GEOCACHING
The main map interface of GEOCACHING when opened in Murcia, Spain. Source: Author screenshot

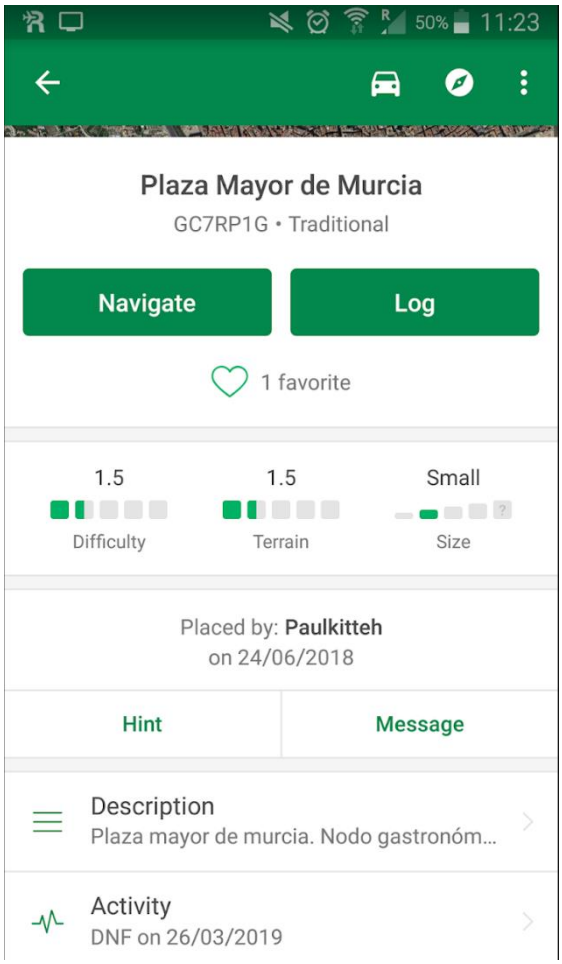


Figure 19 A Cache Menu in GEOCACHING
The menu of a Geocache on the map. Source: Author screenshot

The core loop of caching then is mostly afforded by the interface itself. O'Hara argues however that the caching loop "ignores other points of participation in the activity such as the creation and publishing of caches by people and participation in the on-line community" (2008, 1178). O'Hara and Neustaedter et al. (2013) both argue that the activity of hiding is as important as caching, yet the interface does not refer to any option of hiding. However, since it is based on mapping data, most often Google Maps, adding something to the map is within the realm of affordances. The cache screens clearly depict a player as an owner of the cache and the activity screen offers credit to the player more so than the game (Neustaedter, Tang, and Judge 2013, 345). There are enough signifiers to show that caches are the prerogative of the players. The app offers resources and links to informational resources, such as geocaching.com to explain how participating works, yet the app itself is centrally focused on searching.

The linked website offers a step by step outline of the elements of creation with only a few location based rules (such as accessibility, material, danger, and distance from other caches) (Neustaedter, Tang, and Judge 2013, 383). The hiding loop starts with finding a place that offers a hiding spot fitting the container and hiding the cache from plain sight. Then, the GPS coordinates must be accurately recorded, preferably using a GPS device more so than a smartphone due to its accuracy. Subsequently, the placer must score the accessibility of the terrain, the challenge of finding the cache, and the size, from one to

five, and a description of the search as well as a hint. Groundspeak.inc volunteers will review the cache, but this is outside of the player loop. The final player step of the hiding loop is the maintenance of the cache. The hiding loop is then another core loop with a distinctly different end state than the cache loop.

When interacting with the app or the game in general, these two loops constantly return. The app is a very simple map with meaningful content. This map focus limits affordances to caching (taking from the map) or hiding (adding to the map).[44] Their separate mechanics that are repeated over and over until an end state is reached, shown in Collection 4. From the mechanics forming these two loops, different activities can spawn – the secondary loops.

Core Loop	Collection of Actions
Caching	Select – Navigate – Search - Log
Hiding	Make a Cache - Find a Place - Find GPS Coordinates – Description - Log - Maintain

Collection 4 Core Loops of GEOCACHING outlined in their mechanics. Source: Author creation

4.2.2.2 Secondary Loops

Using the separate mechanics of the core loops, we can now see which mechanics give rise to alternative engagements. Furthermore, through the player interview results of O'Hara, Neustaedter et al. and Lasse Buri Gram-Hansen (2009) several other actions and their monikers can be identified. The results of the academics serve as searchlights in the chronicling of affordances, both on- and offline, having basically done the playtesting for us. The secondary loops identified in GEOCACHING are exploration, exercise, social interaction, tracking, commenting, trackable missions, maintenance, elaborate hiding, kairotic hiding, and digital or physical expression.

O'Hara states that while people go on dedicated GEOCACHING trips, players also "interleave GEOCACHING with other aspects of their lives, opportunistically fitting it in where they could" (2008, 1179). This guides attention to secondary loops that enhance everyday activities. In the caching loop, the mechanic of navigating to the chosen cache affords several secondary loops. The guided walking allows for exercise, exploration and social interaction.

As all geocaches have to be outside and are often planted in places of natural beauty, a GEOCACHING tour can function as physical exercise. The core loop of caching is extended by the linking of geocaches

[44] Given that the app of GEOCACHING works using Google Maps, alternative uses more affiliated to general map use are afforded too, like navigating through a city. However, in doing so the rules of the game of GEOCACHING would be completely laid aside – not consciously broken or adapted, just disregarded. Such spoilsport behaviour will show us nothing about the fit of the game to its goal but instead only relates to map behaviour. Therefore, we consciously ignore these affordances here.

to determine an itinerary instead of selection. Exercise here is a secondary loop as without the actions of searching for a cache, there would be no engagement with the game at all, for no distance is tracked. O'Hara argues that the enhancement of going outside with a goal is what spurs players (such as children) to get out into the world and move to hiking places (2008, 1179), thus making this a secondary loop dependent on caching.

The location specificity of GEOCACHING, forcing players to walk from one location to another, affords the secondary loop of exploration. Expanding on walking and searching by adding discovery or meaning-making to the loop, this secondary loop lets players guide their trip through the city based on caches. Space here will receive more attention than in other loops as the space-engaging activities now expand the core loop, appreciating natural beauty or historical locations.

With the main mechanics of the cache loop being walking and searching outside of the interface, social connections are more easily integrated. The act of walking and searching affords shared responsibility. This can give rise to what O'Hara calls "differentiated level of participation" meaning that "different members of a social group could contribute to different degrees yet still be part of the social occasion" (2008, 1180). Social interactions then expand the core loop of caching by augmenting the act of walking and searching with different roles, interactions, or challenges – like who finds it first.

The last mechanic of the core loop of caching is logging, both on- and offline. The online logging links the player to the online community, thus opening up new secondary loops. This environment affords tracking progress and commenting. Online, the player has a profile, which allows for the tracking of personal successes. The profile page (Figure 20), displays the amount of caches found, which caches have been found and hidden, and earned badges (and trackables, which we will discuss later). One such badge for instance is given for finding a cache in a specific country, which subsequently gives some information about the country (See Figure 21 and Figure 22). Such afforded rewards can steer the gameplay, streamlining the selection process for badges. Another dimension of this tracking secondary loop is the monitoring of badges of others. Neustaedter et al. explain that profiles of players are used by other players to see if a cache they are pursuing is still around or is hidden too well (2013, 344). Someone who has lots of found caches but could not find the one currently pursued is a good metric to judge a cache by. The secondary loop of tracking then expands the core loop by enhancing selection.

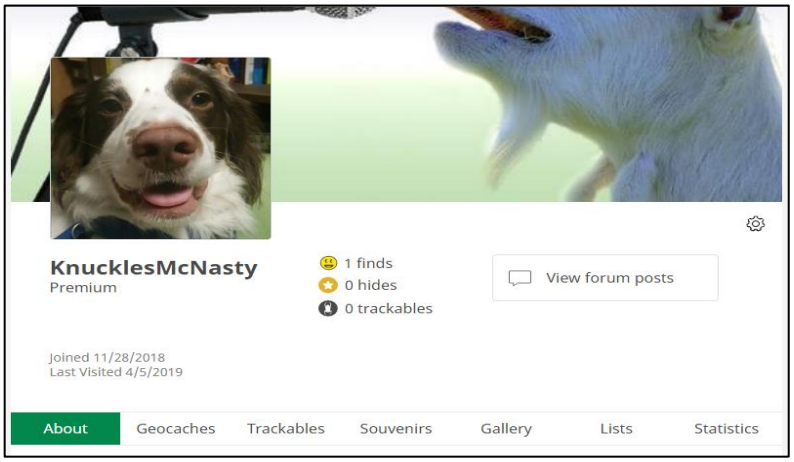


Figure 20 Geocache Profile Page. Source: Author screenshot

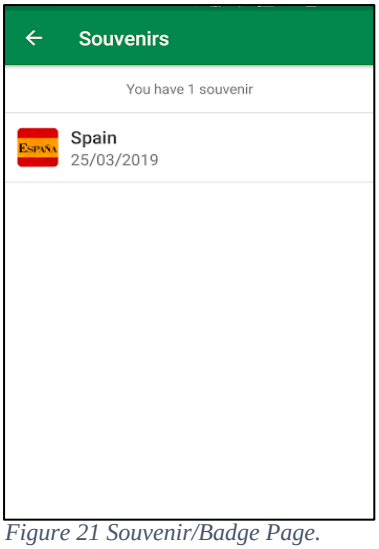


Figure 21 Souvenir/Badge Page. Source: Author screenshot.

Figure 22 Description of a Badge. Source: Author screenshot

Simultaneously, the logging asks for a comment from the player, which affords a comment secondary loop which expands the logging mechanic. Commenting can help the tracking loop and spur on future maintenance. Yet, most of the comments deal with the experience and shout out to the people who shared in the discovery. For instance, user _Jukebox_ states "With my sweetheart zauberin.xy, Geolöser and best buddy "Rapsöl" we arrived last week from Germany. This geocache we visited today in Murcia and found it well" (2018). As shown here, the comment loop, coming after the logging mechanic, is for seeing who has found the cache and showing that you and others have found it.

The final two secondary loops are afforded by the finding and logging mechanics together as they rely on both off- and online interactions. One secondary loop, trackable finding, is provided by corporate sources or sponsors while the other, maintenance, is completely in the hands of the players.

Trackables are physical items, like a toy or a coin, with a label attached containing a unique identification code that can be registered on the website (Figure 23). Players can create a trackable of their own yet many of them are made by promotional partners of GEOCACHING (Groundspeak.inc

Figure 23 A Travel Tag. Source: GEOCACHING.com

2018). These trackables have to be moved *by players* from geocache to geocache, preferably over long distances. Caches display whether and which trackable they contain, and if collected by a player and logged, they appear on their profile as a statistic. According to O'Hara, some trackables even come with "missions" for these travellers such as "travel as far north as possible" (2008, 1183). An alternative mode of play that simply expands the caching loop, trackables form a designed secondary loop.

The final secondary loop associated with the core loop of caching is the capacity of players to maintain caches, even when they are not the ones owning the cache. The comment loop allows players to discuss that current state of the cache they pursue. If a cache is reported missing or too damaged a groundspeak.inc volunteer will check and archive the cache. Yet sometimes, this does not happen. Neustaedter et al. discovered that players sometimes replace the cache themselves, notifying other players through the activity screen (2013, 345). Thus again acting on a meta level with the game, providing an alternative engagement.

The above has described the secondary loops of the caching core loop. However, there is also a hiding core loop with different mechanics. These mechanics afford different secondary loops.

The first mechanic of the hiding loop is the making of a cache to hide. This allows elaborate hiding as a secondary loop. Neustaedter et al. distinguish between light and elaborate caches (2013, 349), with light caches being simplistic in design like a repurposed container with a log, such as a pill bottle or Tupperware. The elaborate secondary loop makes the hiding a game in itself, relying on special containers or specific puzzles. Custom made containers, like those shaped like a 3D printed pinecone in a tree, or a fake rock cover placed over an ammo box, or puzzles to reach the final coordinates shape the mechanics of this secondary loop.

Apart from the physical design, the making of a cache also requires a description and hints, which allows for the secondary loop of *Kairos*, meaning to explicitly give targeted information at the right context. Gram-Hansen explains that Kairos

> … means that the user is only given the information that is relevant for the present time and place thus making it easier for the user to understand this information in the right context. Information made available at the right time and in the right context gains new meaning (2009).

A kind of guided spatial teaching, Kairos as secondary loop is based on the extension of making and placing the cache. The mechanics here are planned hints and linked placements, enhancing the normal placing of the cache. This secondary loop is the main form of engagement that is used to communicate civic goals through GEOCACHING so checking whether this actually fits the design is an important check.

Finally, the hiding mechanic, as per Sicartian playful appropriation, can be a means for exhibiting personal expression, digitally or physically. The expression loop takes shape when players try to add something personal to the hidden cache, which O'Hara identified as one of the main motivations to start hiding (2008, 1184). Digitally, this expression secondary loop expands the locating of the hiding spot. Hiding a cache in personal location, like your own street, changes the in-game map by including a personally owned marker. A more extreme way of expressing oneself digitally is through the artfully arranging of caches, such as in the shape of a dog paw for a special dog route (Figure 24). The digital expression is then focused on appropriating the map and personally leaving one's mark.

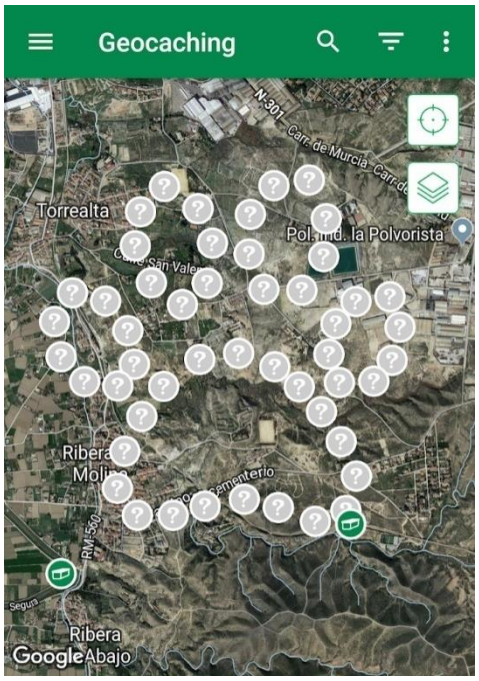


Figure 24 Virtual Expressive Caches
Multiple Caches created by a single player form an artistic expression in the map of the game.
Source: Author screenshot

Physical expression also extends the locating of the cache hiding place. Such physical expression does not focus on the in-game map but on the physical setting of the cache. Players can for instance hide a place in a space with a personal association or one of great beauty they want to share. The secondary loop adds personalised mechanics to the core loop of hiding and a closer relation to the space.

Both core loops exhibit a variety of secondary loops that give GEOCACHING an extensive range of manifestations, shown in Collection 5 below. Whether expanding player actions while caching, or diversifying the types of caches that are hidden, GEOCACHING can ultimately serve a variety of functions. The circumstances and motivations behind each loop group are determined by the metagames.

4.2.2.3 Metagames

The metagames of GEOCACHING come from three different recurring affordance domains: city space, player appropriation, or game provided means. Which afforded means are relied upon depends on the loop group. The limits or signification added by these metagames may in- or decrease the fit if used out of context. Here we will outline how each metagame signifies its interaction with the space, player, and game. The full overview of specific manifestations and foci of the metagames per loop group can be seen in Appendix 4.

The informational metagame, relating to any external sources of information that give meaning to the loops outside of the game itself, is shaped GEOCACHING through its website geocaching.com. Neustaedter et al. acknowledge that a considerable aspect of GEOCACHING is the monitoring of other

Loop Group	Collection of Actions in the Core Loop (Secondary in Bold)
Cache+Exploration	**Selecting itinerary – select first** – navigate – search - log – **select next**
Cache+Exercise	**Selecting itinerary – select first** – navigate – search - log – **select next**
Cache+Social	**Divide Roles** - Select – Navigate – **Interact** – Search – Log
Cache+Tracking	**Select New Cache** – **Check Logbook** – Navigate – Search – Log – **Collect**
Cache+Comment	Select – Navigate – Search – Log – **Comment**
Cache+Trackable	Select – Navigate – Search – **Take Trackable** – **Log Cache – Log Trackable – Move Trackable**
Cache+Maintenance	Select – Navigate – Search – Log – **Read Comments – Maintain**
Hiding+Elaborate	**Make custom cache(s)** – find place(s) – determine GPS coordinates – **Guide player in Description** – Log – Maintain
Hiding+Kairos	Make a Cache – **Find teachable place** – determine GPS coordinates – **Add educational description** – log – maintain
Hiding+Digital Expression	Make cache – **Determine Places of expression GPS** – Hide Caches – Description - log - maintain
Hiding+Physical Expression	Make Cache – **Find Relevant place** – GPS – **write associated description** – Log - Maintain

Collection 5 Secondary Loops of GEOCACHING grouped according to their core loop. On the right are the mechanics that form these loop groups, with the additions of the secondary loops in bold. Source: Author creation

players to gather information about caches, players, credibility, and feasibility. This can be done within the app itself through the activity tab, or the community forums and player profiles on geocaching.com (2013, 344). Alternatively, knowledge of the city itself, its geography and layout, can help the activity of caching and hiding as well. Familiarity with a location will grant the player more knowledge of possible hiding places. Finally, the players have created customs that inform the loops as well. Neustaedter et al. explain that a set of customs has evolved through user practices, resulting in consistency in the kind of container and hiding places, which, if adopted, creates a "geosense" (2013, 341). A key custom is the 'Cache in Trash out,' (CiTo) which obliges players to remove all trash they encounter on the way to a cache (Geocaching 2002; Robison 2011, 48). Within the player, spatial, and game informational metagame, different profiles, familiarity, and customs respectively shape the loops and signifies or limits affordances.

Next, the fictional metagame, or the stories or fictions that add meaning to the loops, is provided by the player or space alone, as the game itself has no overarching stories without those. A lack of stories in the loops makes the act of GEOCACHING solely focused on player narratives. In this case the focus of

the game is not so much in the collection, but more in the process of finding, making the walking around paramount. Alternatively, the main narrative content can be provided by the place in which the cache is hidden or the space traversed during navigation. Finally, narratives can be made by players who create their own legends in the description. While most descriptions are more informational or personal, it is possible to create a story guided geocache, thus opening up GEOCACHING for a variety of exploratory and marketing functions. In the Belgian Ardennes there is for instance a Game of Thrones themed geocache (code GC5DT46) that allows the player to explore the history preceding the acclaimed book and television series through a series of puzzles, leading to the coordinates. Where the narrative comes from will determine which loop group is followed

Third is the economic metagame, explicitly foregrounded in the game through the premium mode. Anyone can make a profile for free but some features and caches are a privilege of the paying customer. The premium mode allows the player to save caches in the app, thus making them available offline. Furthermore, any cache with a difficulty rating over 1.5 cannot be accessed without premium. A motivation for creating a premium cache, according to several cachers on the groundspeak.inc forum, is to limit the amount of players reaching the site, thus postponing the need to maintenance (RuideAlmeida 2015). The economic metagame of the premium mode affords a more private symbolic interaction with the game, as the focus remains on individual benefits. If up to the player, GEOCACHING can have actual and symbolic individual participation, and even actual dimensions in public. An individual player can play for their own symbolic fun, indulging in an exploration, exercise or elaborate hiding loop. However, the CiTo custom can make individual interaction a form of actual participation by playing. Next to that, an individual hider can draw attention to places of natural beauty or reinvigorate an ordinary space, thus serving a more public role. Players can even 'adopt' caches from other players, taking a public symbolic responsibility. While governed by an in-game economic structure, player actions can change from individual symbolic to actual public.

Fourthly, the performative metagame, or the accreditation of performance and/or skill to the loops, is afforded by the game, space, and player. The game itself is based on secrecy, given that it deals with hidden objects. As such, cachers exhibit a furtive playing style in public, staying hidden as to not alert mugglers to the treasures of 'their' community (Neustaedter, Tang, and Judge 2013, 344). Following this game limitation, the performative metagame in the city stems from physical presence, but secretive execution. For the player however, the performative metagame affords multiple options, mostly found online. The tracking of caches found, the collectable badges, and trackables create an exhibit of skill for players, only visible to those 'in the know.' This online visibility and the strong communal ties provide motivation of the player – such as to "give something back to the community" when hiding – or

challenging other players with their creations (O'Hara 2008, 1184).[45] Performance in GEOCACHING can be secretive or online ostentatious.

Finally the contextual metagame shapes the context in which meanings are conveyed, both physical and technological. This game can only be played with a device that can track these coordinates, such as a smartphone or even more accurate dedicated GPS trackers. Apart from this precondition, the contextual metagame has to obey rules of the city, meaning that hidden caches have to be safe, accessible, and durable. Despite these rules, players can appropriate the context to their own liking. By placing caches in ordinary places, the defamiliarisation affordance is employed, for instance. The contextual metagame thus mostly puts limits yet offers agency to appropriative players.

All collections of loops and metagames that each represent a different way to interact with GEOCACHING can be found in Appendix 4. With this overview in tow, the switch can now be made to look specifically for the signified collection of affordances.

4.2.3 The Design Phase of GEOCACHING

GEOCACHING does signify one affordance explicitly while merely directing to the others. The tracking loop is explicitly drawn attention to as soon as the player boots up the game, and after, especially through the (optional but repeated) tutorial. Here we will present the main forms of signification and why it is the most probably loop group.

Regardless of premium membership, the app will, at first boot up and continuously unless directed otherwise, present the player with a series of popups. These popups explain the basic functioning of

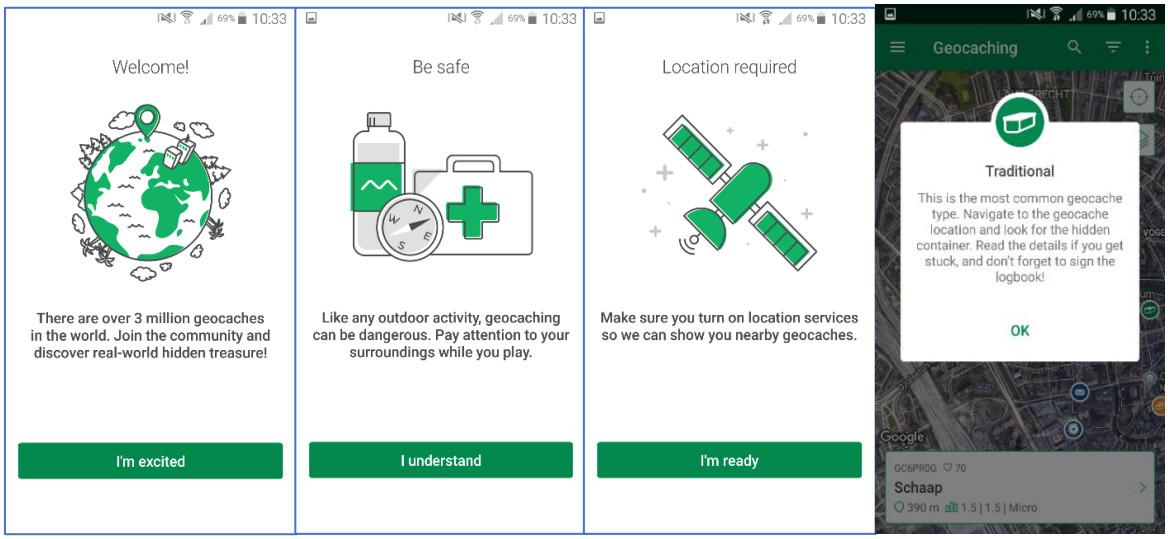


Figure 25 The tutorial screens of GEOCACHING,
The tutorials of a game often present a potent source of signification. Source: Author screenshot

[45] This echoes Huizinga's notion that play allows for the formation of exclusive communities with their own rules that distinguish them from the non-players, in this case the geomuggles (2008, 12). The players of GEOCACHE are completely separated from non-players through an online environment.

GEOCACHING, – find a container outside and log it - warn the player of dangers, and then guide the player to their very first Geocache by making the player press 'Find a Geocache near me," and its associated button (a targeting reticule) on the map (Figure 25). The app will then show the cache on the map, as well as information on the kind of cache. As soon as the player selects the cache, the app remains silent, leaving the player to figure out the next steps on their own. In this case the signifiers are the well described, single word labels of the options, such as 'Navigate,' 'Description,' 'Hint,' and 'Log.' From this initial tutorial can then be gathered that the signified interaction with the app is to find geocaches near you. The explicit focus on the 'finding cache' button and the search function, as well as the stand out caches on the map and the rewards and statistics earned by caching, imply that the only way to really play is to keep finding new after another and to log them. [46] While the app affords all other loop groups, through the links or menus, none of them are as explicitly drawn attention to as finding cache after cache.

Reflecting on the accessibility of the loops furthermore foregrounds tracking as core engagement. Individually playing the game and following directions will set the player to tracking caches. Other loop groups require appropriation for personal purposes, more players, external information, or interaction with others. Therefore, it is less likely that casual players engage in such loops. Tracking, on the contrary, relies on the finding of caches, looking for hints everywhere. As most likely interaction, it does encourage the player to explore all options in the app, thus affording other loops.

With the signified loop group clear, the pursued city model can be reconstructed. Comparing this city model to those communicated by other loop groups will show the capacities of GEOCACHING through the fit. Furthermore, as GEOCACHING is one of the main basis for many other scavenger hunts, determining its approach to certain behaviour will have repercussions for other urban games.

4.2.4 The Requirement Phase of GEOCACHING

Reconstructing which city models arise from the affordances will show what city models can be conjured through the game. While useful on its own as an overview of possible uses of the game, the inventory of all these city models can be used to determine the fit of the game, or, in other words, to see

[46] The economic metagame complicates the tracking loop by creating different signifiers. Whether a player has a premium account impacts heavily on what is afforded. Basic members can only track traditional caches (green on the map; a single container hidden without further challenge). Other caches are visible, but are coloured grey and behind a premium paywall. As such, the signified affordance of GEOCACHING for a basic user is still the tracking loop, which is purely individual and quantitative, as it is solely about finding as many caches as possible. The tracking loop for a premium user however takes on a qualitative dimension. It allows the users to find different types of caches, more difficult and elaborate caches, and join in Geocache tours (touristic sequences of caches). Logging these special caches will ultimately also yield more and different badges, as well as several statistics on the player profile than just the number of finds. The signified loop is the quantitative basic loop wherein the player finds caches and logs them. The premium version, while heavily indebted to this signified loop, is dependent on payment and thus a step further from the signification.

whether and how this game is prepared to achieve its pursued city model. To find the pursued city model, the signified interaction has to be translated into a city model. Here the general categories of city models can help the identification, as the pursued city model is most probably a specification of such a category. If the other afforded city models fit with this pursued city model then the affordances will communicate the pursued goal adequately. The pursued city model of GEOCACHING and its tracking loop group show similarities to both the expressive and place-making category. However, the GEOCACHING city model is less related to space than the place-making city model and too community-centred to be solely expressive. As the categories are the extremes of a continuum, the pursued city model falls somewhere in between. This realisation directs the translation of loops and metagames into city model characteristics

The signified loop group is translated into a city model by using the cypher introduced in chapter three but outlined again in Table 23. Interpreting how the designed observables communicate the city model characteristics will yield a reconstruction of the pursued city model. A similar interpretation with the other loop groups yields all the afforded city models. Here we will outline in detail the translation of the signified loop group into the pursued city model. Of note here is that afforded observables (game design elements) often imply more about the game, such as the number of players or creativity needed. Interpreting these observables as city model characteristics then means identifying these implied capacities.

City Model Characteristic	Afforded elements
Instigators of the Model	Loops, Economic, Performative,
Ideology	Informational, Fictional, economical
Selected City Aspect	Informational, Performative
Carrier	Loops, Contextual
Citizen Actions	Loops, Economical, Performative, Contextual

Table 23 Translation Cypher to City Models from Loops and Metagames. Source: Author creation

Following the cypher, the instigators of the city model are shaped by the private symbolic sequences of finding caches, while explicitly logging them for the community to see. This attests of a performer, an audience, and a supply. The instigators are then multiple – the player, the community to show off to, and the hiders that keep providing caches. The ideology is similarly determined by the logging. Showcasing your finds creates an incentive for achievement. While this offers motivation, it is hardly related to the city. The city aspect is characterised rather generally, shaped by its community info and player stories. The city is solely serving to facilitate the player activity. The carrier is therefore shaped by the online logging, tracking, and community showcase. The citizen actions shows a community formation, with players performing their individual activities, to improve their personal performance – for all to see. The activities are then mostly set online, with the physical setting serving to facilitate the

tracking and point gathering. Given these translations, the pursued city model of GEOCACHING can be charted like in Table 24.

City Model Characteristics	Pursued City Model of GEOCACHING
Instigator	Cachers, Hiders, and Community
Ideology	Striving for more achievement (not really city related)
City Aspect	City as resource or arena
Carrier	Online Tracking and community
Citizen Actions	Get the most and best caches and show it online

Table 24 The characteristics of the pursued city model of GEOCACHING. Source: Author creation

With this city model as the pursued city model, the meaning of individual fits are given shape. A procedural fit with this pursued city model means that the afforded city model similarly makes use of the rules and means of GEOCACHING, so the caches, spaces, and community, pursuing as many credit as possible. The ludic fit means that the player plays the game, so actually goes out searching for as many caches. The focus here is on the act of searching. Finally, the civic fit means that the player sees space solely as the arena for more caches – a resource to be cashed in when submitted to the community.

In a similar interpretation approach as with the signified loop group, the other afforded interactions of GEOCACHING can be translated into city model characteristics. The overview of all afforded city models in GEOCACHING is shown in Appendix 4. Comparing the reconstructed afforded city models in detail with those of the pursued city models will show which affordances fit. With this metric, the strengths, weaknesses, alternative city models can be identified.

4.2.5 The Comparison Phase of GEOCACHING

This final phase will show what interactions GEOCACHING in its current design performs best, and under which circumstances other goals can be achieved. The first step to discover and interpret the fit is the quantification of the fit. With the quantification, a general idea of strength and weaknesses can be justified. Subsequently, smaller and bigger differences have to be explained through qualification of the fit. This qualification can first generally be provided by identifying misdirection in the discourse around GEOCACHING. Next, the nature of the fit as procedural, ludic, civic, a combo of these, or attuned can give more insight into the (mis)fitting elements or alternative approaches. By diving deeper into the fits, the specific strong affordances in GEOCACHING can be identified as well as those uses hardly afforded without significant appropriation steps. If the loop groups with low fits are however interactions that often get pursued in scavenger hunt clones, then the fit can provide an argued critique. At the end of this section, the fit of GEOCACHING must be clear, as well as what can be learned from the fit, which in this

case is that GEOCACHING holds a rather trivial relation to space, with the main strength of the design being in the community management and not the act of play or education through caches..

4.2.5.1 Quantifying the fit

The fit is quantified in a percentage value, which illustrates the degree of which an afforded city model coincides with the pursued city model. The overlap between reconstructed city models shows the propensity of the current design of the game to actually conjure the afforded models as well, despite them being desired or not. Due to signification, every player will run into the signified loop group. If the city model of the signified loop group fits with the afforded city models, then the player is more likely to arrive at this alternative even when they only follow the signification. Furthermore, the city model afforded then overlaps with the one pursued, or at least its general category. These insights can be used to tweak design, to remove certain affordances, or improve fits. Here we will go through one comparison in detail; that between the pursued city model and the city model stemming from the caching+exploration loop group. Their formative loops and metagames are shown below in Table 25. The results from the other calculations can be found further on in Collection 6.

Formative Elements	**Caching+Tracking (Pursued City Model)**	**Caching+Exploration**
Loops	Select New Cache – Check Logbook – Navigate – Search – Log – Collect	Selecting itinerary – select first – navigate – search - log – select next
Informational Metagame	Player profiles as information and goal	Knowledge of the city and the locations and game customs
Fictional Metagame	Player added narratives of achievements	Narratives of the spaces visited
Economic Metagame	Very indebted to premium. Individual symbolic interaction	Indebted to premium. Individual symbolic fun or actual environmental role
Performative Metagame	Display findings online for own profile status	Secretive yet physical presence as formative
Contextual Metagame	Context mostly relevant online, through external rewards	The physical context is the main appeal of the loop. Reinvigorate local.

Table 25 The formative loops and metagames of the pursued city model and caching+exploration city model of GEOCACHING. These will be compared to quantify and qualify the fit. Source: Author creation

For the city model communicated by the exploration loop groups the loops and metagames match completely on the loops, the informational and economical metagame. The fictional, performative, and contextual metagames only partially fit as in the caching+exploration loop group the stories are a hybrid of both player stories and space narratives, the performance is rather hidden, and the context is to be consumed only instead of appropriated fully by the player. In these metagames, there is overlap between the afforded metagames and the pursued city model, but it is not conclusive, which means we qualify them as a partial fit.[47] Calculating the fit value of this afforded city model then follows the formula:

Fit value = ∑(Loops and Metagames overlap of city model characteristics)
= (6.67+6.67+3.33)+(6.67+6.67+3.33)+(10+5)+(10+5)+(5+5+2.5+2.5) = 76%

While this is definitely a higher fit in this design, it is rather low when considered that this exploration loop group is often cloned in other scavenger hunts, such as the DoeUtrecht games. Furthermore, the low fits and the varying characteristics of the other afforded city models as shown in Appendix 4 show that the afforded city models are more often specialisations of other general city model categories than the categories the pursued city model specialises. To explain the meaning of the quantifications further and understand the effects of these mismatches means looking at the expectations formed by the discourse, and at the qualification of the fit.

4.2.5.2 The GEOCACHING Discourse Model

Groundspeak.inc is the organisation that runs and governs GEOCACHING, mostly through the website geocaching.com, textual descriptions, and informational videos shaping GEOCACHING. An explanation for the higher fit of some afforded city models and the existence of low fitting loop groups can be found in the expectations created around the game by Groundspeak.inc. This is done by analysing the discourse around GEOCACHING. There are two main texts that communicate Groundspeak.inc's take on GEOCACHING: a 76 seconds long instruction video called 'What is GEOCACHING' (GEOCACHING 2017) and a (quite hidden) blog post on the blog section of the website also called 'What is GEOCACHING' (Carly 2018).

The instructional video explicitly describes the core loop as well as possible secondary loops, presenting a signification of the city model characteristics. In the transcript of the video below, the salient remarks are highlighted and explained below.

[47] The interpretation of the match between the loops and metagames from the afforded city model and the pursued city model can be found in Appendix 4. This overview is for clarity only, in order to highlight where the quantified fit comes from. As the fit is mainly a relational measure, a slightly different interpretation will yield a different fit which will not necessarily change its meaning. It is not the absolute value that matters but its relation to the other fits. The quantification then functions as a searchlight.

> GEOCACHING is an any day, anytime adventure that can take *you* to **amazing and beautiful places**, or even just to a place in your town that ***you*** **have never been before**. There are **millions** of geocaches worldwide. There are probably even some near *you* right now. (…) To start finding them, just **get out *your* phone or GPS**. (…) Then create a free GEOCACHING account and *you* are ready to go. The way it works is simple. Just choose the geocache *you* want to find, then **navigate to its location**. What you are looking for varies. Geocaches come in **different sizes, shapes, and difficulties**. GEOCACHING isn't always easy, so it's OK to get excited if *you* find the cache. After finding it, sign the logbook, trade knickknacks, and log *your* find online. Just put *your* geocache back where *you* found it, and *you* are off to **the next one**. There is an **adventure happening** all the time, all around *you*. **Become a part of it**, at geocaching.com (Geocaching 2017; emphasis added).

Most strikingly (in italics) is the focus on the player. Every action performed is related to an individual experience of looking and finding. The main instigator is then the player, as other agents are not even mentioned. The instruction similarly focuses on the repeated discovery of caching and the possibility of the player to be 'part of it,' indicating the online community. This discourse deviates from the pursued city model by adding emphasis on the discovery of new and amazing places, in a continuous adventure. This adds a more exploratory dimension that is not in the pursued loop group.

The blogpost mostly mirrors the instruction video, but refers to several afforded loops, such as the tracking, kairos, exploration, and exercise loops. One paragraph describes GEOCACHING as follows:

> GEOCACHING offers something for everyone, from families with children to retirees. Some geocachers play the game to see how many total "finds" they can get, while others play to see how many new states or countries they can visit. GEOCACHING is a great way to find remarkable destinations that you would not have otherwise discovered. It is also an excellent education tool and an excuse to get off the couch (Carly 2018).

This discursive approach acknowledges the possibilities of alternative forms of play, explaining other afforded loop appearing, even despite a lower fit. Yet, there is no mention of hiding at all in these discursive explorations. The discursive dimension of GEOCACHING then mostly echoes the design and its signification. It does open up some possibilities of loops, implying their inclusion in the design. The fits however show that these claims are not always grounded. Qualifying the fit further can show why some fits are lower and what is missing in the design for this to be better.

4.2.5.3 Qualifying the fit

While the discourse analysis explains why some affordances occur despite the low fit, the qualification of the fit itself can show for which affordances the design is conducive and for which it is not. In case of the negative, the fit can show what focus is missing for a higher value. The pursued city model pursues

a mechanical interaction of collecting while mostly allowing interaction through online statistics and comments. It echoes O'Hara and Neustaedter et al.'s idea that GEOCACHING is a spatial game that can be played everywhere due to its central interaction being in an online tracking environment.

The afforded city models fit with this city model to a lesser or greater extent. This is because their city model characteristics focus on a different interaction between the game, city, and the player. Determining if the fit is procedural, ludic, civic, a combo of these, or attuned, will explain why some fits are higher than others and will show where the discrepancies are. An overview of the qualified fits, with an explanation of how it matches the pursued city model, and how it does not is found below in Collection 6. These are gathered by checking which characteristics match which specific loops and metagames. Loops and the performative metagame correspond to a ludic fit. Informational and economic metagames to a procedural fit, and fictional and contextual to a civic fit. Even with this cypher, there is still interpretation of how game, player, and city correspond to each other.[48]

A striking result from this qualification is the relative lack of ludic fits. This means that the game does not have to be played according to the signified tracking rules in order to be interacted with. GEOCACHING yields many appropriations that can occur through its provided means without the design being strictly mechanically – or through procedural rhetoric – made for that. This finding can be explained and analysed by looking deeper into the design reverse engineering, as done in the previous steps. The lack of a ludic fit in most of GEOCACHING can explain the prevalence of scavenger hunts. As their physical setting and general procedure in the city in most appropriations, the game of seeking is merely facilitating. Looking around is solely a mechanical action to set up other actions. GEOCACHING adds its community and hiding possibilities – although meagrely implemented in the signification, they are present in the design – but its mechanics matter little. As such, a game might not even be the best approach to certain purposes like kairos, as the act of play and discovery seems largely irrelevant.

Still, this does not mean that GEOCACHING can be used for everything. Just because the mechanics are largely irrelevant does force the circumstances in which actions happen to be specific. These circumstances are highlighted in three interpretations.

[48] Important to note is that the qualification of a kind of fit means a correspondence between two models, so not necessarily presence per se. For GEOCACHING this means that in a civic fit, both city models treat the city as a resource, instead of meaning that the game relies on location specific formations.

Afforded City Model	Quantified Fit	Qualified Fit	Qualify Explanation
Caching+ Exploration	76%	Procedural Ludic	The exploration city model fits well when it comes to the game and the players. There is plenty of space to cache as well as appropriate actions in the online community. Yet the link to the city required for this model is not immediately present in the standard design of GEOCACHING.
Caching+ Exercise	63%	Civic	The exercise city model fits the design of GEOCACHING with regards to its solely functional use of space. However, in the process, the act of caching is backgrounded, and the focus rests on distance made more so than caches gathered or online interaction
Caching+ Social	28%	None	The social city model again discards the game of looking for caches, using it solely as facilitator for other social interactions. The community is now brought into the physical reality as players are together. The city itself, remains secondary to physical community interaction.
Caching+ Comment	90%	Attuned	The comment city model is only a small variation of the tracking loop. As such, it stays focused on the act of caching and puts even more emphasis on the online community. Added to that is the inclusion of multiple discourses in the comments, making it even more versatile.
Caching+ Trackable	80%	Procedural-Ludic	The trackable city model largely leaves out the player. Instead of relying much on the online community, the player is forced to engage more in the game itself. The city itself is now explicitly a space for displacement. The player is demoted in that they can only follow rules.
Caching+ Maintenance	52%	Procedural	The maintenance model relies on a 'meta' approach to the game, requiring a selfless act. It changes playing the game into caring about the game. Although motivated by the online community and using space solely as a place to facilitate the game, this model relies the virtue of a game not played.
Hiding+ Elaborate	41%	Procedural	The hiding loop city models display a misfit on the game front. Elaborate hiding is more focused on catering to the procedures than actual play. The city as well may play a more prominent role in this, especially when it comes to personal expression.
Hiding+ Kairos	11%	None	An educative interaction with GEOCACHING, and the city model stemming for that, does not fit the signified city model. The organised hiding, as well as the focused activity – separate from the online community – do not match a 'find-them-all' tracking involvement. The city relation also differs from the tracking model, as the location gains prime importance in this model.
Hiding+ Virtual Expression	67%	Procedural-Civic	As the virtual expression model takes a more 'meta' approach to GEOCACHING – playing the platform itself more so than the game – it does not match the game focused caching. Instead it also solely approaches space virtually, while engaging with the rules of the game
Hiding+ Physical Expression	60%	Procedural	While also expressive, this city model is pure place-making. The relation to space is physical and specific and the focus is more on the idea of caching than actually playing the game.

Collection 6 Types of fit in GEOCACHING and their justification. The fit values are given as well. The presence of a fit means that the afforded city model allows for a similar engagement between game, city, and player as the pursued city model. Source: Author creation

Community

GEOCACHING in its current design attains particularly high fits with those city models that place special emphasis on the community aspect of the game. Usually these models attain a civic fit, in which the player and the city aspects match the signified afforded interactions, while the game takes a backseat. As also identified by Neustaedter et al. (2013, 337), GEOCACHING has survived so long due to the apparent freedom granted to players and simultaneously the reliance on it. By placing the emphasis on the logging and the sharing of the activity, both online and physically, GEOCACHING stresses the showcasing of the caches. The game itself only tracks the end product however: the way to get there remains open. For instance, the general vector navigation function, the occasional use only of the phone screen, and the addition of missions and narratives to trackable descriptions, leave a lot of freedom for

the player to shape the activity of caching. Whereas the process of hiding and finding is important, the main value comes from logging and showing that a cache was found and with who and under which circumstances. The many loops that appropriate the community, such as the trackables, the virtual expression, the commenting, the maintenance, and even the giving back to the community through elaborate hiding, ensure that the existing game design is solely a facilitator of further actions. The large openness of the game coupled with a vibrant community with plenty of agency then turns GEOCACHING in a jumping board for more activity. The quantification and qualification of the fit has shown as such, and these findings can be relevant when looking for inspiration for possible successful designs. GEOCACHING is largely self-sustaining because of it, according to O'Hara (2008, 1180). The low entry threshold and inclusive nature makes GEOCACHING a scavenger hunt that is more the prerogative of players than other rule-focused games.

Serious Geocaching

Striking as well is the low fit in some of the afforded actions. This low number means that the signified afforded design (tracking) of GEOCACHING does at no point overlap with the actions and circumstances of these affordances. It is therefore unlikely that new players will immediately encounter these forms of interaction, yet they are possible to achieve. This lack of fit highlights the limits of the use of geocache for serious purposes. Despite what Gram-Hansen (2009) claims about persuasiveness being an inherent characteristic of GEOCACHING, the circumstance that players encounter initially are not conducive to persuasion. As Robison also acknowledges after his educational geocache experiment, the main benefits of the game was "the feeling that they had a chance to bond with fellow students in pursuit of a shared task, that it was "something different"" (2011, 54). As such, these serious activities do not fit with GEOCACHING in an unaltered form.

However, Gram-Hansen's assertion of Kairos and persuasiveness of GEOCACHING should not be ignored. While simply creating a top down task for students to fulfil will fit a more mechanical 'caching' interaction, creating geocaches – partaking in the hiding loops – still engages the players with heightened attention to space. Especially the Kairos loop explicitly asks players to consider the context in which information is delivered. These loops facilitate personal expression in a variety of forms, offering more possibilities for creativity. Still, the design of GEOCACHING *as such* does not explicitly cater to this affordance. In order to thrive on co-creation or make kairos more prominent, a redesign is required. GEOCACHING can then not simply be used for a different purpose: it needs to be adapted. As the many clones and software lines illustrate, a simple copy of a scavenger hunt will not yield specific results without considered redesign. The identification of this misfit does support a recurring sentiment in serious urban games, which is the increased reliance on co-creation as a necessity for success (e.g. Gordon and Baldwin-Philippi 2014; Alfrink 2014; Ampatzidou et al. 2015). While the game of

GEOCACHING may not fit serious uses, the creation of it can yield fruitful results. By starting from the identification of the fit and questioning the reasons for a misfit, the strengths and weaknesses of a game can then be determined.

Public Values

The standard design of GEOCACHING attains quite high levels of fit with loops that involve, or are driven by, public values. The maintenance loop, the tracking and exercise loop paired with the "Cache In Trash Out" tenet, the association of GEOCACHING with health, the group trackable challenges, and, of course, a sense of community; all these possible city models are based on appropriations and assumptions made by the player that add this semiotic public layer. The game manages to create a flexibility in circumstances that, despite being focused on a mere scavenger hunt, can instil selfless acts of cleaning up and maintaining caches that are not yours. The largely bare bones scavenger hunt loops signified in the game are arguably only the tip of an iceberg. An iceberg that consists of the online capacities and player agency. The sheer variation in informational, economical, and contextual metagames, rooted in a repeated simple loop shows the virtue of less is more. GEOCACHING is a scavenger hunt that leaves the players in charge of the signification of their finds and hides. The communication of larger topics is then possible due to the facilitation role of the loops themselves. Even without explicit mention of the public values, the relative freedom of the player both in playing and signification while hiding, allows them to imbue a public function into their actions. The lack of civic fits attests this, as the player can play the game while interacting more with space and be connected to an online community – more so than in the signified interaction. The fit then lays bare the specific focus points present in a design but also shows whether deviation from this focus can matter and what this means.

4.2.6 Conclusion of GEOCACHING

This case study of GEOCACHING has shown what the fit and its action space analysis can offer when analysing the start of a software line – in this case GEOCACHING as a scavenger hunt. The pursued city model of GEOCACHING is focused on player movement through the city with a specific target and collective desire – get as much as you can. Regardless of its Neoliberal undertones, the lack of ludic fits, and a generally high number of procedural fits with this pursued city model, show that GEOCACHING allows for players to interact with the supplied community and interfaces, while the game itself is only of minimal importance. The specific design of GEOCACHING, with its large amounts of freedom and player focused self-sustainability, affords a great deal of interactions giving the illusion of flexibility. However, the fit has shown that imposing messages on the game does not fit its current design. Surprisingly, the link to the city remains quite limited, making place for a mechanical search, more so than urban investment. Given these caveats, GEOCACHING does attain a fit with most of its afforded

interactions despite the differing specialisation of the general categories. The fit only remains as long as the afforded city models remain grounded in the community, and keep the analog interaction possibilities free. As such, the fit here critiques and argues against the mindless cloning of scavenger hunts.

The first case study has shown that the fit can reveal insights into the specifics of a game and its wider applicability. As main takeaway, it shows that games, regardless of the flexibility of player actions, are shaped and directed by specifically designed circumstances that do not clone well. Such a critical insight is only the first of the capabilities of the fit.

4.3 Case Study 2: ONTDEK OVERVECHT[49]

4.3.1 What is ONTDEK OVERVECHT

In this case study we shall see what the fit and its action space analysis can show about ONTDEK OVERVECHT and about facilitation game design. ONTDEK OVERVECHT is a negotiation game designed by Amsterdam based urban game studio Play the City and issued and paid for by the Municipality of Utrecht and the realtor organisation Wijk & Co. After the municipality performed a census of the neighbourhood of Overvecht in Utrecht, they compiled a new approach to this "krachtwijk," which denotes a neighbourhood with persistent challenges (Wertwijn et al. 2016, 3). Add to that an increase of citizens into the neighbourhood of 80 per week, coupled with an influx of refugees taken in by Utrecht and housed in Overvecht, the municipality decided to allocate funds to "accelerate" the development of Overvecht on the areas of "coexistence, employment, health, and safety" (Wertwijn et al. 2016, 24). Faced with these challenges, the municipality considered that "the build-up of the inhabitants, coinciding and interacting with the spatial organisation and social consequences, make Overvecht an atypical neighbourhood in the city" (idem, 14; Author Translation). The municipality explored unconventional approaches to improving the neighbourhood – amongst which urban gaming. Play the City was tasked with designing a game following several design criteria based set out in the acceleration report.

One of the ten neighbourhoods of Utrecht, Overvecht was built after World War Two. It contains many social housing apartments, sport facilities and it is the greenest neighbourhood of Utrecht. Due to this social and cheap housing and generally accessible facilities Overvecht welcomes a lot of newcomers every year. Many students, migrant workers, but also reintegrated delinquents flock to the many ten-high apartment buildings of Overvecht due to its low prices, and it serves as the main locus of housing refugees taken in by the city itself. However, Overvecht also copes with unemployment, a higher

[49]Sections of this case study have already been discussed in a blogpost on *The Mobile City* (Martens 2017b; 2017a).

percentage of residents with declining health, youth delinquency, and criminality. Added to that, while many different nationalities and cultures live together,[50] these negative characteristics, the isolated apartment condos, and drab buildings give Overvecht a negative and anti-social image, both in the rest of Utrecht as well as in Overvecht itself. This dynamism in inhabitants, as well as the abovementioned problems, can make it hard to feel at home in Overvecht, both for those that live there and those that arrive.

Play the City was tasked with providing a game that can counter the sentiment of homelessness. Newcomers and long-term inhabitants have to be able to feel at home in Overvecht – which ultimately has ties to safety, health, and employment. Key considerations are the provision of a voice to unheard and isolated groups. Hidden behind doors in the ten-high rise building, the various cultures do not interact with each other. Furthermore, the youth experiences a lack of agency in their life in the neighbourhood (Wertwijn et al. 2016, 11). As such, to improve the homeliness and agency in the neighbourhood, Play the City had to create game that allowed citizens three main activities (Wertwijn et al. 2016, 16):

1. Get Straight: The acceleration of Overvecht requires the provision of the means for inhabitants who are stuck with their own stacked and intersectional problems to stabilise themselves.
2. Get Along: When stabilised, inhabitants should have the possibility of participating in society.
3. Get Further: Ideally, given the right provisions, inhabitants can develop themselves or the neighbourhood further.

These three pillars have to be achieved by connecting the inhabitants to the necessary expertise. The game had to have replay value, while yielding useful results for the players every time at every place it was played.

Play the City designed 'ONTDEK OVERVECHT' (Discover Overvecht) as an answer to these challenges. The purpose of the designed game was to allow inhabitants and entrepreneurs in Overvecht to equally discover and exploit existing initiatives,[51] and to establish and develop new initiatives and enterprises (together), both amongst themselves and in correspondence with the municipal government. In doing so, the players can learn what is available in their (new) habitat (Get Straight), can participate in the neighbourhood to improve their standing (get along), and can develop their own enterprises in order to improve their home (get further).

[50] In the whole of Overvecht there live about 170 different nationalities (in contrast: the whole city of London houses about 180) (Martens 2017a)

[51] The development started with an inventory of the neighbourhood itself: the reigning problems, the different underused provisions such as the many green places, and the existing initiatives and enterprises aimed at using public space, buildings, and services focused on improving the liveability of the neighbourhood.

Figure 26 The Game Board of ONTDEK OVERVECHT.
The board is an axonometric map of Overvecht with the locations for the 3D printed buildings in pink. Source: Play the City

Figure 27 3D Printed Station Overvecht. Source: Play the City

Figure 28 Players interacting with the neighbourhood cards. Source: Play the City

The game board is an oversized axonometric map of Overvecht divided into ten neighbourhood sections, as seen in Figure 26. On the board are spaces for 3D printed models of buildings in which existing initiatives take place that have to be placed on the board (Figure 27). Their 3D printed nature draws attention to the building itself and by placing it specifically on the map, the players will hopefully recognise the location in the future. The players are divided into groups, with each becoming the representative of one of the sub-neighbourhoods in Overvecht. They place their 3D models in their sub-neighbourhood and study the cards belonging to their buildings (Figure 28). These cards contain descriptions of the initiatives happening in their sub-neighbourhood and whether they cater to the topic of cohabitation, health, employment, or safety. With the capacities of their sub-neighbourhood known, the game can begin. Each player takes a 'challenge card' they find particularly suited. The challenges on these cards are those pestering Overvecht such as obesity or youth delinquency. It is also possible for

players to introduce their own challenge, thus offering them a chance to get along and address situations troubling them specifically. One of the players then presents their challenge and asks the other players for possible solutions. Each player now has to pitch the capacities of their sub-neighbourhood and show the other players how their existing initiatives address the problem, or they introduce a new original initiative. Once everyone has pitched their initiatives, the players vote for the most promising solution, each having three votes to dish out. After addressing all the challenges, the neighbourhood with the most points wins, although the real value is gained from learning about and setting up new initiatives.[52]

Play the City designed the game with several preconditions. As it was funded and officially owned by the municipal government and their subsidiary Wijk&Co, an essential part of the design was that a representative of these organisations would function as game master during the sessions. This way, the challenges, remarks, and initiatives introduced by the players – who are inhabitants of Overvecht or entrepreneurs working there – could be directly heard and possibly addressed by the executive parties. The play setting allows for the voicing of concerns in a safe setting, but being explicitly heard is a strong addition. Furthermore, the game travels around, being played in 24 locations. Just like in the game, Overvecht consists of different sub-neighbourhoods, each with different people and different experiences. Travelling from one place to another allows the game to encounter different people from different demographics who introduce more tailor-made challenges and initiatives, thus improving the neighbourhood throughout. The game can easily be adapted with new buildings and cards to mirror the current situation.

Ultimately, the game allows players to get to know what is already present in their neighbourhood and get a new inventory of existing problems and initiatives from different places. This focuses the aid given as well as provides connections for people looking for solutions. It can also highlight why people do not use existing solutions, especially by asking various players from different places and demographics. The inner functioning of the neighbourhood comes to the fore through play. Because the game is largely played through unstructured dialogues, many different ways of playing are afforded.

4.3.2 Implementation Phase of ONTDEK OVERVECHT

With the development of the game known and a regular round of play outlined, with all its specifics, the inventory of the loops and metagames can begin.[53] This section, in accordance with the action space

[52] This description is the ideal case when players are motivated and creatively engaged. However, getting citizens to participate in civic issues is an additional challenge that goes beyond the scope of this thesis. Whereas the careful consideration of motivations can be addressed through the fit, here we focus solely on the actions afforded by the design, which exist despite motivation.

[53] The players and game masters and their appropriations have been studied during the 24 play sessions to identify the different ways of playing and the circumstances forming these interactions. Especially helpful were the reflections of the designers themselves after a session, determining what worked and what needs improvement or change. Based on these reflections, specific nuances of the loops and metagames were foregrounded.

analysis, will outline the afforded loops and metagames grouped into loop groups, as well as the identification of the signified interaction.

Determining the core loops is the first task as the secondary loops and metagame variations build upon these. Regardless of personal playing style, each game will contain the following steps: pick a neighbourhood, pick a challenge, pitch your neighbourhood, and vote for best options. Depending on the amount of players, these actions will be repeated per round, wherein usually the neighbourhood choice is a stable given, yet still a conscious determination. Different player interactions arrive when this basis of the core loop gets a particular nuance in its end state. This results in three different core loops that all pursue different goals, as shown in Table 26.

Core Loop	**Mechanic**
Win	pick a neighbourhood, pick a challenge, *pitch your neighbourhood*, vote for best options
Ask	pick a neighbourhood, *pick a challenge*, pitch your neighbourhood, vote for best options
Solve	*pick a neighbourhood*, pick a challenge, pitch your neighbourhood, vote for best options

Table 26 Core loops of ONTDEK OVERVECHT, with the focus of each core loop in italics. Source: Author creation

When players strive to win, their pitches (and ideas) have to be the best in order to gain the most votes. Whereas when players come to the game with a specific question or challenge, the presentation and discussion of this challenge takes centre stage. Some players, especially entrepreneurs or representatives of governments or businesses can instead display their knowledge and activities by representing a neighbourhood they are familiar with. This way, this core loop will focus on solving the challenges through more intimate knowledge of what is present in Overvecht.

These core loops are all based on the game as given – the provided challenges are played and nothing is added. Secondary loops, and specifically added secondary loops, arise through three sources in ONTDEK OVERVECHT. Firstly, the players can introduce new assets such as challenges, initiatives, or even cross-neighbourhood solutions. In those cases the afforded requests for player input can give the core loop a different spin due to appropriation Secondly, depending on where the game is played, specific neighbourhoods can also be subjected to focused treatment; scrutinising the available means and comparing with others. Finally, depending on the experts' knowledge, a reflective loop may foreground important locations in Overvecht not highlighted on the map. Not all of the secondary loops fit with each core loop however. Someone asking for solution will not initially pitch a new initiative because otherwise they would not need to ask. Core loops and secondary loops form identifiable loop groups as shown in Collection 18.

The metagames similarly can range from player added to provided by the game. The position here has influence on the location specificity of the actions. For the informational metagame, this means the player can bring in knowledge from their own experience with the challenges, neighbourhoods, or

solutions, or they can work solely with the information provided by the cards. Fictionally, players can add a personal experience or a convincing narrative, or stick to the challenge provided and let others do the discussing. The economical metagame can take all possible forms, depending on the presence of executive members or not. Regarding the performance, players can put themselves out there and

Loop Group	Mechanics
Win+Initiative	pick neighbourhood, pick a challenge, **create new initiative**, *pitch it*, vote best options
Win+Challenge	pick neighbourhood, pick challenge your neighbourhood excels at, pitch solution, vote best options
Win+Connecting	pick neighbourhood, pick challenge, ***pitch solutions by connecting different neighbourhoods***, vote best options
Win+Neighbourhood	**pick a neighbourhood you are familiar with**, **pick a challenge your neighbourhood excels at**, ***pitch solutions worked on***, vote best options
Win+Reflection	**pick a neighbourhood you are familiar with**, pick a challenge, ***Pitch any missing initiative in your neighbourhood***, vote for best options
Ask+Challenge	pick a neighbourhood, introduce a pressing challenge, collect initiatives, vote for best options)
Ask+Connecting	pick a neighbourhood, *pick a challenge*, **pitch connections as a solution**, vote for best options
Ask+Neighbourhood	pick a neighbourhood, ***identify challenges of neighbourhood***, **collect initiatives**, vote for best options)
Ask+Reflection	pick a neighbourhood, *pick a challenge*, collect initiatives, vote for best options, **suggest alterations to address challenge in the future**
Solve+Initiative	*pick a neighbourhood*, pick a challenge, **introduce new initiatives**, pitch initiatives, vote for best options
Solve+Connecting	*pick a neighbourhood*, pick a challenge, **pitch initiatives based on cooperation**, vote for best options
Solve+Neighbourhood	*pick a neighbourhood*, pick a challenge, **pitch general plan for whole neighbourhood**, vote for best options
Solve+Reflection	*pick a neighbourhood*, **identify challenges**, **pitch plan for whole neighbourhood**, vote for best options

Table 27 Secondary Loops of ONTDEK OVERVECHT grouped according to their core loop. On the right are the mechanics that form these loop groups, with the additions of the secondary loops in bold. The focus point of the core loop of the loop group is in italics. Source: Author creation

introduce options with flashy pitches, or instead they can play the game in order to be helped. Finally, the contextual metagame can be personally specific – making the best use of local space – or applying general solutions like more funding. These metagames differ per play style. The complete overview can be found in Appendix 5.

4.3.3 The Design Phase of ONTDEK OVERVECHT

To gain more grip on what interaction is explicitly designed for, the signified affordance has to be determined by identifying the signifiers. While all afforded interactions can happen, the signified affordance is given most attention, and here is interpreted as the pursued interaction.

The main signifiers are in the manual of the game. A cut-out with the steps of a play round is always within reach of the players. On the back of the cards detailing each of the initiatives is a short overview of the steps as well. The manual, seen in Figure 29[54], outlines registration, picking a challenge, picking a neighbourhood, studying your neighbourhood, sharing challenges, suggesting solutions, awarding points, and tallying points as steps. While in these steps there is mention of introducing new initiatives and challenges, the gist of the explanation is on the mechanical playing of the cards. The narrative – the urban function – attributed to the initiatives is given only limited attention. In that sense, the game is more a puzzle game of linking the appropriate initiatives to the challenges, with pitching being the mechanic to establish such links. The ultimate goal is the division of points in order to win. Furthermore, no specific mindset or pre-existing knowledge is required. Given this mechanical linking interaction, either through the cards or through own inventions, with the ultimate goal of winning, the signified affordances can be said to be the 'Winning through New Initiatives' affordance group. This form of interaction can be expected to be exhibited most, as all players are confronted with these instructions and they are least limited by specific metagames. This mechanical win focus as most announced ultimately shapes the most explicit purpose of the game: win. The signified loop group is that of winning through new initiatives, which will influence the pursued city model in ONTDEK OVERVECHT.

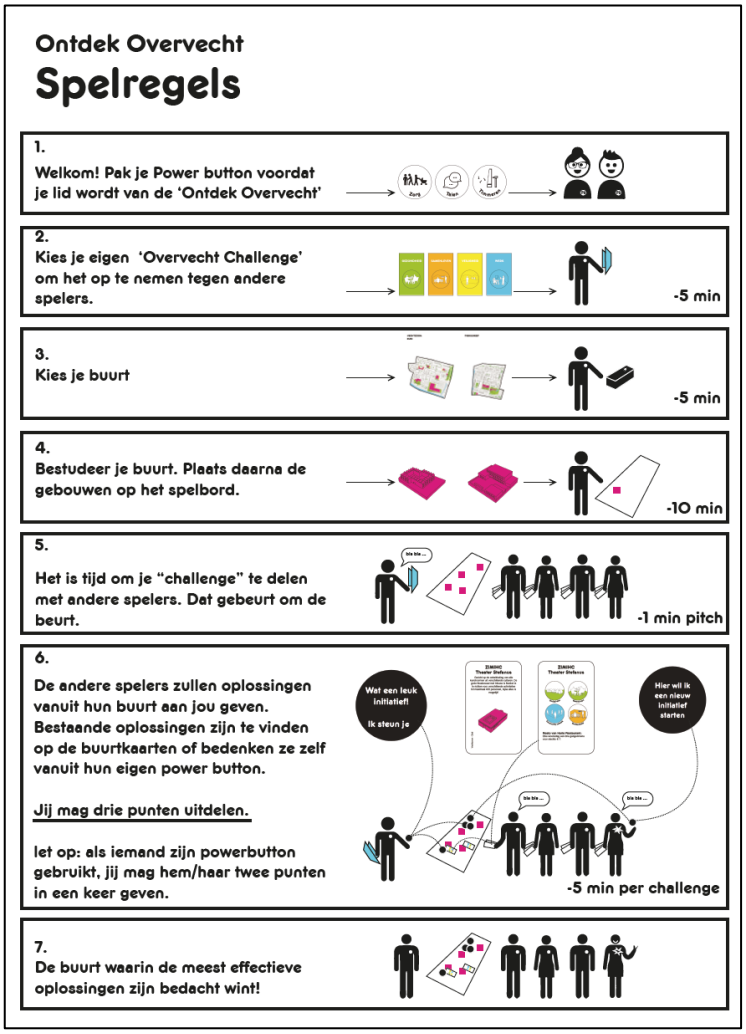


Figure 29 ONTDEK OVERVECHT Manual Page. Source: Play the City

[54] The Power Button was removed as a functional element early in development. Instead, these buttons offer a means of identifying other players and their function.

4.3.4 The Requirement Phase of ONTDEK OVERVECHT

Translating the loops and metagames into city model characteristics for the signified loop group will yield the pursued city model. For ONTDEK OVERVECHT, The pursued city model is located between the facilitating and social categories of city models, thus offering some flexibility in terms of determining the characteristics. The instigators of the city model are shaped by the largely private symbolic player activity of (mostly) eloquent pitching. As it solely benefits the player, the instigator can be said to be player focused. The ideology is purely functional for the player as well, relying on knowledge valuable for a tale yet to be spun, as winning is above all. The city aspect is determined by the pitching of local knowledge. This then forms a city aspect that approaches the general city as a resource for winning ideas. As this is an idealistic take on the city, some aspects may even be imagined. The carrier is then mostly a communication of ideas through pitching, with credibility a secondary worry. Finally, citizens, players are expected to create a killer presentation capable of winning over others. These interpretations yield the pursued city model as outlined in Table 28.

City Model Characteristics	Pursued City Model of ONTDEK OVERVECHT
Instigator	Player Focused
Ideology	Winning Above all
City Aspect	City as resource to win
Carrier	Personal Presentation of ideas
Citizen Actions	Winning pitches – disregarding feasibility

Table 28 The pursued city model in ONTDEK OVERVECHT based on the Win+Initiative loop group. Source: Author creation

Knowing the pursued city model gives meaning to the possible fits. A procedural fit means that the player is mostly making use of the means of the game as resource. Their impact on the game state remains limited. A ludic fit means that the player is focused on playing the game to win. Finally, a civic fit sees the city treated as a resource open to appropriation but with a link to reality in order for the initiatives to fit with the logic of the reality issued by the challenges.

With the city models afforded by ONTDEK OVERVECHT known and shown in Appendix 5, as well as the pursued city model, the fit can now be calculated and interpreted. Based on the numerical values of the fit, the likelihood of the current design of ONTDEK OVERVECHT achieving its goal can be listed, while the interpretation of the fits can show strengths as well as points of order in the design.

4.3.5 The Comparison Phase of ONTDEK OVERVECHT

4.3.5.1 Quantifying the fit

When comparing the characteristics of the pursued city model to those of all the afforded city models in ONTDEK OVERVECHT, the matching dimensions of the characteristics add up to form a fit value. This fit value denotes how well the afforded city model fits the pursued city model and thus how likely it is

that the afforded city model is communicated while playing, due to the overlap with the signified loop group. Each afforded city model has its own fit value but here we shall only discuss the fit value of the win+challenge city model. The loops and metagames of the win+challenge and the pursued city model that will be compared, are outlined in Table 29. The other city models follow a similar method to calculate their fit value. These different fit values of the afforded city models of ONTDEK OVERVECHT are collected in Collection 7 further on.

Formative Element	Win+Initiative (Pursued City Model)	Win+Challenge
Loops	pick neighbourhood, pick a challenge, create new initiative, it, vote best options	pick neighbourhood, pick challenge your neighbourhood excells at, pitch solution, vote best options
Informational Metagame	Knowledge of Neighbourhood and strong initiatives	Knowledge of Neighbourhood and meta challenges that can be won
Fictional Metagame	Dependent on the Challenge. Solutionist. Stress initiative benefits	Specific Spin on Challenge. Completely laid out road by deciding the playing ground
Economic Metagame	Private Symbolic with room for Public Actual	Private Symbolic
Performative Metagame	Pitch to win	Pitch to win
Contextual Metagame	Solutions can be general. Less tactile Still have to count as logical solution	Solutions can be general. Less tactile than the rest. Fill in the gaps created by player

Table 29 The Win+Initiative city model loops and metagames and those from the win+challenge city model in ONTDEK OVERVECHT. These elements are compared in order to quantify and qualify the fit. Source: Author creation

The loop group aiming to win by introducing a new challenge pursues victory by basically clearing the way for their ideas. Introducing a new challenge here means to introduce a challenge that the player has the perfect solution for. The loops of this city model matches the pursued city model and so does its pitching performance. The external info used is however detached from the challenges and city, unlike in the pursued model, but still relies on some resources from the city, thus making for a partial fit. While also economically private and symbolic, the win+challenge city model is completely focused on individual play and lacks any possibility of actual public interaction, also manifesting a partial fit. The story spun, as well as the complete irreverence for realistic solution make the fictional and contextual metagame of the win+challenge city model not match with the pursued city model at all, wherein the stories used are clever tricks on urban issues instead of its complete disregard. Given these matches and mismatches, [55] the quantification of this fit is done by adding up the values per characteristic according to the formula:

Fit value = ∑(Loops and Metagames overlap of city model characteristics)

= (6.67+3.33+3.33)+(3.33+0+3.33)+(10+5)+(10+5)+(2.5+2.5+5+0) = 54%

[55] The matches and mismatches of all loops are found in Appendix 5.

The afforded fits mostly score lowly, with some outliers. This means that the pursued city model is not readily conjured through appropriated loop groups. The general categories of city models that the pursued city model is a specification of often do not match those conjured by other afforded loop groups. An explanation for this is the very open mechanic of discussion. These allow for flexible appropriation but can also go awry. Understanding what the quantifications mean will give further insight, although this requires qualification. Qualification can first be done by checking the discursive model sketched for ONTDEK OVERVECHT.

4.3.5.2 The Discursive model of ONTDEK OVERVECHT

The discourse around ONTDEK OVERVECHT is mostly shaped by the Acceleration Report and its focus on cohabitation. Given these special expectations of the game, the city model characteristics can be determined. The instigators of the pursued city model, given that the focus is on giving a voice to the unheard, is partly with the players themselves. While the municipality has a specific view on the way the city should function, it is ultimately the players that have to get better because of the game. The ideology underpinning this model therefore is the cohabitation approach. The goal is to make people feel at home by getting along and further in their lives. This ideology specifically limits the city aspect addressed to the citizens' experienced environment – or what constitutes as a home for them. As such, it is not too large an aspect that has to be addressed, depending on the player's approach to life. In accordance to the acceleration plan, the acceleration of cohabitation can happen when professionals take a proactive approach (Wertwijn et al. 2016). This requires that interaction has to happen face to face instead of through digital channels, which are often unavailable to many players. The main goal of these communications is to get the players to get straight, get along, and get ahead. If the players manage to take useful information from the game that will help them in their life, then the game will have achieved its purpose. The discourse paints a much more civic picture with a distinct focus on interacting to solve problems. This discourse differs in that there is no mention of winning at all. This explains why the other affordances exist and why afforded loop groups do not fit the winning focused pursued city model. Still, it seems that some afforded city models mirroring the discursive approach (the solve models) achieve higher fits in general, as solving the challenges is a way of winning. Still, ONTDEK OVERVECHT displays a mismatch between the game design and its strengths or purpose. To unpack this further, qualification based on the type of fit is required.

4.3.5.3 Qualifying the fit

Qualification of the fit means the determination of the type of fit based on the city model characteristics. Identifying which of the formative elements of the city models (the loops and metagames) correspond to those of the pursued city model can show on what level the afforded city models fit with the pursued

models; procedural, ludic, or civic level, or a combination of the three. This qualification will show what different fit values mean, how their value can be explained, and what aspects of the design make some values more attuned than others. The results, done according to the cypher introduced in chapter three, can be seen in Collection 7, with a brief explanation as to the relation of the afforded city model in the game, player, and city configuration.

Problematic Signification

The first value that strikes is the high number of ludic fits and lack of civic fits. This means that the game fits the desire to play the game individually for winning or personal agenda pushing. However, the game was originally intended as a means for civic improvement. This does not mean the game design is flawed but that the signification draws attention to the wrong elements if the assigned city model is to be achieved. Add to this the lower fit values of most models not pursuing individual gain and the pursued city model seems less fitting to the current design. The focus is solely on ludic elements, allowing the players to 'play the system' instead of diving into appropriation of the city, which loses its meaning in the game. In this case the point system is a rather crude abstraction of support and draws attention to winning. Exchanging this point system for an expert assessment could be more fruitful, driving attention away from the core loops of winning.

Another highlight is the higher values of models relying on interaction and reflection. Even in the win city models, despite focusing on winning regardless of others, these models score higher due to their openness to connection and reflection. Especially the solve models score higher and fit on more levels due to their embracing of the full supply of actors in the game to address the challenge – either to win or provide a solution. Other lower fits, like asking answers to a personal challenge or solving through neighbourhood imposition, seem lacklustre in their approach to victory. These models rely explicitly on having problems solved for the player or providing a unitary unnegotiable solution, instead of solving them together or themselves. The player and the game here are at odds for the player cannot use the game themselves. The solve models almost all achieve higher fits for here the player is actively involved the problem solving. As such, the game adequately embraces the getting along and getting further. Arguably, getting further is rewarded more than getting along. Regardless of these fits, the pursued city model seems to be focused on winning. While it touches on the discursive goal of solving challenges, the winning signification is stronger, which causes a misfit with many other afforded loop groups.

Afforded City Model	Fit Value	Fit Value (Quality)	Explanation
Win + Challenge	54%	Ludic	The point here is to play the game which the player is spurred to do. The city, or cooperation options are irrelevant
Win + Connecting	67%	Ludic	Again, playing the game is key, although now more interactions are possible. Still, these are loosened from the gameplay and city
Win + Neighbourhood	55%	Ludic	The engagement with a neighbourhood is solely instrumental for winning. The relation between the city and other players is instrumental
Win + Reflection	82%	Procedural-Ludic	While still focused on the game, the reflection on the winning results can be used to improve the city. However, as the city is still such a resource, this is not a given
Ask + Challenge	47%	Procedural	The player is not playing but merely coming for help. As they do not have any control over the city or the game means, they are dependent on others. No control over status.
Ask + Connecting	62%	Procedural	The player is not playing but is actively looking for help, thus gaining the most from the game. It is not up to them though what they leave with
Ask + Neighbourhood	39%	Procedural	By starting from a clear idea of the neighbourhood, the player functions as expert control for answers provided by others. They still do not participate actively. There is no personal gain.
Ask + Reflection	76%	Procedural-Ludic	Reflecting on the answers given by others and using them to improve personal neighbourhoods keeps the player involved in the means of the game, the rules of the game, and its application, while still practically winning
Solve + Initiative	85%	Procedural-Ludic	Instead of cooperating to come to an answer for the city, here the player uses the means of the game and their personal knowledge to effectively solve problems. Whether they always fit with the neighbourhood remains to be seen
Solve + Connecting	68%	Procedural-Ludic	The player here is less playing the game but more gathering support for clever solutions. They may not be always asked for, but the collaboration can be of value.
Solve + Neighbourhood	72%	Ludic	A thought out plan is being imposed through the game rules. This sidesteps alternatives or game collaborations. Quite similar to winning only now rooted in reality.
Solve + Reflection	92%	Attuned	Perfecting a neighbourhood with solutions supplied by everyone through the game. Winning by cooperation

Collection 7 Types of fit in ONTDEK OVERVECHT and their justification. The fit values are given as well. The presence of a fit means that the afforded city model allows for a similar engagement between game, city, and player as the pursued city model. Source: Author creation

Solving contexts

Solving models score relatively high as fits, some even attaining attuned fits. While this is insightful when it comes to design, a caveat here is necessary. Experts cannot present their solutions if they are not asked for, otherwise they are more seen as an attempt to win. Nor will askers get a solution if no-one with expertise is there to deliver it. As such, the build-up of players in this game is an essential variable. ONTDEK OVERVECHT is therefore more a connector or facilitator – as its general category attests; linking problems to solutions through play. Yet its manual focusing on winning is a disruptor. The contextual addition of having this game played in different locations with different demographics and with experts as game masters ensures that the Ask and Solve models are possible. If there are no experts present or the players do not have a link to the area discussed, then the game loses its contextualisation, resulting in more mechanical winning models.[56] This is also highly dependent on the type of players. For children, the challenges dealt with will differ than those from adults, as do the salient places. To avoid pure mechanic (winning focused) play, the game needs a redesign in order to accommodate different players to cater to their recognition.

A key aspect in these city models arising from this caveat is the reliance on recognition. Both askers and solvers are experts in their own way, either of neighbourhoods or solutions. Essential is the recognition of problems existing and solutions present. Just throwing ideas out there to win will ultimately not be very conducive, nor is the presentation of a hugely top-down vision as seen in the Solve + neighbourhood fit. There needs to be room for personal appropriation. This further subscribes the repeated statement that co-creation of a neighbourhood or city is more effective than extreme top down or bottom up (Ampatzidou, Bouw, et al. 2015). As a game for newcomers, ONTDEK OVERVECHT might not offer all it could. The reliance on recognition is essential for the functioning of the game. Newcomers will not recognise enough to fully utilise the game. They are, in the beginning, subjected to the recognition of the other players. After a short while the game will inform them of initiatives, but at the beginning expert guidance is required. Given this step-up to asking and solving, several design recommendations can be made. Changing the signification is one, a contextualisation with experts is another. Furthermore, to get rid of mechanical uses only, the game should be played more often so that the procedure becomes clear and the civic fit becomes more foregrounded due to recognition.

[56]During the 24 sessions of ONTDEK OVERVECHT, the municipality and Wijk&Co increasingly stepped back from the game, resulting in an absence of experts. The game could still function as communicator and inventory of local grievances, but it missed access to the 'ask and solve' models. At times, experts from the field would participate, offering solutions and questions, yet other times – especially when played with children – the game became a competition wherein recognition was less important than convincing your friends.

4.3.6 Conclusion of ONTDEK OVERVECHT

ONTDEK OVERVECHT has great potential to achieve its pursued city model of collective problem solving with individual personal input. As it is yet however, ONTDEK OVERVECHT does not attain a fit due to the affordance of winning the game and the explicit mention of it in the manual. However, this ludic element may be a necessity to make this game an actual playful entity and not just a glorified meeting organisation. The lack of fit here has shown the weak spots of the existing game and the strengths of the other interactions. However, it also showed how dependent on multiple types of players games can be. Dependencies between fits are something that can be used to identify what type of cooperation between models is required for a fully fitting game. This means that asymmetrical game design can at some moments be the desired action. Granted, ONTDEK OVERVECHT is an analog game with a great potential due to its reliance on unlimited discussion and communication. Still, instead of relying on rules and winning scenarios like it does now, to make the game fit its goal better may require more limitations and necessities in the type of players. As such, the fit and its action space analysis can be used to identify designed disruptors, as well as analyse the contextual build-up of games.

4.4 Case Study 3: CITIES: SKYLINES

4.4.1 What is CITIES: SKYLINES

Here we will see what the fit and its action space analysis can show about the city simulation game CITIES: SKYLINES and how it can be used to reflect on serious alternative uses of entertainment games. CITIES: SKYLINES is a 2015 city building, or city simulation game by the Finnish company Colossal Order. Previously Colossal Order had developed city simulations focused on transport and mobility, such as CITIES IN MOTION (Colossal Order 2011). When the prime representative of city building games, SIMCITY (Maxis Emeryville 2013) was received with critical backlash Colossal Order and publisher Paradox Interactive scaled up their development of a city building game. The result was CITIES: SKYLINES. The game set out to simulate the daily routine of one million assets, which are up to the player to orchestrate and streamline. Like SIMCITY, CITIES: SKYLINES relies on developing districts with specific dedicated zones, establishing an infrastructure, and expand the constructed city like a deified mayor (Bereitschaft 2016, 53). The main difference with its competitors came from its more accessible user interface, its improved traffic simulation, and, most importantly, its readily acceptance of user generated content due to its reliance on the Unity engine. These differences meant that "[g]enerally critics considered CITIES: SKYLINES to have superseded SimCity as the leading game of the genre" (Stephens 2016, 270).

Building on its mobility heritage, in CITIES: SKYLINES, its most detailed simulations are achieved in transport and infrastructure design. Bradley Bereitschaft describes the general interaction of the games as follows:

> "balance the supply and demand of various land uses (i.e., residential, commercial, and industrial), provide services and infrastructure (e.g., roads, water, sewer, electricity, police and fire protection), set and collect taxes, and see to the health, happiness, and education of their citizens" (2016, 52).

The main challenge, apart from financial agency, is to make sure all these provisions run smoothly, allowing for the movement of the particular service, be it industry traffic, garbage collection, or public transport. Only through clever road design and intelligent zoning, facilitated by the characteristics of each selectable building (such as environment pollution and coverage), can congestion be prevented and will both happiness and revenue soar. Balancing the supply and demand of the land use will ultimately have to take on many variables presented by the game such as noise, ground, and water pollution, education coverage, leisure, and policy choices. As Bereitschaft points out however, most of these variables can be manipulated by altering the road network – the most powerful tool in the game. Improving the road system gives "immediate feedback" and makes the "primary goal […] to tame automotive congestion, [which] leads many players to exhibit a kind of 'freeway fetish'"(2016, 55), possibly due to the focus of the game on an American style city (idem, 56).

Despite this cultural positioning, several authors have explored the capacity of this game to serve a simulation tool in urban planning (Stephens 2016; Juraschek, Herrmann, and Thiede 2017). The game has even been used to model and test the new bus network of Stockholm before its implementation (Donnely 2016). While mostly an entertainment game, CITIES: SKYLINES is embraced as a semi realistic simulator of traffic and inter-district movement. City planner Ric Stephens explains that the main value is in discovering how "[i]n future simulations, the flapping wings of a sim-butterfly may be the inception of a sim-hurricane" in order to discover "unintended consequences, or externalities, of various actions" (2016, 272). Max Juraschek, Christoph Herrmann, Sebastian Thiede furthermore use the game to test scientific hypothesis, in this case urban factories viability, in a participatory setting. This required them to tweak the game through mods in order for them to find an answer, but the many variables and friendly interface made this a useful tool for use in scientific studies (Juraschek, Herrmann, and Thiede 2017). CITIES: SKYLINES is a game that can fulfil a variety of functions.

Regardless, a common denominator in these uses is the reliance on testing and modelling in pursuit of "a process of demystification" (Friedman in Bereitschaft 2016, 52). The main benefit of these games is that they "place learners in a unique position to understand a system's dynamics" (Squire in Bereitschaft 2016, 52). Indeed, Juraschek et al. admit that "[g]aming software is mainly focused on the user experience, not on scientific accuracy" (2017, 472). Bereitschaft has outlined many of the missing

aspects not afforded in the game, such as mixed use buildings, ethnic diversity, and its inconsequential traffic focus (2016). The inclusions and exclusions ultimately relate to a specific ideology placed in the game by design – a city model. Of course, CITIES: SKYLINES is not alone in this, as Stephens shows, for this is present in every game dealing with the city (2016). Yet the ultimate affordances of this game are limited due to the present and forwarded aspects. Additionally, Bereitschaft expresses the idea that "players, like the games, are not a blank slate; they bring to the game environment knowledge and experience, as well as preconceived biases and stereotypes of cities and their inhabitants (2016, 59). When determining the afforded interactions of CITIES: SKYLINES then, and its city models afterwards, required diving into the mechanics and interface of the game, as well as the "external interactions," such as modding, which players undertake to make the game playable for them (Bereitschaft 2016, 52).

4.4.2 Implementation Phase of CITIES: SKYLINES

As a complex city simulating game behoves, CITIES: SKYLINES is a complex game with many game mechanics for the player to explore. Unlike ONTDEK OVERVECHT, CITIES: SKYLINES limits the mechanics through programmed possibilities. Though many, the affordances of the game are hardcoded. Mapping these affordances into loops and metagames will ultimately simplify activities, yet this is unavoidable when dealing with such a complex simulator. This section will then outline the distinguishable core loops in the mode accessed when pressing New Game and Start in the menu right away.[57] This means observing how the game strives toward an end state because, despite a lack of tutorials, the game does have a form of progress that outlines core loops.

The progress mechanic of CITIES: SKYLINES is based on the gradual unlocking of buildable objects.[58] While there is no clear tutorial, only text blocks with explanations of different selectables pop up periodically explaining their purpose and use, whereas the requirements for unlocking structures are displayed in a dedicated progress menu that displays every time a milestone is accomlished (Figure 30). At the onset only roads are available to the player, quickly followed by zoning, electricity, and water. Here is where the loops start to reveal themselves. Through introduced dependencies, the unlockable options follow a logical order (population requires housing, which requires water and power, etc.). Ultimately these series of dependencies provide a repeating loop to unlock everything and make a running metropolis. This loop consists of infrastructure (roads, water, and power), zoning (living, commercial, and productive), public service (education, healthcare, and garbage), public transport, leisure, and finally, wait. Only with all the options unlocked, the player can start building their city according to their wish. However, funds are required for construction so at times the player

[57] Based on the version of the game without expansion packs. Furthermore, the New Game version is the most bare bone version without imposed limits and challenges present in other game modes.
[58] This is not the case in the Sandbox mode wherein everything is open from the start and funds are unlimited. However, even there, the order of unlocking in the New Game mode provides the logical order to build a city so that each requirement of the selectable buildings are met.

will experience stretches of dead time in which they wait for their city to gather enough revenue through taxation and export. Then the cycle repeats: the better the city develops the more new options in each of the categories unlock (such as high density apartments, railways, clean power, hospitals, etc.).

Figure 30 The Unlock screen of CITIES: SKYLINES. Source: Author screenshot

Stephens and Juraschek et al. show that the game can also serve more from a simulation or model perspective. In this case the city to be designed is more limited by the environment modelled – for instance an existing city – than a creativity inspired city. An added dimension here for instance is the topography of the city that has to be handmade by the player (Juraschek, Herrmann, and Thiede 2017, 472). Similarly, the infrastructure and zoning will have to be adjusted to the parameters of the target area or city, mirroring realistic numbers. The game affords this ability but in the normal game mode this would significantly impact funds. Since the focus is not on profit but on the analysis of a model, the sandbox model with unlimited money is often used. Juraschek et al. explain that the steps of such a modelling can be "divided into four steps with their respective results: modeling [sic] (model), implementation (simulation), execution (results) and analysis(insight)" (2017, 470). These steps are however seen from a meta perspective, with the study as reference frame. The modelling, implementation, and execution steps can all be actualised in the game through game mechanics as determine parameters, topography, infrastructure, zoning, public service, public transport, leisure, read variables, analyse. In this core loop it is possible that some of the actions are ignored, as they are eliminated or controlled variables in the study. Depending on the desires of the study, this core loop can have several variations that will be discussed later.

The modelling and build loop both rely on the construction and simulation of a city in the game. However, creating modifications is an essential form of interaction with the game as well, as it set

CITIES: SKYLINES apart from SIMCITY. The opening menu draws attention to the Steam Workshop creations and one of the options in the main menu is Content Creation. Modding can be a secondary loop when assets are used as part of a larger build, but when made by players, they constitute a core loop. Modding requires players to import an asset – an object such a building or a road – from the game and edit its code, often in a different programme altogether. Depending on whether the function or the visual of an asset is modified, players can alter only the code or may need to perform 3D rendering actions. The complexity of the programming also consists of several actions. To stick with the interdisciplinary technical level of the rest of this study, the compound mechanic of coding the modification will be summarised as 'programming'. Modding then takes the following actions: Import Classes, Programme, and Compile.

There are three core loops in CITIES: SKYLINES, depicted in Collection 8. These however are only general distinctions in how the game is played. The secondary loops give the game its varied existence.

Core Loop	**Mechanics**
Build	Infrastructure, zoning, public service, public transport, leisure, wait
Model	Determine parameters, topography, infrastructure, zoning, public service, public transport, leisure, read variables, analyse
Mod	Import classes, programme, compile

Collection 8 Core Loops of CITIES: SKYLINES. Source: Author creation

The secondary loops expanding on the build loop usually keep the main interaction of city building in place. The difference is in the goal set by the player which shapes the playing style and salient elements. If the goal is creative expression then the unlimited money sandbox mode is more fitting, while additionally removing the need to wait. Instead destroying and rebuilding become freely available. A more personal form of creative expression comes from the creation of an existing city. In this case, like the modelling loop, the poignant parameters have to be determined first before the city can be built. This may also divert from the core loop by adding mods to import existing buildings not originally in the game. These secondary loops all focus on a particular building goal. Other secondary loops instead focus on playing the game. The main metrics of success in the game are profit and citizen happiness. Gaining profit is often related to optimising traffic and transport, while citizen happiness relies on listening to citizen demands (often still related to traffic). These gameplay loops are guided by different measures of success. Finally, as Bereitschaft identified, an important loop in the community is the creation of impressive freeway intersections – called Freeway Fetish – which are then shared on community pages such as reddit. The specific mechanics are shown in Collection 9.

Secondary Loop	Mechanics
Existing	**Explore existing parameters**, infrastructure, zoning, public service, public transport, leisure
Sandbox	Infrastructure, zoning, public service, public transport, leisure, **destroy, rebuild**
Freeway Fetish	Optimise infrastructure, **feedback from parameters, share**
Profit	**Optimise** infrastructure, zoning, public service, public transport, leisure, wait
Happiness	Infrastructure, zoning, public service, public transport, leisure**, feedback citizens**
Modded	**Import mods**, infrastructure, zoning, public service, public transport, leisure, wait

Collection 9 Secondary loops of the Build Core Loop. In bold are the mechanical expansions of the core loop for each secondary loop. Source: Author creation

In a similar vein the modelling loop can be experimental, participatory, or tweaking, depending on the purpose of the study. Juraschek et al., in their modelling of the feasibility of factories in the city area, were more focused on experimenting with variable configurations of city building and their interrelations, providing valuable feedback about interrelations. Alternatively, the modelling in CITIES: SKYLINES is deployed as a participatory tool; a more accessible and visible interface of sharing ideas. In this case the stakeholders are the main source of feedback instead of the game values. Yet even here the modelling loop may first need tweaking by modifying the game to fit better with the purposes of the study, for instance by programming a module for mirroring topographic data from pre-set parameters. Collection 10 shows the mechanics of those three secondary loops

Secondary Loop	Mechanics
Experiment	Modelling, implementing, executing, **analyse values, reset parameters, retry**
Participatory	Modelling, implementing, executing, **gather feedback, tweak**
Tweak	**Mod to tweak conditions**, modelling, implementing, executing, analysing

Collection 10 Secondary loops of the Modelling Core Loop. In bold are the mechanical expansions of the core loop for each secondary loop. Source: Author creation

The creativity of play comes forth in the modification of existing assets in order to express a sentiment or subvert expectations, echoing Sicart's play characteristics (2014). For instance, one user modded a funeral home to look like a toaster (Figure 31). Here the play comes from subverting expectations. Alternatively, players can be motivated to mod in order to create buildings they have a personal connection to, such as existing buildings not in the game built from scratch, for instance the Crématorium d'Armiens Métropole (Figure 32). This personal motivation can also mean tweaking existing assets or mechanics in order to improve realism, such as an improvement of the winter graphics (Figure 33). Ultimately, modding can also take up a carnivalesque approach to playing wherein players, from a more meta perspective, alter the functioning of the game. The game affords the addition of player built scenarios or different forms of interacting with the game, such as a first person camera. Here the

Figure 31 Funerary Home as Toaster Source: Mutant_Tortoise 2015

Figure 32 Crématorium d'Armiens Métropole. Source: Kliekie 2016

Figure 33 Realistic Winter. Source: BTB 2016

object being programmed encompasses the entire game and its rules instead of a single asset. Finally, modding can be a social and prestigious activity by the sharing of skill in a community on sites such as Reddit or Steam. Motivated by a playful interaction, modifications have a variety of secondary loops, as shown in Collection 11.

Informing these secondary loops are recurring variations amongst the metagames. The informational metagames all depend on the required information needed for playing. In every Mod Loop this means programming knowledge, which is not included in the game per se. Most of the time however the informational metagame stresses an intricate knowledge of how the game works, or how a real life city looks, in order to beat the game or simulate reality respectively. The fictional metagames however are often individual and related to personal convictions or motivations. There is no larger narrative behind specific loops. This is mirrored in the economic metagames that are also mostly private, with some public function possibilities, depending on the kind of research. The performative metagames usually centre on a particular position towards the game. This can mean showing off, experimenting, or beating the system. The reliance on community can expand this metagame in some loops. Finally the contextual metagame usually explains the specificity of the actions – how related to local actions they are. As a simulator there is a certain general abstraction in CITIES: SKYLINES yet some loops may pursue real world references. The complete reverse engineered inventory of loops and metagames of CITIES: SKYLINES can then be seen in Appendix 6. A complex game as CITIES: SKYLINES has a considerable amount of possible actions and circumstances in which these actions occur. Given the relative freedom the player has to experiment, most of these interactions can be reached by each player at some point in time. The signified loop group can show what the pursued option is within this cornucopia.

4.4.3 The Design Phase of CITIES: SKYLINES

The design phase looks for the signified affordances in order to identify the pursued loop group. Usually, manuals and tutorials are most telling for this purpose. CITIES: SKYLINES does not have a tutorial, despite its complexity. Instead, there are optional pop-up information screens linked to every selectable city asset. In this case the signifiers that structure the gameplay must be found in the user interface. Determining which form of interaction is pushed forward by the interface will show that the classical mechanic gameplay of mastering the system – the profit focused interaction – is central.

Secondary Loop	Mechanics
Expressive	Import classes, **import objects**, programme tweaks, compile
Contribute	Import classes, **determine parameters of existing object**, **import or design object**, programme tweaks, compile
Existing	Import classes, **determine missing elements**, programme tweaks, compile
Realism	Import classes, **programme conditions, compile scenario, upload**
Scenario	Import classes, **programme alternative game states, compile modifier, upload**
Modifiers	Import classes, programme, compile, **upload source code**

Collection 11 The secondary loops of the Modding Core Loop. In bold are the mechanical expansions of the core loop for each secondary loop. Source: Author creation

Figure 34 CITIES: SKYLINES Main Menu.
The menu depicts signified affordances in how it positions content and what is included or not. Source: Author Screenshot

When booting up the game all the afforded interactions are still fair game, given the options of the main menu as shown in Figure 34. Building loops are afforded by the general attention to playing the game and the editors allows for modelling loops. Modding is helped by the prominent showcasing of mods on the right side (although turning on a mod will disable the ability to gather trophies).

Figure 35 The New Game Menu of CITIES: SKYLINES
As first contact with the player, this menu contains explicit signifiers of what is possible and what is not. Source: Author Screenshot

Listed at the top, and touting 'New,' first time users are explicitly confronted with the new game option. Scenarios and mods are less accessible here as the player first has to download or even make them, placing the main focus on building cities. In the menu shown in Figure 35 the amount of water, arable land, and rocks have been predetermined. To alter this freely, a sandbox mode with unlimited money should first be enabled in the content manager. This menu then forwards the build core loops so identifying of the specific secondary loops involved comes next.

The new game will start with a hello message (Figure 36) giving some pointers on building roads and housing. However, as seen in the bottom of the screen, many options have to be unlocked through achieving a certain citizen numbers. Here the dependency relations slowly lift limitations and introduce significations. Ultimately, the player will have access to all options if they keep fulfilling the dependencies. The ever demanding increase of citizens and the associated public services require increasing funds. However, citizen happiness can also be pursued to increase the number of citizens living in the city, yet this proves secondary as the player can simply build a new district if enough money is earned. The game rewards the pursuit of money, the creation of efficient infrastructures, and the ultimate smooth sailing of the city. While there is no end goal, a flowing panorama is only achieved if the player manages to attain the funds needed to house more citizens. The profit focused loop group with its penchant to beat the system then comes forward as the signified loop.

Figure 36 Hello Message at the start of a new game.
The hello message is a signifier that gives some directions of what needs to be done. Source: Author Screenshot

4.4.4 Requirements Phase of CITIES: SKYLINES

With the signified loop group clear, the city models communicated through the current design of CITIES: SKYLINES can be determined. Essential is the identification of the pursued city model by translating the signified loop group. The general city model categories can guide the interpretation of the loops and metagames into city mode characteristics. The fit will subsequently show whether the other afforded city models manage to communicate a similar city model to the pursued model, or at least the general category.

Translating the signified loop group into the pursued city model means interpreting configurations of loops and metagames as city model characteristic. Here we shall outline in detail the translation of the signified loop group. The other loop groups and their reconstructed city models, translated through a similar method, are shown in Appendix 6.

The profit-focused loop group, and the nature of CITIES: SKYLINES as city builder match the category of modernist city models, characterised by individual control over city-wide projects. For the pursued city model, the instigator contained in the signified loop group can be seen as the player. The building options are the purview of the player and they serve a private symbolic joy of beating the system. This beating takes the shape of an efficiency and profit ideology formed by the private pursuit of in game efficiency through exploiting its monetary reward system. As such, the city aspect studied is solely focused on productivity, subsuming every other element to gaining benefit against the system. The carrier is then solely in the game itself, as the existing means are used to beat the system. The citizens are expected to function as cogs in the machine of efficiency, fulfilling the individual need to beat the system through exploitation of the city means. The pursued city model then echoes the God-Like entertainment perspective granted in the game as city builder, as charted in Table 30. The rest of the afforded city models are translated in a similar fashion.

Characteristics	Pursued City Model of CITIES: SKYLINES
Instigator	Player
Ideology	Profit focused cities
City Aspect	Productivity of sectors and their interrelations
Carrier	Game means
Citizen Actions	Focus on the profitable. Cog in the machine with less focus on locality or happiness

Table 30 Pursued City Model of CITIES: SKYLINES and its formative characteristics. Source: Author creation

Given this pursued city model, the fits gain specific meanings. A procedural fit with this pursued city model means that both city models are based on the usage of the game tools without altering them; basically a subscription to the internal profit logic of the game. A ludic fit means that the both city models strive for the victory through game means; whether profit minded remains to be seen. Finally, the civic fit means that players can create a city they envision as profitable, but without the other two fits, the internal profit logic of the game or winning the game is not a requirement. With the pursued city model clear, the fit can be calculated for real.

4.4.5 The Comparison Phase of CITIES: SKYLINES

The quantification and the subsequent qualification of the fit will show that he design of CITIES: SKYLINES allows possible alternative uses of CITIES: SKYLINES besides entertainment. Juraschek et al. already explore alternative uses and deem them plausible (2017, 473), yet the extent of this finding is what will be explored here. The afforded loops groups, translated into city model characteristics, will here be quantified against the pursued city model. To understand what these fit values mean, the fit will subsequently be qualified by looking at its discourse and the types of fits. Ultimately we will show that the fit can serve critical support, alternative uses, and explanations for and resistance against playbour.

4.4.5.1 Quantifying the fit

Here we will outline the quantification of the fit between the afforded city model stemming from the loop group of building an existing city and the pursued city model of building for profit. Their formative elements are outlined in Table 31. This happens by comparing and scoring the loops and metagames on their correspondence between the two models. The loops, informational, economic, and contextual metagame match between the build+existing and build+profit models as they centre on the individual display of skill based on thought out plans or ideas. The fictional and performative metagames however do not match as they are too personal and isolated to fit in the larger profit minded system present in the game.

Formative Elements	Build+profit (pursued city model)	Build+existing
Loops	Optimise infrastructure, zoning, public service, public transport, leisure, wait	Explore existing parameters, infrastructure, zoning, public service, public transport, leisure
Informative Metagame	Intricate game systems	City dimensions
Fictional Metagame	Efficiency and money are key	Personal motivation; grounded in reality
Economical Metagame	Private symbolic	Private symbolic
Performative Metagame	Beating the system	Test of skill
Contextual Metagame	Regardless of locality. It has to work	Pursued ideal. Clear frame of reference

Table 31 The loops and metagames that will be compared for the qualification of the fit between the pursued city model and the build+existing city model of CITIES: SKYLINES. Source: Author creation

Given these overlaps, the calculation of the fit follows the following formula:

Fit value = ∑(Loops and Metagames overlap of city model characteristics)

= (6+6+0)+(6+0+6)+(10+0)+(10+10)+(5+5+0+5)=69%.

The other fits and their quantifcation can be found in Collection 12, further below.[59]

In Collection 12 the quantified fit is shown per loop group. The quantification shows a wide range of fit values. What can be distilled from the get go is a pattern in higher values and lower values. Higher fits are achieved in city models that allow players to use the logic of the game to impose the best functioning city they can imagine, like the Freeway Fetish, Happiness Factor, and Modded Build models. Alternatively, city models that do not at all subscribe to the logic of the game, like the modding city models, score lower. Despite the explicit acceptance of modification, rejecting the logic of the game while imposing a personal city ideal is only partly supported by the design of CITIES: SKYLINES. Despite, the modernist city model category (of which the pursued city model is a specialisation) being quite

[59] For an overview of the matches and mismatches of loops and metagames informing the quantifications can be found in Appendix 6.

individually focused, a tension between actual player additions and player appropriations of the existing means can be seen. Qualifying the fit can help understand this difference, as well as show alternative possibilities for the design. The inception of this misfit between modifications and inherent systems, can be found in the discourse around CITIES: SKYLINES.

City Model	Quantified Fit (%)	Qualified Fit	Explanation
Existing Build	69	Procedural	While not obeying the rules of the games per se in embracing the freedom, the player follows the logic of the game to create a purely individual yet unoriginal city
Sandbox Build	53	Procedural	Despite being a sandbox, the player is only free when the game allows it. Freedom is solely provided, not actuated
Freeway Fetish Build	80	Ludic	While not following the goal of the game or anything city related, the means of the games are used to full extent
Happiness Build	81	Ludic	Focussing on a game metric and exploiting it to full extent, the player basically plays the system instead of city.
Modding Build	78	Civic	Going beyond the means of the game and exceeding the goals of the game, the player pursues their ideal city.
Experiment Modelling	62	Civic	The city is free game and open to experimentation. It however has little to do with the game anymore
Participatory Modelling	78	Civic	The city is free game and the goals are determined outside of it now. It has little to do with the game anymore.
Tweak Modelling	68	Civic	Like the Modding Build, the player can now create their own city for research purposes this time
Expressive Modding	51	Civic	In order to make the desired city, playing the game and its means are ignored to create art
Contributing Modding	35	None	While creating assets for a city game, the focus here is neither on the game, city, or message; solely on community
Existing Modding	64	Civic	In order to make the desired city, playing the game and its means are ignored to create references
Realism Modding	64	Civic	In order to make the desired city, playing the game and its means are ignored to improve graphics
Scenario Modding	38	None	A more meta model, here the focus is on the game itself but ultimately lets go of the creative power in-game
Perspective Modding	23	None	A more meta model, here the focus is on the game itself but ultimately lets go of the creative power in-game

Collection 12 Types of fit in CITIES: SKYLINES and their justification. The fit values are given as well. The presence of a fit means that the afforded city model allows for a similar engagement between game, city, and player as the pursued city model. Source: Author creation.

4.4.5.2 Discursive model of CITIES: SKYLINES

In the description of the game on the distribution platform Steam (Figure 37) emphasis is placed on the traffic simulation capacities and the acceptance of modifications – the two distinguishing elements from SIMCITY. Even the animated pictures accompanying the description focus on the flowing of traffic or the appealing sight of headlights cruising through the night. Furthermore, the description

stresses the simulation capacities of the game. Here the freedom gets emphasised, albeit with a traffic focus. With this description, the game seems to convey a neutral city builder with a penchant for traffic simulation and user modifications. This discursive model echoes the governing city model category that focuses on the coordination of multiple parties in pursuit of a singular controlling vision more.[60] The game is thusly presented as a much more accommodating game.

Figure 37 Steam Description of CITIES: SKYLINES. Source: Steam CITIES SKYLINES store page

This accommodating discursive image is complicated by the dominance of the internal system. Bereitschaft has shown that CITIES: SKYLINES is "constrained by the limits and assumptions of the game's mechanics, and are guided by the built-in ideologies and biases of the game developers" (2016, 52). He explains this internal logic goes against best practices in urban planning and instead gives absolute – even deific – powers to create and destroy. The player functions in a political vacuum while fulfilling the roles of planners, transport engineers, and zoning boards (idem, 53). The absolute power squarely positions the category of the city model of CITIES: SKYLINES in the modernist city model category, as there is no governing or organising involved. The main tool of the player are roads, specifically car roads as bike roads and footpaths are grouped under the decoration tab. This distinctly North American perspective (idem, 56), allows for creativity on the player's end but ultimately limits the actual application of the game. Key design factors like mixed use or demographic inequalities are ignored or abstracted to simplistic metrics, making the cities designed by the player more exercises in efficiency than city building. So despite the many ideas from the governing category of city models, like freedom and orchestration, the underlying system forces a modernist category into the game. Stemming from system knowledge, the player is positioned to embrace the provided system and mastering it. Technically then, the player only learns the system

[60] One could even argue the game provides an exploration of city models of the planning kind due to the different shapes the player can give the city. Yet when linked to the limitations and choices the game presents to the player, this distinction becomes untenable.

knowledge of one system, although it is presented as governing multiple possibilities. Mastering the system as a show of skill becomes essential and powered with the modernist tool of traffic control, the player can govern a city-wide plan. This implies that the discourse provides an image of a more pliable city – a place for experimenting with city models – while as far as affordances go, the player is hooked to a singular system. The modernist, North American, underlying system thus ultimately impacts on the fit and many of the afforded interactions. The meaning of these fits then must be studied further in order to see how such a system influences other actions.

4.4.5.3 Qualifying the Fit

Apart from the discursive qualification explaining lower fits due to interference of another general category, a deeper understanding of the type of fits can show the focus of the city models and how they match the pursued model. Here we will illustrate the first qualification with the other identifications following a similar method. The qualified fits and their explanation are shown as well in Collection 12.

The identification of the type of fit means looking at which loops and metagames match between the afforded city model and the pursued city model. Specific loops and metagames that match show the focus of the particular afforded city model on a specific relation between the game, player, and city. For the building+existing, the loops, informational, economic, and contextual metagames match those of the pursued city model. However, the informational and economic metagames together show a focus on a procedural fit – a relation between the game and the city similar to those followed in the pursued city model. This fits this particular afforded model as the player performs exactly what the game intends to without altering its assets, or appropriating the means of the game; players solely use the system of the game to create a city they want. This city may not be a personal creation made for efficiency, nor do the players technically play the game to win, thus eliminating the civic and ludic fit respectively.

A general review of the qualified fits shows a dispersion of types of fits but a relative high number of civic fits with low scoring values. A civic fit here means that the city is approached as a personal creation of the player striving for efficiency, while the means of the game itself or rules set for the player are not particular conducive. Especially in Modding and Modelling city models, this type of fit occurs, showing that these city models appropriate CITIES: SKYLINES as a means to create their ideal city; as if it is a city building toy.

Those city models with ludic fits score higher, showing that these models allow the player to use the current design of the game to create cities that do not follow the signified message, nor do they necessarily engage with the city. Instead they show complete subscription to the profit-focused progress of the game and do what they want with it, while still being guided by the rules structuring the game, such as traffic flow.

The tension between the civic and ludic fits show that many affordances of CITIES: SKYLINES do not rely on its use as an entertainment game. This raises questions about possible alternative uses for the game. He we will show the critical potential for the fit, its role as informant for alternative uses, and as explainer of low fitting affordances.

Following the Rules or not

The higher values for ludic fits and lower values for the civic fits show that CITIES: SKYLINES is ultimately reinforcing its own model most. Recreating an existing city or experimenting with different city models is possible, but ultimately will only be judged based on the pre-programmed city model of efficiency, as that is what brings progress to the players. It will therefore not particularly function as testing area for future planning, as success factors are already pre-determined. Without breaking the mould of the game through modding, all city models will follow the modernist model designed into the game. This recognition through the fit can serve as support for criticising conflicting findings.

This echoes Bereitschaft's notions that the cities from CITIES: SKYLINES when he states that "these toys do not present their patron with a blank slate; they come pre-packaged with built-in rules and assumptions that the player must negotiate en route to realizing their own urban vision" (2016, 58). As a commercial game, the lack of realism cannot be faulted. Yet Juraschek et al.'s findings of CITIES: SKYLINES as promising tool for spatial planning research should then be tampered. Juraschek et al. base the viability of CITIES: SKYLINES as modelling tool on the feedback the player receives from the values presented in the game. Indeed, the game provides the player with many values, but whether these values are positive or not is determined by the programmed city model. Juraschek et al. do not seem to preoccupy themselves with the criticisms Bereitschaft offers to the simulations offered by CITIES: SKYLINES. As such, their positive findings are more the result of subscription to the profit-centred city model than to the freedom of experimental modelling that achieves a 62% value. The fit here serves as a critical tool to reflect on findings, further adding to its prevaluative power next to statistical validation.

Alone or Together

The participatory modelling city model managed to achieve an exceptionally high fit amongst its models of a similar core loop. Surprisingly, a single player game like CITIES: SKYLINES scores high on a multiplayer aspect. CITIES: SKYLINES fits with this participatory modelling because it manages to lay bare expectations and facilitate discrepancies. By virtue of the game visualising urban planning, its functioning, and a degree of its success, CITIES: SKYLINES can achieve its participatory city models. Exactly the aspect of visualisation through a comprehensive and accessible user interface, such as that of CITIES: SKYLINES, works particularly well for governing with several actors. Although here a more

governing category is pursued, this particular city model makes this plausible by drawing part of the game away from its programmed logic and into face to face discussion, a much more flexible mechanic. This helps identifying the desires and responsibilities of all stakeholders involved, by basically following the building loops together. In a similar vein as ONTDEK OVERVECHT, this game then helps making topics discussable by making them visible. Here the fit managed to highlight a hidden strength of a game and subsequently managed to explain it through qualification.

Modding

The availibility and facilitation of user made modifications were two of the measures that Colossal Order took to differentiate and pass beyond SIMCITY. Regardless, none of the modding city models have a ludic or procedural fit, which would mean that modifying is afforded in the design as means to win (although disabling trophies) or included in the assets respectively. Solely showing civic fits, the fit of the modding city models show that here the player can create an efficient city to their liking – the nature of the liking and the means to do however do not match the profit focused pursued city model. This mismatch and expectation discrepancy highlights a playbour relation wherein on the ground that their work is considered 'just play,' unpaid production of assets by players is accepted. Players are told their mods are accepted, again echoing a governing city model category, but ultimately the game remains focused on its own modernist logic. The additions made are published as official alterations or even play modes, thus subjecting them to the modernist logic of the game. Colossal Order cleverly incorporates alterations into the game as official functions. In doing so they managed to fill up shortcomings without spending too much on manpower. Modding then seems to be another solely private symbolic entertainment form.

However, instead of subscribing to it uncritically, modding allows the players to rebel against the status quo and design alternative situations that do fit their city models. Whereas the scenario and perspective city models can change the most, other modders can build on the civic fit the game lacked in its building loops. When explicitly addressed as such, and when addressing the system modded, an alternative use of CITIES: SKYLINES is then as educational tool for system knowledge. Modding can be seen as one of the main ways towards alternative uses of CITIES: SKYLINES and possibly as an important participatory urban planning tool, although it has to be presented and contextualised as such.

Still, when looking at the fit percentages, modding does not seem particularly conducive to the pursued city model. Players interact with assets instead of the system and as such do not subscribe to the pursued city model. However, without these modding activities, fewer players would ultimately subscribe to the logic of the game. When a significant shortcoming is missing for a player, their investment with the game can be broken. The modders resolve these shortcomings for all users. As such, the conflicting city models of player and buildable in the game can be more attuned to each other, improving the fit overall.

Modding then as city models might not attain the highest fit, but their participatory dimension and run with the established assets and rules make it one of the most subversive and simultaneously supportive interactions with the game. The city models deriving from this modding are where true innovative city ideas might come from. Regrettably, these city models are dependent on the steep informational metagame of C# programming knowledge, but when integrated in an educational and reflective context, this can yield the most expansive and flexible engagement with the city.

4.4.6 Conclusion of CITIES: SKYLINES

Determining what the metric of the fit can reveal about the afforded interactions of the city building game of CITIES: SKYLINES has yielded several insights. By distilling the afforded loops and metagames of this entertainment game the different dimensions could be brought forward that shape forms of interaction. All in all, the design of CITIES: SKYLINES fits with most of its afforded interactions, as long as they subscribe to the underlying profit and efficiency logic and any alteration is accepted as property of the game. While mostly a private and symbolic form of diversion, there are some explicit and some implicit calls to community or multiplayer options that underpin this game and reveal its strengths as visualizer and adaptable playground. Moreover, the pursuit of the pursued city model led to the awareness of the vice grip of the pre-programmed city model and its limits. Its considerable impact on many of the city models was undeniable yet at the same time it was flexible enough to still offer system insight, as long as a critical stance remains in place.

The fit itself revealed that CITIES: SKYLINES as modelling software for research purposes has severe limits due to the inherent values. Simultaneously, using internal feedback mechanisms and relating these to the citizen can link the citizen to the urban planner more directly. Finally, modding is the area where most of the resistance and subversion to the pursued city model comes from. It is a necessary evil however as the assets that improve civic fits get produced at no cost. Future or alternative uses of CITIES: SKYLINES could explore the contextualisation of the game or its use as an educative tool further, as both these uses are afforded in the design.

The fit and its action space analysis in this case study have shown critical and explanatory potential, also identifying a capacity for redesigns. The quantitative values of the fit can be used to support criticism of analyses. The qualitative discourse comparison can explain how a game is presented to its players while eschewing the underlying logic. Finally, the values and types of fit can show which alternative uses deserve more attention in the current design and which meta models can have a broader application.

4.5 Case Study 4: POKÉMON GO[61]

Expanding on the exploration of the fit in entertainment games, here we will discuss the final quadrant of urban games through the case of POKÉMON GO. We will study what the fit and its action space analysis can show about the individual entertainment game of POKÉMON GO and how strictly entertainment games can use player freedom to their benefit. This case is characterised by its focus on individual engagement with the city through physical interaction. The player is thus traversing their physical surroundings, with no direct consequences on the world around them, or any other interaction with it other than being there. POKÉMON GO has been used throughout this thesis as an example several times already, so its description will be relatively short (for the extensive explanation, see chapter one). The findings of this case study differ from the other case studies in that POKÉMON GO will be used to compare the discoveries about the efficacy of urban games as gathered through the fit and reverse engineering, with those gathered through statistically proven methods in 4.6. This case study thus serves to show how the fit can be used to understand and learn from the design of POKÉMON GO, and to provide further evidence for the validity of the newly proposed method.

4.5.1 What is POKÉMON GO

POKÉMON GO is a mobile augmented reality game created by Niantic Inc., based around the Nintendo franchise of Pokémon, and was released in 2016. It was an runaway success and although the player base has fluctuated over time, it is still a well played urban game, with 2019 seeing more players then ever before (due to multiplayer, content, and story-based updates) (Statista 2019; Bright.nl 2019; Lavorato 2019). The physical reality receives a virtual overlay if the player looks at their phone. There, their avatar will walk through space if the player traverses physical space. While walking, Pokémon – tiny creatures – appear on the map that have to be caught through a simple swiping minigame. While catching the Pokémon, if the augmented reality camera is enabled, the Pokémon will be overlayed onto physical reality. The goal is to catch all available Pokémon. The game further allows hatching eggs for other Pokémon by travelling a certain distance, collecting items needed for catching and battling at PokéStops – virtual markers placed on real world urban highlights like artworks around which new Pokémon appear – and playing a battle minigame at gyms, also placed on urban landmarks. Although the player transverses their physical environment, all the relevant content of the game can be found on the screen of their smartphone. Focusing on walking, phone gazing, and franchise engagement, POKÉMON GO contains a variety of loops and metagames that afford different forms of interaction. Studying the fit of this game can explain why POKÉMON GO managed to grip the imagination and time of many players in the summer of 2016, basically manifesting the childhood dream of many in the

[61]While POKÉMON GO has had quite some update since its 2016 release that may complicate the studies that validate its effects, this analysis was focused on the base form of the game.

material world, through many forms of interaction, often different from the phone centred interaction contained in the game, and instead relying on social interaction afforded by the game or not. This understanding shows the capacity of the fit and its action space analysis to introduce and explain alternative uses, as well as elucidating how this can help the main goal of the game in the end.

4.5.2 Implementation Phase of POKÉMON GO

The afforded actions of POKÉMON GO are at the source of many different possible uses of the game, while still conducive to pursued engagements. This means charting the loops and the metagames, starting with the main forms of interaction. Determining the core loops in POKÉMON GO is both an explicit search and an interpretative read. An inventory of the variety of interactions possible in the game has been outlined by Janne Paavilianen et al., who suggest interactions "related to movement, sociability, game mechanics, and brand engagement" as the central forms of play (2017, 2493). While those insights help guide the identifications of loops, their role as core or secondary loop remains unknown. From Paavilianen's perspective and the reliance on location tracking, the core loop of POKÉMON GO is the Catch loop. This loop encompasses the game mechanics of walking, encountering a Pokémon (tapping on your phone), and catching it (swiping on your phone).

The second core loop of fitness stems from the motion affordances of the game. As walking is instrumental to catch Pokémon, the game has a variety of trackers for distance travelled. The player menu feature badges for distance travelled (Figure 38), eggs hatch after specific walking distances (two, five, seven, and ten kilometres) (Figure 39), and the total number of kilometres travelled is tracked and displayed (Figure 38). This tracking affords the appropriation of distances for exercise purposes. In this case of individual betterment, the core loop becomes a Fitness loop – walking, reach a milestone, rinse repeat. The eggs and badges feature as milestones that hold signification in the game, yet can serve as arbitrary markers. This loop was for instance the inspiration for dog shelters that asked players to walk their dogs while playing (Sunkara 2016). The main purpose of POKÉMON GO with this loop becomes walking, not catching per se.

Figure 38 POKÉMON GO Badge. Badge for kilometres walked and the walked total. Source: Author Screenshot

Figure 39 The Egg Tracker. An incubator displays distance walked. Source: Author Screenshot

Focusing on the arrival instead of the process affords the exploration loop. This exploration loop consists of

walking, reaching a place, recognising new place. A large part of this core loop exists outside of the game, relying more on the physical displacement of walking than the act itself. Given that POKÉMON GO uses PokéStops as markers, the game has a strong scavenger-hunt aspect. It gives the player a new frame to explore space with, as PokéStops offer new highlights in the urban fabric. This characteristic was highlighted in the trailer already, and although realised lesser than advertised, it still holds the possibility. Not only do PokéStops place different highlights in the space, so does the (less than ideal) system of placing Pokémon with specific elements in associated spaces, like water Pokémon near water. Some Pokémon are even only found in specific places of the world, requiring international travel as well (Robinson 2016). Players explore new parts of the city, with various negative effects such as players trespassing (Griffin 2016) walking off cliffs ('POKÉMON GO Death Tracker'), and onto roads (Pharoah 2016), or causing insensitive situations around (mostly Holocaust) museums (Peterson 2016; VICE Staff 2016), but also positive effects such as in the city of Plymouth, UK, whose council started using the routes people take while playing Pokémon for city planning to ensure that public space remains safe at all hours of the day (Richards 2017). This exploration can even have such an impact that locations become tourist hotspots like Santa Monica Pier in California, or Kijkduin, an area in The Hague named 'Pokémon Go Capital of the Netherlands' (Omroep West 2016), or ghost towns get a second life like the Italian Consonno (Landoni 2016) or the Belgian Doel. The exploration loop is limited through technology however, as POKÉMON GO is quite demanding. Switching between the game and a description of the location is cumbersome. Many PokéStops go without description, making this a more niche interaction with the game, but ultimately an afforded one. These different core loops all make use of the mechanics and information feedback of the game, all with different effects. Their specific mechanics are shown in Table 32.

Core Loop	Mechanics
Catch	walking, encountering (tapping phone), and catching (swiping phone)
Fitness	walking, reach milestone, set new milestone
Exploration	walking, reaching a place, recognising new place, setting new objective

Table 32 The core loops of POKÉMON GO and their associated mechanics that have to be repeated in order to reach an end state

While consisting of almost the same mechanics, these core loops differ in their end state, thus manifesting different fundamental interactions with the game. Yet, as secondary loops, the interactions from the core loops can be optional. This means that the core loops can both function as core and secondary loops, depending on the player appropriation (and their pursued end state). The catch loop consists of walking, encountering, and catching. However, in order to catch a Pokémon, the player needs Poké Balls, which can be gathered at PokéStops. This means walking to specific landmarks to gather items, thus walking, reaching new place, register the place by swiping (Figure 41). Here the exploration

loop to gather items, functions as secondary loop with the core catch loop, as the end state still relies on catching Pokémon, only now expanded with detours to gather items. The Fitness loop as well can become a secondary loop for the core Catch loop, as walking distances and noting the benchmarks can be used to hatch eggs, or reaching different places with new Pokémon. The fitness loop is less open to secondary loops. For this core loop, the action of walking distances remains the same, but the secondary loops of catching or exploring can determine the milestones that are approached. But there are also other designed and player added loops that cannot exist on their own, but that can expand the core loops.

Figure 41 A PokéStop.
These physical locations give items after swiping their virtual counterpart. Source: Author Screenshot

POKÉMON GO affords social interaction, as well as competition. Banking on the presence of the game in shared physical space, POKÉMON GO can give rise to social interaction in various forms, forming a secondary loop of social interaction. The affordance of the social also partly stems from the existing social nature of the Pokémon franchise with trading and battling playing a large role. Phrased generally here as social interaction, this secondary loop can take a variety of forms. Since the game requires walking before further action can be taken on the phone, POKÉMON GO became a parent-child bonding means wherein the parent would carry the phone and navigate and the child would get to catch the Pokémon when they reached it (Sobel et al. 2017). Given an already determined topic of conversation with phone-staring Pokémon Players, the game turned out to be an easy tool to bond over while catching, with many media reporting that even players dealing with autism suddenly exhibited more social contact (Cao 2017), and even some dating services popped up around POKÉMON GO (Figure 40), banking on the organised exploration together (Walcutt 2016). Especially around gym battles where players visibly group together, or around hotspots like Kijkduin, where because of players' use of lure items many Pokémon spawn, the sheer proximity of other players creates a social climate centred on Pokémon. This led to some city police departments contacting groups of POKÉMON GO players walking outside at night In the Netherlands in order to enlist them as a neighbourhood watch (Verlaan 2016). This physical movement of groups was also used to address

Figure 40 POKÉMON GO Dating Service Ad.
By referring to the characters from the television series, the game was used to appeal to different markets. Source: Fixup

digital inequality (Akil 2016; Gordon 2016), and sexism (Cross 2016). Despite these specific uses, the social loop is often broadly defined as walk, meet a fellow player, and interact. The shape this 'interact' mechanic takes depends on the core loop spawning the social interaction loop, and the associated metagames.

The gym battle loop alternatively is a designed secondary loop. Fighting together to win gyms for your team, located in public landmarks, ensures physical proximity of players with a shared purpose. It is possible these team-based gym battles lead to community forming, yet the game itself has no overt technical affordances for this such as teammate recognition or chat function (Richards 2017). The gym battle loop can lead to informal division of urban space, with some neighbourhoods being patrolled by one team and others by the others. This secondary loop can be the result of the catch loop – putting stronger Pokémon in gyms – or the exploration loop – discovering new landmarks and claiming urban territory as your own.

A final secondary loop stems from the technological affordances associated with the augmented reality capabilities: the photography loop. When catching Pokémon it is possible to initiate the back camera of the phone, visualising the direct front environment, and overlaying the encountered Pokémon onto it. From the earliest releases of the game, this augmented reality photography function has been used to create a collection of mostly humorous photographs of Pokémon in the real world (for instance Figure 43), which fit the catch loop as documenting an enquiry in the experienced reality. The photos would subsequently be shared on image sharing sites such as Imgur or Reddit. The photography loop can then be understood as walking, finding a Pokémon, and photographing a Pokémon. An affordance stemming

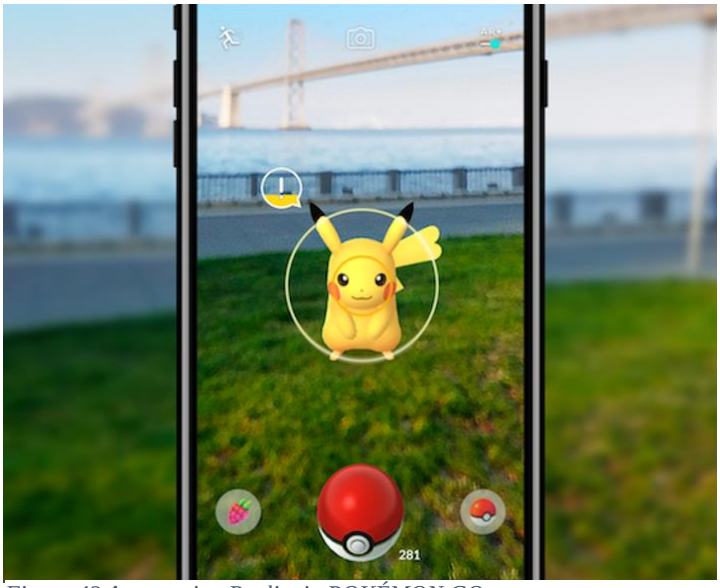


Figure 42 Augmenting Reality in POKÉMON GO. Turning on the augmented reality in the game creates a virtual overlay that positions the Pokémon 'in' physical reality. Source: mic.com

Figure 43 A Humorous Augmented Reality Photo. Source: Reddit @ReallyBadCafe

more from the technology than the mechanics, this core loop takes the call to put Pokémon in the real world more literal than the other loops.

The possible secondary loops and their mechanics are shown in Table 33, linked to their corresponding core loop. Here they are grouped as loop groups, with the secondary loop mechanics in bold. Having outlined the loops, we need to understand the afforded was of distinguishing one from the other. This is where the metagames come in, which give a specific context and meaning to a particular end state, which, in turn, determines which secondary loops are followed.[62]

Loop Groups	Mechanics
Catch+Item (exploration)	walking, **encountering Pokémon or PokéStop** (tapping), and catching (swiping)
Catch+Egg (fitness)	walking, **hatching,** encountering (tapping phone), and catching (swiping phone)
Catch+Lure (Social)	walking, **placing lures in social spot**, encountering (tapping phone), and catching (swiping phone)
Catch+Gather (Social)	**Grouping up,** walking, encountering (tapping phone), and catching (swiping phone)
Catch+Gym	walking, encountering (tapping phone), and catching (swiping phone), **battle in gym**
Catch+Photo	walking, encountering (tapping phone), **photographing,** and catching (swiping phone)
Fitness+Pokémon (catch)	walking, **reach specific Pokémon, set new specific Pokémon**
Fitness+Location (Exploration)	walking, **reach specific location, set new specific location**
Exploration+Pokémon (Catch)	walking, **reaching a place home to specific Pokémon**, recognising new place, **setting new Pokémon place**
Exploration+Location (gym)	walking, **reaching a PokéStop or Gym**, recognising new place, **setting new PokéStop or Gym**
Exploration+Social	**Grouping up,** walking, reaching a place, recognising new place, setting new objective
Exploration+Photo	walking, reaching a place, recognising new place, **photographing new place,** setting new objective

Table 33 The afforded loop groups in POKÉMON GO. The left column shows the core and secondary loop combination (and its possible derivative core loop). The right column shows the associated mechanics of the loop group, with the bold mechanics representing the secondary extensions. Source: Author creation

When looking at the metagames of POKÉMON GO there is a general distinction to be made. Based on the afforded loops and their formations, we argue that all metagames follow a range from 'unspecified' to

[62] Another secondary exploration loop can be argued for, but as it deals more with interacting with the game itself than with the content, we have decided to leave it out. Players reaching the highest level (40) can suggest certain locations as new PokéStops (Niantic Support 2016). This would reframe playable space as a possible in-game location. However, the exclusivity of this loop as well as its engagement with the space itself, although interesting, makes it less suited for our study of the game itself.

‘highly specific’. The loop groups make use of walking as necessity of the game and an augmentation of reality with Pokémon. The metagames of these main affordances in POKÉMON GO are then characterised by their specificity, which helps identifying them and their details. Here we illustrate the shapes the metagames can take in POKÉMON GO so that their combinations in the loop groups can be inferred and understood generally and without having to deal with each group individually.

The informational metagames, as the reliance on external information that is deemed relevant for the loops, affords knowledge about the space of play (the city) and the franchise (Pokémon). On the one hand are those loop groups that rely on none of such knowledge and thus readily accessible. The catch and fitness loops are completely informed by the game information on the smartphone screen. Salient locations for Pokémon or items, or the distance travelled, are all presented in the game itself, rendering external knowledge irrelevant. [63] On the other hand, external spatial info is essential in the exploration loop. Learning more about the places visited, although guided by the game, requires external information, which is technologically limited as switching apps is a dainty task. Regardless of the challenge, this core loop could not exist without external knowledge of the playing field. Gyms and their loops can follow this to an extreme when local gyms ‘should be’ owned by specific teams, although gyms can also be another node on the smartphone provided map. Simultaneously, photography can serve to position Pokémon in any physical space, or is dependent on photography conventions of proper locations. Depending on the core loop then, the informational metagame informing secondary loops can differ in their specificity.

When it comes it comes to greater reliance on content knowledge, social loop groups become possible. Brian Sefton-Green explains that knowledge about the Pokémon franchise has a great social component, as exhibited by “a specialist discourse that works simultaneously to include the initiated and to exclude the rest of us” (2004, 155). The socialisation loops are affected by knowledge of the Pokémon franchise, thus knowing your Pokémon can be an influential domain of knowledge for this loop. These social loops can also rely on both extensive spatial and content information. Knowing accessible spaces that have several PokéStops on them afford the use of lures (attract Pokémon without walking in one specific area) on PokéStops, to create catching corridors. The Dutch city of Kijkduin became such a socially agreed on place to gather and catch Pokémon, without consent of the native population. These shared game spaces gained more meaning when the mechanics of the game or franchise were discussed on a meta level. Some Pokémon are stronger than others by design or programming, making the acquirement of specific types and versions of a Pokémon important. To succeed in this loop then means exploiting the game itself, requiring deeper knowledge found in specialist websites such as The Silph Road. The

[63]The game used to flaunt that specific type of Pokémon would appear in logical places, like water Pokémon near water, yet this is largely trivial. A wet country such as the Netherlands will have more water Pokémon everywhere than a drier country like Spain. The location specificity of Pokémon thus exists but is on such a macro scale that it hardly influences the direct player experience.

informational metagame shows how knowledge of the play space and content can inform and signify each loop group differently.

Content offers the main framing of the fictional metagame. All actions are coloured through the franchise of Pokémon, which explains for instance what 'catching' means. However, the actual reliance and contribution to the franchise itself remains limited. Especially the catch, fitness, exploration, and photography loops do not rely on a fiction at all as the caught Pokémon, travelled distances, and spatial descriptions respectively are mere statistics or benchmarks in the game, making these interactions accessible to everyone. The socialisation and gym battle loop rely more on the fiction of the franchise. Discussing Pokémon content with friends, or going for a specific team build-up or avatar costume can all contribute to the narrative signification. These are however added by the players themselves, as the team interaction remains fully outside of the phone. The fictional metagame is either instrumental for the game or up to the player.

The economic metagame deals with the beneficiaries of the game, be they private, public, or corporate, as well as with the real or symbolic degree of participation. For every loop, as a result of the EULA of the game, the player is positioned as a resource. In the settings of the app (in the earliest phases of the game (Frank 2017b)) the player can find that the walking is visualised on map data from Google Maps. Further digging into the privileges of the app shows that the user location data is used by Niantic and its partner Google to improve their map service ('The Silph Road' 2016).[64] Walking in POKÉMON GO then is used as a form of playbour – play by players as labour for an external party - although it happens largely unbeknownst to the player. Next to this improvement data, Shoshana Zuboff expands on the economic metagame potential by explaining the surveillance capitalism possibilities (2019). Purchasable in-game items can be used to profit off of human behaviour, like making enterprises buy items that lure Pokémon to their business. By monetising the *facilitation* the core loops, the economic metagame can have a surveillance function, cleverly leaving bait for players to structure their behaviour and monetise it.

Yet apart from this data gathering metagame, each loop has its own approach to the player, shaped through space or content. In this case the metagame will colour how important the actions of the player are in the game and outside, and how much control they have over them. The catch loop is solely individual betterment with a symbolic relation to space, as everything occurs on the phone. Items to catch Pokémon can be found in PokéStops, which would require walking. However, these can also be bought through microtransactions, removing the need to walk, and adding a corporate beneficiary. Although still in control of the player, the catch loop thus has a backup which removes the spatial relation

[64] In the first five days of the game, the access demanded by the game infringed on many more privacy laws, including checking Google related email accounts and searches. Despite the large amounts of players who apparently did not mind these concessions, Niantic Inc. issued an apology and started working on a 'fix' to limit their data gathering to Pokémon Account data (Bernstein 2016).

completely by providing a monetary shortcut. Regardless of the variation, POKÉMON GO remains a commercial entertainment game, resulting in an underlying profit focus.

Despite the profit focus, actual interaction in space is also afforded through the fitness loop, wherein walking is the main motivator but also the main benefit. POKÉMON GO mostly allows the player to determine the actuality themselves. Photos can be shared and be related to the space – or not. Exploration can be individual and related to the space – or guided by corporate sponsors (Evangelho 2016). And the social interaction can be individual and symbolic, focusing solely on the franchise – or any degree of public actual interactions when players group together for serious purposes such as a neighbourhood watch (Verlaan 2016), or reinvigoration of ghost towns (Landoni 2016). The ease of access of all the loops is up to the players themselves, yet facilitated by an in-game store.

The performative metagame similarly ranges from a reliance on spatial or content investment to no such thing. No spatial or content performance means that the player is unnoticeable in game and out. The catch and fitness loops for instance do not give the player an in-game presence nor do players look different from other phone users. The performative metagame becomes important when the players and their activities are visible both as city walkers and in-game players. As walkers they are visible when they visit specific places more, in exploration or gym loops for instance. When the performance also takes over the content, the public meaning increases. Around launch and still during community events, players will dress up in Pokémon related costumes, giving the interaction a public meaning. The performance remains focused on the game and the franchise though, even when social. This has been lamented by some for it is a wholly entertainment and consumerist focused activity with no critical potential (Kriss 2016). The main performance of the game itself and a display of skill is in the photography loop. Yet this is dependent on the sharing of results. The performative metagames in POKÉMON GO then vary from unremarkable, to physical presence, to in game skill displays, to online prestige.

The final metagame, the contextual metagame, mostly shapes the relation to the space: from unimportant to location specific. This metagame also determines the importance of the number of players. The catch and fitness loops for instance, since they are phone centred, take place in the phone mostly. These games can be played in (nearly) any place, and while locations do matter, it is more the movement that will reveal new content. The exploration loop is phone centred as well however now the location does matter. This loop is much more location specific as it thrives on discovering new places or diving into known places, changing the context in which this loop is adopted. The socialisation loops are the opposite of the exploration loop. The context herein largely is irrelevant, as long as it is shared. The gym battle loop on the other hand is also a shared context, yet highly location specific. The context of this loop is determined by the locations of gyms as well as the teams present. Finally, the photography loop group is mostly individual, yet very location specific. However, these locations of value are determined by the player, positioning it in a photography and aesthetic context.

In POKÉMON GO all core loops are forced into a specific relation with the phone, and therewith space. While touted as the first real augmented reality (AR) technology, the AR technology takes a surprising backseat to the location specific capacities of the mobile phone. The game, and its possible metagames, are very much constricted by the phone as the player must continuously pay attention to the screen to encounter Pokémon. The link with the real world through AR is optional and sometimes, in some phones, even impossible making the blending with reality less of a technological aspect. Instead, the phone functions as the main communicator of meaning during spatial displacement.

With all the metagames and their links to the loops outlined, the complete overview of affordances can be outlined, as can be seen in Appendix 7 The metagames, shaped by their spatial and content specificity, will add meaning to the core loop through its secondary loops. With this overview in tow, the switch can now be made to look specifically for the signified collection of affordances.

4.5.3 The Design Phase of POKÉMON GO

With the affordances known, a selection can be made of which loop group is forwarded by the design itself. The signifiers and constraints of POKÉMON GO forward the catch loop as most pursued and probable interaction possibility. The first locus of signification are textual elements. From the moment of installation and login, the player is confronted with the franchise slogan “Gotta catch ‘em all,” and the introductory text by Professor Willow explaining that “You'll need to find and collect Pokémon from everywhere!” and “I hope you get out there and catch Pokémon—and register them in your Pokédex! It's time to GO!" (Bulbapedia 2019) (Figure 44). The tutorial wherein Willow is explaining the player will not end until they have caught at least one Pokémon (Figure 45). No other features of the game, such as gym battles or eggs, are as explicitly explained as the catch loop. The signified secondary loop can be inferred from this textually signified loop. Item gathering is signified textually as well, for

Figure 44 Professor Willow. Source: Author Screenshot

Figure 45 The Tutorial of POKÉMON GO. The three steps of the tutorial: meeting Pokémon, Catching minigame, caught Pokémon. Source: Author Screenshot

instance in the line “You will need more Poké Balls and other useful items during your exploration. You can find items at PokéStops” (idem). Based on text alone, the design forwards the catch loop with item gathering as signified interaction. Yet the signified interaction can be found in different places as well.

Another locus of signification is the interface and available mechanics, such as menus. At the start of the game the item menu only contains items for catching, and the Pokémon and Pokédex menu both tracks the number of Pokémon caught. The character menu as well awards the player badges mostly based on the number of Pokémon caught (Figure 46). Mechanics-wise, the player only has control over these menus, and the ability to tap encountered Pokémon after walking. Limitations subjugate most loops to catching, such as only being available during catching or requiring levelling up, only possible through catching. Notice that this catching focus makes no mention at all of social interaction, which ultimately did arise; we can already see the beginnings of a misfit.

Figure 46 Badges in POKÉMON GO.
Badges solely dedicated to tracking how many Pokémon are caught. Source: Author screenshot

The metagames are also signified, largely depending on the core loop taking place. For the informational and fictional metagames, the game does not explicitly rely on previous knowledge of the Pokémon

franchise or the city. Professor Willow is a new character and all the mechanics are an innovation to the franchise and explained separately. While some benefits can be gained from knowing the elemental nature of Pokémon and their equivalent in the space, the informational metagame is minimal, as it is more important to understand the game than to understand the information around it. Here it is especially indicative if semiotic or mechanical play is forwarded; if the player has to invest in the story and its meaning or if the playing or the goal of winning is vital (Aarseth 2016). The story of the game is the player's road to catch all the Pokémon, but what this means is left up for interpretation, focusing instead on the mechanical skill of catching.

The economic metagame in POKÉMON GO is again focused on individual walking while interacting with the phone; purely individually symbolic. There are some implicit actual goals through the playbour of improving the mapping algorithm and the microtransactions. Cynically put, the preferred economic metagame is sheepish, hedonistic obedience, while buying into the franchise. This sounds malign, but as a game-as-service app, such a goal is always there, up for appropriation.

How much of a spectacle the game is and which actions are deemed showable dictates the performative metagame. For POKÉMON GO the visibility is limited due to the phone-centred nature. While visible to a phone user, there is no inclusion of an audience outside of the phone. Finally, the context in which the game is ideally played and which actions are appropriate there will show the vision of the player as well as an ethos of what is considered normal and acceptable behaviour. From the catch loop group, the context of play is implied to be on the move and outside, but ultimately does not specify where or how the game should be enjoyed. The game presumes to place Pokémon everywhere in the real world through the phone, and as such the contextual metagame remain private yet fluent.[65] With the elements of the ideal interaction identified, the pursued function as gauged from the signified affordances can now be identified. In POKÉMON GO it are the catch loop groups with item gathering, and their associated metagames.

4.5.4 The Requirement Phase of POKÉMON GO

With the signified loop group – the catch and item loop group – known and located, the next step is to translate the afforded loop groups into city models. This will allow us to create an inventory of afforded city models and see whether they match the pursued city model. While ultimately all afforded loop groups are translated into city models, here we will discuss the translation of the signified interaction into the pursued city model.

[65] However, it should be said that several urban restrictions, such as a lack of PokéStops in poorer areas (Gordon 2016), shapes the contextual metagame in its content, but not in its general nature.

Determining which general city model category POKÉMON GO presents a specification of will help charting the possible city model characteristics. Out of all the possible city model categories, the pursued city model of POKÉMON GO shows most overlap with *the expressive city model*. Using characteristics of the category, the pursued model of POKÉMON GO can be interpreted through gradual specification of the characteristics of the expressive city model category. For instance, when it comes to ideology, this category sees city models that have to be adopted into everyday life. Starting from this general description, the ideology of POKÉMON GO can be interpreted more specifically from the loops and metagames. Based on the descriptions of the loop group gathered in the implementation and design phase. The ideology behind POKÉMON GO creates a citizen that is invested in the content of the game – not necessarily the franchise behind it. They are further expected to regard the city through the lens of the game. In the case of POKÉMON GO these metagames detail a player familiar with the in-game material (like Pokémon in eggs) but with optional use for it. It is purely an individual engagement with a monetisation scheme. Both city models focus on a player using the provided technology *as is* rather than strictly appropriating it, in order to spice up their life and living environment. Instead of making a mark on the environment, the player in both city models uses the game to improve themselves in daily activities, even if only through entertainment by spicing up a walk (Mäyrä 2017a), without further public effect. The adoption into everyday life of the expressive city model is then specialised as citizens invested with the game content, spicing up their commute through a technological aid. The pursued city model of POKÉMON GO then is charted in Table 34. In a similar process of specification, the other characteristics can be discovered as well, collected in Appendix 7

City Model Characteristic	Catch+Item City Model
Instigators of the Model	Player with Monetisation scheme
Ideology	Citizens invested with the game content
Selected City Aspect	Franchise based virtual layer on physically traversed space
Carrier	Smartphone, tracker, landmarks
Citizen Actions	Individual phone activity with locations provided by game itself, possibly with corporate backing

Table 34 An overview of the characteristics of the pursued city model of POKÉMON GO. Source: Author creation

With the pursued city model known, the fit types can be defined. A procedural fit for POKÉMON GO means that the players use the phone carrier to interact with their surroundings only. A ludic fit instead means that the focus is on the means of the game to interact and structure daily activity. Finally, a civic fit means that the virtual city or use of space offers specific markers to explore.

The other afforded loop groups that are not explicitly signified can similarly be translated into city models. Here, when identifying the general city model category which is specified in these afforded city models, an initial heads-up of possible fits and misfits can be discovered already. A complete overview

of the city models can be found in Appendix 7 . With the overview of city models in tow, the qualification and quantification of the fit can take off.

4.5.5 The Comparison Phase of POKÉMON GO

With the afforded city models of POKÉMON GO gathered, the actual comparison to chart the fit can happen. Here, again, we will discuss one quantification and qualification in detail, with the rest following a similar method. First, the fit is quantified, providing a fit value that gives an indication of how well the afforded city model matches the pursued city model. The higher this value, the more likely the afforded city model is achieved, as it derives from the signified interaction. Subsquently, these values will be qualified, showing what aspects of the design of POKÉMON GO afford these alternative city models or disrupts them, how these afforded city models relate to the pursued city model, and what alternatives are afforded by the design. This qualification will ultimately give insight into where the social surge of POKÉMON GO came from around its launch, despite it not being signified anywhere. This overview will show the emphases of the game which can possibly explain any lower fits. Furthermore, we argue that the occurrence of other loop groups, despite the low fit, arose mostly through a politics of nostalgia exhibited in the trailer and developer correspondence.

4.5.5.1 Quantifying the fit

We have seen that the loop groups of catching and item gathering secondary loop are signified most within the game. To discover if the design fits with its goal, we now have to determine how well all the afforded city models can spawn from the pursued city model and its signified loop groups. There are for instance minute differences between the catch+item city model and the catch+egg city model. These differences will impact the fit and therefore can serve as an ideal example to show the in-depth quantification and qualification. When looking at their city model characteristics (displayed in Appendix 7) both the catch+item loop group and the catch+egg loop seem to be the same. As such, their fit would appear to be the same. But when comparing the combinations of loops and metagames that form city model characteristics, some differences can be observed, as shown in Table 35. Quantifying the fit according to these formative elements then will show that, when it comes to fit values, the catch+egg city model does not fit completely.

The contextual metagame is the differing factor. While other metagames and the loops differ minutely, their overall picture remains the same. The contextual metagame differs from irrelevant space to relevant space however, which can make or break a fit. Quantifying these fits then will result in

different values. To quantify the fit, we check the correspondence of each loop and metagame combination in each characteristic.[66] Note that the fit is relative, so their values should be seen in

Formative Elements	Catch+Item (Pursued City Model)	Catch+Egg
Loops	Walking, location for items, catching, walking	Walking, catching, hatching, walking
Informational Metagame	Optional Pokémon and Location info	Game knowledge of Pokémon in Eggs
Fictional Metagame	Optional Pokémon stories	Optional Pokémon stories
Economic Metagame	Playbour, Private symbolic with paid shortcut	Playbour, Private symbolic with monetisation possibilities
Performative Metagame	Physical walking, yet solely on phone	Physical walking, yet solely on phone
Contextual Metagame	Location relevant only in access to PokéStops	Location (largely) irrelevant. Distance matters

Table 35 The loops and metagames of an afforded loop group and the pursued city model in POKÉMON GO. Source: Author creation

relation to the other values in the same game. Following the formula introduced in chapter three, the calculation for this particular fit value then is as follows (and the fit values of the other afforded city models can be calculated similarly, with their results shown in Collection 13):

Fit value = ∑(Loops and Metagames overlap of city model characteristics)

= (6.6+6.6+3.3)+(6.6+6.6+6.6)+(10+5)+(10+5)+(5+5+2.5+2.5)= 81%

This is a rather high fit. Quantitatively, these catch+egg loop does not fit completely. Still, it is highly catch+egg city model will be attained through the current design as the fit is high enough to rely on its coinciding loops and metagame. Yet why and where does the design of POKÉMON GO steer away from this afforded city model? And still, how well does the social interaction fit into this design? The questions require deeper qualitative analysis, starting with a dive into the discourse around POKÉMON GO.

4.5.5.2 Discursive model of POKÉMON GO

One explanation for different fit values or occurring loop groups despite low fit values can be found in the discourse around the game. Much of the official correspondence, often from Niantic, the Pokémon

[66] For an overview of which loops and metagames coincide with those of the pursued city model in every afforded city model of POKÉMON GO, see Appendix 7 .

Company, or Nintendo, focused more on linking the game that was going to be published to the experiences players had with earlier titles. The Pokémon Company for instance wrote:

> In POKÉMON GO, you will gain levels as a Trainer, and at higher levels you will be able to catch more powerful Pokémon to complete your Pokédex. You'll also have access to more powerful items, such as Great Balls, to give you a better shot at catching Pokémon. Keep exploring and encountering Pokémon to raise your level! ('POKÉMON GO | Pokémon Video Games' 2016)

Afforded City Model	Fit Value
Catch+Egg (fitness)	81%
Catch+Lure (Social)	41%
Catch+Gather (Social)	40%
Catch+Gym	88%
Catch+Photo	80%
Fitness+Pokémon (catch)	52%
Fitness+Location (Exploration)	60%
Exploration+Pokémon (Catch)	85%
Exploration+Location (gym)	61%
Exploration+Social	21%
Exploration+Photo	62%

Collection 13 The fit values of the afforded city models in POKÉMON GO. Source: Author creation

In marketing the game they then explicitly refer to loaded signifiers that only fans of the franchise will recognise. Furthermore, they focus on levelling up, which has always been a key element of the franchise. Regardless, the stress of these reports is still on walking, proudly stating that players will have to travel the world if they want to catch every one (Paculaba 2016). Yet even the walking is linked to the players' familiarity with the elements of Pokémon and the corresponding places for instance by stating that "[w]ater Pokémon can be found close to water while very rare Pokémon are tucked away in very few places" (ibidem). While this feature ultimately remained lacklustre, the stress placed on this knowledge is a step away from the ultimate final product. Although the core loop was sketched similarly, the marketing presented the game as relying more on the informational and fictional metagame than the final product actually did.

More striking is the image sketched in the trailer (The Official Pokémon YouTube channel 2015). Apart from the marketing spice which places Pokémon visibly in the real life, the trailer builds on the performative metagame by showing multiplayer much more than the actual game. Again, this multiplayer character is facilitated through recalls to the earlier games, such as showing a focus on trading and battling. It furthermore references familiar imagery and mechanics of the earlier games, such as 16-Bit character icons reminiscent of the earlier Gameboy games and physical movements such as throwing the Poké ball as made famous by the television series (Figure 47). Showcasing nooks and crannies of cities, ruins, and even highlands, the trailer presents a brave new world to explore which is now transformed because of Pokémon. In doing so the marketers cleverly

build on nostalgia related to both the franchise itself and the desire to go on a Pokémon journey through the world. Even better than just nostalgia, the trailer ensures that it is seen as a social activity. Highlighting trading (implemented two years after launch), real-time battles with friends (implemented

Figure 47 Images from the POKÉMON GO trailer.
From top left clockwise: A mention of trading, joint real-time battles, cooperative battles, 16-bit icons. Source: YouTube POKÉMON GO Trailer

nearly three years after launch), and a straight-up manifestation on Times Square to catch a legendary Pokémon (implemented 1.5 years after launch). The trailer made the performative and contextual metagame stand out more so than the actual game loops by focusing on social play and adding meaning to location specificity, again disregarding the ludic fit.

The discourse around POKÉMON GO in the form of official communiqués and trailers then showcases a social game that is much more grounded in reality. This manifests in social gatherings, physical movements, and exploration of far off places. The game itself is mostly single player and is nearly unplayable in unpopulated mountainous areas (Figure 48). Building more on the metagames than on the loops, the discourse around Pokémon can be the origin of a misfit, or the source of various alternative afforded interactions. POKÉMON GO had a strong marketing campaign, yet its ultimate mechanics did not match their initial promise. This has consequences for the appropriations, such as spurring the search for alternative means of play, like social interactions. While a misfit with the design, and spawning as a result of a misfit, POKÉMON GO does offer enough freedom to afford such actions, with the game offering a mere facilitation. As such, the presence of a misfit is not necessarily a negative, as in POKÉMON GO the ultimate goal of entertainment is still achieved. Yet it does offer interesting insights about the level of freedom allowed while still succeeding in linking interaction to the pursued goal. For entertainment, and corporate facilitation, this might work, but these insights show the relevance of linking the design

and player actions to the goal, as too much freedom and the corresponding misfits are detrimental when it comes to games with serious purposes.

Whereas the discursive dimesion of POKÉMON GO explains why some of the low fit value affordances are still interacted with, such as the social city models, it does not show what the fit values mean by themselves or how the design contributes to or exacerbates the fit value. For this purpose, the second qualification step is necessary: that of charting the types of fit.

Figure 48 POKÉMON GO Dispersion.
On the left POKÉMON GO in the urban centre of Utrecht with plenty of activity. On the right, the same game in the Spanish countryside.
Source: Author screenshot

4.5.5.3 Qualifying the Fit

Identifying which of the formative elements of the city models (the loops and metagames) correspond to those of the pursued city model can show on what level the afforded city models fit with the pursued models; procedural, ludic, or civic level, or a combination of the three. For POKÉMON GO this will show how the afforded city model with low fit values still correspond to the pursued city model, and how this ensures that these afforded city models still benefit from the design of the game.

A fit between separate loops and metagames of the afforded city model and those of the pursued city model show the emphasis or positioning a game favours. The catch+egg loop has full coinciding loops and metagames with the catch+item city model save the performative, and contextual. Lacking this performative link, the catch+egg city model has a different way of playing the game, as the only mechanic really relied upon is walking. This means that the catch+egg city model lacks a ludic fit. Furthermore, the differing contextual loop means that the catch+egg city model lacks a civic fit as the walking-focus leaves the link to the space largely irrelevant. The excess of freedom in comparison to the pursued city model, lowers the probability of achieving the pursued city model with the current design if this afforded interaction is chosen. With the only clearly matching elements being the informational and economic metagames, the catch+egg city model displays a procedural fit with the pursued city model: both are guided by the means of the game to pursue an endstate. The catch+egg city model however, does not use the mechanics to actively play, nor do they follow the location specific instructions. With the in-depth analysis handled in detail, the other fits of the loop groups can be determined. The results of this determination can be found in Collection 14, with a slight explanation of the type.

In this overview we can see that the majority of high value fits with the pursued city model in POKÉMON GO are procedural. This means that the game is most succesful in making the players follow the same goals and values as the catch+item loop, namely walking past set places in space and interacting with the designed rules on the phone, but that there is little space for alternative engagement with the city, or even any alternative game goals, as the main value is in the playing of the game itself. The high number of social loops score lower fits as they often do not need the game to function and occur largely analog, in parallel to the game. If the player closely follows the rules and the means provided by the game, such as in the catch+item+egg+gym+photo loop, or the Pokémon guided exploration, the game offers the player room to appropriate their actions, but not the content of the game. As soon as deviation or appropriation occurs through external sources or knowledge, the fit goes down. This insight into POKÉMON GO should indicate that this game is not applicable to other goals than its own augmented reality entertainment. Unless the design changes, the game does not afford any meaningful interaction with the environment. The ludic fit and procedural focus keep the game turned inward – focusing on its own activity instead of the city.

Despite this lower fit, and unlike preceding similar games such as INGRESS (Niantic 2012), POKÉMON GO still became a massive hit, skyrocketing the profits of the Pokémon Company by 2.400% (Frank 2017a). POKÉMON GO managed to captivate the minds of smartphone holders for an entire summer like never before, also with the low fitting social loops. This can partly be explained through the discourse around POKÉMON GO, forwarding more the Pokémon content and social interaction around the game instead of the design and gameplay itself. That being said, the misfits with the social city models do arise from the freedom granted by the game. While taking place mostly on the phone, the physical traversal of space leaves room for appropriation. As such, the social city models, while not based on the pursued gameplay or signification, do use the game as facilitation of further activities. As the ultimate goal of the game is entertainment, as well as data gathering or microtransactions, the use of the game as step-up for further social activities, like lounging while catching Pokémon in a lure-enhanced zone, or using the PokéStop locations, possibly paid for by enterprises, to structure a get together, still allow for the original goal to be met. While not specifically catered to the signified, and simplest, affordances, POKÉMON GO embraced alternative uses as they all still proved useful. As such, what POKÉMON GO can show us, is that sometimes keeping the space of possibility open and free for appropriation can be a boon, if the goal is ultimately broad enough. Games serving civic purposes might not benefit from this freedom, which makes POKÉMON GO hard to translate into a civic game. If anything, the fit and its action space analysis have managed to show that sometimes a game is not the best answer – or at least not the freedom associated with it.

City Model	Quantified Fit (%)	Qualified Fit	Explanation
Catch+Egg (fitness)	81	Procedural	The player follows the rules of the game yet ultimately does not explore the affordances. The city is completely devoid of meaning apart from distance
Catch+Lure (Social)	41	Ludic + Procedural	Citizens rely on specific locations to fulfil the phone centered activies of the game
Catch+Gather (Social)	40	None	Citizen has all the control, the game merely facilitatates
Catch+Gym	88	Procedural-Ludic	Still focused on catching Pokémon through the phone, only now does the location contribute to this
Catch+Photo	80	Procedural + Ludic	Still focused on catching Pokémon through the phone, only now does the location take center stage as well
Fitness+ Pokémon (catch)	52	Procedural + Civic	The game goals of catching are ignored, but space is still irrelevant and interaction is solely through the phone
Fitness+ Location (Exploration)	60	Procedural	Interaction with an augmented reality through the phone remains, but the gameplay is different and location matters
Exploration+ Pokémon (Catch)	85	Procedural + Ludic	Game goals are still guided and led by phone interactions. Focus on game values, but this time location is important.
Exploration+ Location (gym)	61	Procedural + Ludic	Game goals are still guided and led by phone interactions, although less catching this time. Focus on game values, but this time location is important.
Exploration+ Social	21	None	Game is disregarded for other activities.
Exploration+ Photo	62	Procedural	Still engage solely with the phone but catching is irrelevant and space does matter

Collection 14 Types of fit in POKÉMON GO and their justification. The fit values are given as well. The presence of a fit means that the afforded city model allows for a similar engagement between game, city, and player as the pursued city model. Source: Author creation

4.5.6 Conclusion of POKÉMON GO

In this final case study we looked at what the fit and its action space analysis can show about the entertainment game of POKÉMON GO and how it can illustrate the benefit of player freedom in entertainment games. POKÉMON GO pursues a city model focused on catching Pokémon and walking to specific locations for items. Bluntly put: a guidable, phone-centred good citizen. Most other afforded city models attain (at least) a ludic fit with this pursued model, meaning that regardless of the approach

to the city or which instructions followed, most city models rely on the same playful actions. In other words: the game is almost always played as it was designed. As this entertainment game relinquishes a strict link to the city other than entertaining citizens and making money off of them, this predominantly ludic fit with the pursued city model can be interpreted as sufficient. POKÉMON GO thus attains a functioning fit through its design with most of its afforded interactions.

Even those city models that attain a low fit are conducive to the ultimate purpose, although the game merely serves as facilitator in these cases. As entertainment game, POKÉMON GO cleverly leaves many appropriations open to the player, merely providing a barebones structure around which actions are woven. Key in this incorporation of appropriation however is the building on the nostalgic franchise familiarity. POKÉMON GO can serve merely as another instance of this franchise, providing a novel engagement while relying on players to fill in the rest. The action space analysis has shown that even with a low fit, affordances can still be conducive. It should be noted though that POKÉMON GO has a very strong and defined back catalog, allowing for such actions. More serious civic games have no such anticipatory freedom when it comes to appropriation by the players.

4.6 Validating a Method

The four case studies above have illustrated the functioning, capacities, and relevant insights that can be gathered through the fit. In doing so, we have shown that the action space analysis can be applied to several distinct forms of urban games as well as offering insightful results in each case. Its validity could be inferred from these examples and findings. However, a final test should show its validity by comparing the findings gathered through the fit and the action space analysis with those findings gathered through tested and proven methods. This is necessary in order for the action space analysis to be trustworthy. Finding a result or not with the action space analysis should indisputably be seen as the result of the correct execution of the method. Thus far there are no existing methods ascertaining a fit, as it is an amalgamation of several concepts and trends. Its validity can be checked by comparing the findings of the action space analysis with those of established methods, both discovering a relevant result and disproving others. If the proposed method manages to achieve similar results as the validated methods when studying the same phenomena, its validity can be accepted. While the exact conclusions may differ because of different foci of methods, the results have to be attained in both. Through this comparison the differences and, perchance, strengths of the action space analysis can be made clear. Some of these differences are already clear from the start

A formative difference is that reverse engineering, instead of a binary answer rejecting or accepting a hypothesis, allows for prevaluation. As an epistemological means to determine under what circumstances an urban game might function better than others, reverse engineering is not a validation of results, or an indication of a strong correlation of specific mechanics that are directly linked to effects

that always occur. The fit is a means to predict the probability of a goal being achieved under certain circumstances; it shapes the general ballpark in which a desired effect may occur. It is therefore possible that the action space analysis will yield more results next to those found by the statistical methods. Regardless, if the results from the validated study can be discovered within the findings after reverse engineering an urban game, and if the additional findings can be explained as well, reverse engineering can be considered trustworthy.

To ascertain whether the action space analysis can achieve the same result as validated methods it will be compared to findings of two game focused analyses into POKÉMON GO. One in which a certain activity is validated and one wherein an activity is excluded. Wen-Lung Shiau, Li-Chun Huang and Yu-Lun Cheng study the (confusingly named in their study) fit in virtual reality integration in POKÉMON GO (2017).[67] Through a Stimulus-Organism-Response framework they explain that a POKÉMON GO player "feels as if he/she were playing with the roles in the cartoons in his/her childhood" which is caused more by the "intuitive emotional reaction," more so than the information presentation, or the cognitive reaction that requires thinking and planning (Shiau, Huang, and Cheng 2017, 151). According to Shiau et al. POKÉMON GO affords players to engage with the city emotionally through an infusion with nostalgia. POKÉMON GO then thrives on the interaction with the Pokémon and its associated facets, more so than the presentation of its information in real space. Reverse engineering has to show whether a loop group can be identified among the affordances that represents this interaction. The determination of the fit subsequently can illustrate whether the design of POKÉMON GO is suited for this interaction.

On the other hand Aáron Rodríguez Serrano, Marta Martín-Núñez, and Samuel Gil-Soldevila discover that there is no "correlation between the previous narrative knowledge of the Pokémon universe with the perception of the ludofictional processes of the game," while also arguing that mechanics, rules and objectives of the game play a larger role (2017, 667). Perceivable as a contradiction of Shiau et al., Rodríguez Serrano et al. look specifically at "the concrete influence of the previous knowledge of the *Pokémon Universe* on the gamer experience," in the form of other games, the television series, and films (Rodríguez Serrano, Martin-Núñez, and Gil-Soldevila 2017, 669). Where Shiau et al. focus on what makes players immersed in the game, Rodríguez et al. reflect upon the mechanical skills required to play the game. According to Rodríguez et al. previous knowledge is of little concern as the game mostly revolves around its catch mechanic and gathering all the Pokémon. Of all the ways to play, Rodríguez et al. did not discover an affordance in which players immerse themselves in the world of Pokémon instead of the real world for the purpose of expanding the franchise. In the affordances of the action

[67]They speak of the cognitive and emotional fit. These should not be confused with the fit discussed in this chapter however. The cognitive and emotional fit of Shiau et al. relates more to an immersion in a virtual world based on thinking or on feeling respectively. The fit discussed in the present study is a qualification of the match between intended results and actually designed results.

space analysis, this interaction should similarly not be discovered in order for the method to be validated, or with an extremely low fit.

The analysis of POKÉMON GO used above will serve as a means to validate its use. The findings will be discussed and compared in relation to the findings of the two validated studies. Ultimately this section should show the value and added capacities of reverse engineering.

4.6.1 Validating the Reverse Engineering of POKÉMON GO

The analysis above has shown which affordances are contained in POKÉMON GO and what city models these can convey. From the reverse engineering of the implementation step, Rodríguez et al.'s finding that previous knowledge of the franchise holds no added benefit for the experience of playing the game can be tested. To reiterate, they state that it is mostly the mechanics of the game itself that have to keep the player's interest instead of any narrative layer (2017, 675). This afforded interaction will then focus on mechanics (catching) while the fictional metagame and informational metagame do not contain any reliance on the franchise. Especially in the metagames, the franchise is absent or optional, which certainly underlines Rodriguez et al's. discovery as all interactions rely on the player to walk and catch Pokémon, either with or without actual purchases. Hardly any of the pursued catch loop groups, require deeper knowledge of the franchise, as it is not invoked at all or is explained in the game anew. The gym battle loop does rely more on the characters from the Pokémon franchise, although also from a mechanical point of view, ensuring the strongest Pokémon is used at all time. Only in the social loop does knowledge of the franchise function as a means of social cohesion. Yet these loops show a lower fit with the pursued city model of the design, as the social interaction is not strictly afforded in the design. It may be a problem of appropriation but Rodriguez et al's. conclusions are about the game itself. Still, the interaction with the game, even if done together, does not require further knowledge. It is solely the facilitation of social contact that shapes the loop, but is separate of the game.

Rodríguez et al. furthermore underline that the lack of value of this knowledge ultimately turned out to be a major turn off for many players as there was no way they could control the pursuit of new Pokémon (2017, 675). This was solely governed by random encounters while walking, but that ultimately did not give the players enough control or entertainment outside of their phone-guided walk. The affordances described above subscribe this finding, showing that the action space analysis managed to not only reach the same conclusion, but also find out in more detail what alternative interactions are possible outside those not deemed important. Next to that, the action space analysis created a distinction between appropriated interactions and the pursued affordance, to show that in any form of interaction, outside knowledge was of lesser concern. The action space analysis then not only reaches similar conclusions as this validated method, but goes beyond these findings as well. Its correspondence to Shiau et al. comes from such further findings, in this case the fit.

The nostalgic immersion described by Shiau et al. shows no fit with any of the core loops afforded by the game itself. Whether procedural, civic, ludic, or ideal, none of the interaction forms of POKÉMON GO seem to suggest that players are immersed in the game on a nostalgic base. This further stresses Rodríguez et al's. point, but bodes doom for the validation of Shiau et al's. point. However, this immersion motivation has been explained by the action space analysis in the requirements step. Despite there not being a fit in the game, the discourse analysis showed a city model that does explain the emotional fit/immersion described by Shiau et al. While not explicitly in the design, the nostalgic feeling of living in a Pokémon world has been attributed to the game before it even came out. The fact that players grasped the opportunity to immerse themselves in a game that does appeal to those with previous knowledge but does not rely on it shows that the expectations created in the intended city model were enough to give the game the success it needed. Unsurprisingly, after 2-3 months player numbers started to dwindle as the expectations were met less and less and Niantic made the core loop less interesting (Smith 2016). It was the emotional semiotic tie promised to the players in the initial city model that tied them to the game. Once the mechanics started taking over, as in the designed city model, interest started to wain as explained by Shiau et al. (2017). Therefore, Shiau et al's. finding is supported by the discourse analysis portion of the action space analysis. However, the action space analysis showed more support for their findings in a deeper analysis of the implementation.

The socialisation loop as core loop thrives on using the game as a means to increase social interaction, both by relying on the appeal of the franchise as means of regulating communication or exploring a brave new world together. The emotional appeal of role playing in the world of Pokémon becomes acceptable in social conversation, ensuring players' prolonged interaction. While not signified explicitly in the game itself, this interaction is within the space of possibilities. Therefore the reverse engineering has shown that the nostalgic play outlined by Shiau et al. is not only possible, but also is specifically the result of a core loop and expectations created outside the game. The action space analysis then subscribes to the idea that exactly the nature of Pokémon in POKÉMON GO made it successful, yet also illustrates that the game itself only marginally fits with this particular promise of a Pokémon filled city. As alternative to traditional validation research, the action space analysis goes beyond the binary consideration whether something is present or not and explores what circumstances in the design possibly can influence the existence of said action. While not committed to correlations, it gives important pointers into where validated results can be traced back to.

The action space analysis has thus shown that both Shiau et al. and Rodríguez et al. have proven certain aspects of POKÉMON GO. As tested methods have shown the emotional nostalgia to be an aspect of POKÉMON GO while mechanics govern the main gameplay, the action space analysis has managed to show the same and more. With this achievement in tow, and with the results gathered from the case studies, we argue that reverse engineering and the fit has shown itself to be a validated method with replicable results as well as a solid claim of credibility.

4.7 General Conclusion

This chapter set out to illustrate and validate the capacities of the fit as qualifying metric when studying urban games, as well as the efficacy of the action space analysis for gaining more insight into the design and misdesigns of urban games. To show this efficacy and validate the use we had to show how the action space analysis could yield a variety of fit values in a single design and explain these differences. Through four case studies, and a comparison of the results of the action space analysis to the results of similar studies that used validated methods, we have shown that the fit and its action space analysis can give insight into the design of urban games, their specific strengths, weaknesses, and limitations, the presence of explicit and implicit city models that structure the play activity, and the acknowledgement of afforded alternatives.

The first case study, GEOCACHING, showed the capacity of the fit and its method to reflect on the inception of software lines. The fit between the design and the afforded interactions could clearly be found, as long as the afforded interactions remain focused on the communal discovery without imposing messages. The second case study, ONTDEK OVERVECHT, showed a misfit in the design as winning was forwarded as main signifier, which does not fit the discursive communal problem solving city model, and the strict context of play made it less flexible to appropriation. Therefore the pursued city model hardly fit any of the affordances, as it was misdirected in its purpose. In the third case, most of the afforded city models of CITIES: SKYLINES fits with the pursued city models, as long as they subscribe to the underlying profit and efficiency logic and any alteration is accepted as property of the game. The freedom afforded in the game is cleverly encapsulated within unwritten rules that keep the communication focused on the pursued city model category. The case further showed that an entertainment game can have useful academic purpose as a visualisation tool and as a reference frame for discussion, as long as its programmed systems are acknowledged. Finally, POKÉMON GO showed a strong fit focused on its role of the game as facilitator of further activities, by ensuring that appropriations will deal with the city model of the entertained yet consuming player. The cases and a comparison showed that the results from the reverse engineering match similar studies using validated methods, but ultimately the fit offers more results than these statistic focused studies.

This chapter has shown and validated the use of the fit as a metric with useful insights. These case studies are however micro studies into singular games. Some steps into broader conclusions have already been made but further generalisation can make the fit more applicable. To exceed the specifics of statistical validation, a bigger size is needed.

Chapter 5 – Fitting Design Implications

Introduction

Imagine going to a clothes store. The clothes size that is the best fit will probably guide the search for a future purchase. If some sales person tries to sell a small size then this knowledge should allow the buyer to gently, yet firmly, rebuke the delirious seller. The city-game fit described in this study has similar predictive and dismissive potency. Yet, just like a clothes fit should not be used to measure volumes, the city-game fit can function as a useful metric only when used within certain parameters. The fit, as introduced here, can highlight whether the design of a game is unfit for a particular pursued city model. Knowing the limits of the fit as metric will allow the implications of this method and metric for urban game design to be defined and explored. This chapter will explore how the fit and its action space analysis can be further applied in the domains of game design, policy making, and cultural criticism. To explicate these concepts and future perspectives, we will use POKÉMON GO, and its positioning in broader city and gaming culture, as illustrating example. Here we explicitly deal with areas of application of this method and metric. Although sometimes these applications are only available in the future, after multiple uses of the method, we deal here with the implications for design. Future research suggestions will be provided in the conclusion of this thesis.

This chapter will firstly in 5.1 organise and outline the specific parameters in which the fit can function. This summarising exposition will reflect on the findings of the previous chapter in order to outline the specific functioning context. The fit is relevant during, after, and beyond design, but solely illustrating when it comes to possibility.

Following the identification of the parameters of potency, these parameters will be explored for further usage of the fit in 5.2. If a variety of games is reverse engineered and their fit measured, recurring patterns in games can yield information about a tailored and conditional fit. The tailored fit can show which game design features fit best with which urban challenge whereas the conditional fit shows which game design features repeatedly return in fitting designs, regardless of the urban challenge. These two versions of the fit are instrumental in applying the fit to different domains.

5.3 will be devoted to illustrating possible areas of application of the fit. This section will delve into upscaling the findings from the case studies from the previous chapter. Firstly in 5.3.1, in game design the tailored and conditional fit can serve as a basis for a list of best practices when it comes to urban games or specific urban challenges. Secondly in 5.3.2, following a similar best practice approach, the fit can help inform policy making. Knowing what games have a higher fit to specific urban challenges can help create a checklist for policy makers when deciding on the application of games for civic challenges, filling in for a possible lack of expertise and unnecessary or inconsistent use of games for urban issues. With these two domains discussed, finally in 5.3.3 the critical potential on a more Meta level of the fit will be discussed. As a means to ground cultural critique, the fit offers some tenets and numbers that help to strengthen certain positions against city models or urban planning. To show this

value of the fit, this chapter will end with a pilot study of how the fit can offer a grounded critique against a technology centred approach to smart cities. These three suggestions are mostly based on the repeated use of the fit as a metric, resulting in the possibility for comparison between recurring patterns spread over several games. In order to promote this comparison, first the parameters in which the fit functions have to be clarified.

5.1 The Fit of the Fit

When is the fit useful? For what can it be used otherwise? All these questions will be answered in this section. In doing so, important boundaries will be drawn within which the fit can exert its prevaluative power. Going beyond these boundaries means venturing into territory not yet validated, possibly drawing conclusions from the fit that are not supported by its methodological design. By first drawing these boundaries in this section, the next sections can extrapolate these parameters to what implications this has for attention to urban game design.

In chapter three the nature of the fit as a prevaluative metric was introduced. This meant that the fit is an exploration of mechanic combinations inside games to predict appropriations and the associated approaches to urban issue. This only shows the general ballpark of what is possible to happen, not concrete causations. While this rules out cold hard validation of results, the prevaluative powers bring with it several advantages. Firstly, unlike validation, determining the fit requires less specialised knowledge for instance. Secondly, because it reflects on the possibilities contained in the game it exceeds the spatiotemporal specificity of validation research, allowing for longtitudinal comparisons and recurring patterns. Thirdly, without its debt to statistical validation, instead opting for measures of probability, the fit can offer value at different moments of the existence of an urban game. Depending on these moments, specific parameters can be discerned that show the strengths and limits of the fit. The fit yields results during design as check-up, after design as assessment or test of alternatives, and beyond design as reflection or criticism.

5.1.1 During Design - Prevaluation

The most straightforward prevaluation is achieved by using the fit for what Ben Light et al. call a “walkthrough method,” meaning the “step-by-step observation and documentation of an app’s screens, features and flows of activity – slowing down the mundane actions and interactions that form part of normal app use in order to make them salient and therefore available for critical analysis” (Light, Burgess, and Duguay 2018). During the development of an urban game it pays to step back and walk through what afforded loops and metagames the game contains at this stage. This differs from regular

playtesting as the focus is not so much on determining the bugs and faults, but more on how players can interact and if this is free enough to achieve the pursued goal. In this phase, the affordances of the game have to be charted, and particularly the unforeseen or appropriated affordances. This inventory then serves as an overview of possibility. The fit can offer the full use of its prevaluation, showing which city models are more likely to be conjured based on the current design.

The height of the fit explains how close a possible interaction comes to the pursued city model. This does not equate directly to the likelihood of that interaction occurring.[68] Through this quantification then the current design can be judged on whether it signifies a desired interaction enough, or if the player is too free in their appropriation. While it is possible to expand on the probability values given by the fit, the values themselves only show the ballpark of city models afforded by the current design.

In POKÉMON GO this early prevaluation would have highlighted the extent of player appropriations of space to catch Pokémon. Quickly after launch, a variety of problems arose from Pokémon appearing at locations not suited for player presence, such as Holocaust memorials (Peterson 2016), busy highways (Pharoah 2016), or train tracks in the Netherlands (Remmers 2016). A pre-existing bias based on an expectation of individual common sense or at least self-preservation (Friedman and Nissenbaum 1997, 26) influenced the design. Reverse engineering the game in order to chart the fit would have shown the disregard of spatially specific locations in favour of space as solely an arena for catching. With this realisation in tow, the design of the game could have been adapted or at least the company could anticipate adequate responses, because these events were often met with radio silence from Niantic Inc. (Prell 2016).

The efficacy parameters in this stage of the design are then the existence of communicated city models. This does not ensure correlations or a degree of probability – it solely charts possibilities. Within these parameters, the fit can be used to inventory the city models afforded by the current design, identify those more likely to be experienced, and interpreting the signification of the game accordingly.

5.1.2 After Design – Assessment & Alternatives

Prevaluation allows for prediction of possible outcomes. While this is a valuable and money-saving affordance in its own right, the fit can also be used after the design in finished. Then, the fit can be used as tool for assessment of effect. Note that the fit explicitly is not a validation of effect, as this would require the deeper investigation of correlations. Assessment conversely checks whether a designed game is capable of even achieving the desired goal. It does not offer information on the probability of it happening (although, a simple tally could help here) nor of the specific mechanics that make it so. The

[68] This probability can be charted as well through a small alteration of the method, by tracking how many of the playtesters engage in each interaction. Yet this is not the focus of this study or the extent discussed here.

fit can show whether the design allows for the pursued city model to arise and which relations and combinations of mechanics either increase the probability or decrease it.

This assessment function is particularly useful when testing whether an existing game would be a useful tool to pursue a city model. In this case, the pursued city model is decided upon first and a fitting game is required. In a way still prevaluating, this use of the fit sees the charting of the ballpark of city models in a game that is already finished. The fit in this case only denotes the possibility of an existing game affording the pursued city model and whether the current design is up for the task. While the qualification of the fit can reveal which relations are attuned or not, the adaptation of the game is beyond the reach of the fit. The fit can show which games from a collection even have a chance to achieve the intended goal. As one step of the action space analysis, the loops and metagames are reconstructed which can help in the adaptation of the game. This will ultimately require further reflection beyond the fit. It only pursues insights gained from the fit but is not guided by it.

Alternatively, the fit can also be used the other way around with existing games. Instead of selecting an existing game to pursue a city model, the fit can help to pick a city model afforded by a game and pursue that instead. Determining the fit can show which city models are afforded. This will show that some city model categories fit better with the game than others. Based on the highest quantified fit, signified or not, the existing game is shown to be capable of conjuring a specific type of city model – even if this is not the original use of the game. The fit can then serve as an exploration of alternative uses for a game, possibly a useful addendum for designers or municipalities. Note that the action space analysis as introduced in chapter three is not sensitive enough for this implication yet.

For POKÉMON GO, after its launch, many hopeful ideas arose for alternative uses, ranging from getting users to vote (McGonigal 2016) to raising awareness about sexually transmitted infections (Ham 2016). Reverse engineering and determining the fit would have shown that the design itself is not that suited for alternatives. Reliant on the Pokémon franchise in every afforded city model, simply transposing it with something else does not necessarily translate well.

The fit after the design is a metric of viability. It assesses whether pursued city models are afforded by checked games and in doing so offers a reflection on alternatives. The parameters of its use are again limited to this display of possibility.

5.1.3 Beyond Design – Reflection and Critique

The final uses of the fit is found in a more general domain here called ‘beyond design.’ Uses of the fit beyond design take a more meta perspective, reflecting on what can be learned for the future through the fit. It can be used as a reflection and criticism tool but it is dependent on a collection of fits in different games.

The reflection is focused on learning what designs afford which city models. The fit serves as searchlight here, showing in which design it is even possible to communicate specific city models. However, concrete correlations between mechanics and city models remain limited. As illustrated by Ampatzidou et al. (2015), specific mechanics cannot be directly related to their ramifications. At best, combinations of mechanics can be related to an effect. With all these caveats in mind, reflecting on a single game will not yield credible results for future trends. In that case multiple games have to be analysed in order to determine patterns.

Next to that, a type of game overrepresented in the online stores for various functions, like scavenger hunts, or a game receiving funding that does not fit the required city model can be criticised based on the presence, quantity, and interpretation of the fit. When applied to a singular game, this is more a prevaluation or assessment. Yet, if more and similar games have already been analysed, comparable fits can be used to criticise selections of types of games or mechanic combinations. This may even result in a critique against the use of games for certain city models in general, as they hardly ever fit the designs. Yet for this criticism beyond the design, an inventory of studied fits is needed, but ultimately the fit can serve as generalised criticism on uncritical game use.

Recently, several POKÉMON GO clones have appeared such as JURASSIC WORLD: ALIVE (Ludia 2018), in which you hunt dinosaurs to clone, GHOSTBUSTERS: WORLD (FourThirtyThree Inc. 2018) for looking for bustable ghosts, and most recently HARRY POTTER: WIZARDS UNITE (Niantic 2019) with recoverable magical artefacts. While each has their own unique addition, they basically use the same mechanics of walk and catch. Reverse engineering all these clones and charting their fits can show which shared elements in these games contribute to the same city models. Such an insight can then be generalised and used for future designs.

The fit then has various functions during, after, and beyond design wherein it shows the possibility of a city model to occur from a specific design. Whereas during and after the design, the attention is directed to the current game, to go beyond the design requires an inventory of studied fits in order to perform comparative research. The current action space analysis is not yet prepared and tested for this. Furthermore, two new interpretations of the fit will have to be introduced to make comparisons worthwhile.

5.2 Comparative Fit Studies

The larger reflections beyond the game indicate a new level of fit: not within the game but within the domain of gaming as a whole, here called the tailored and conditional fit. To discover these fits, a larger corpus has to be analysed in order to account for larger patterns within urban games. The tailored fit can show which game design features fit best with what urban challenge, whereas the conditional fit shows

which game design features repeatedly return in fitting designs, regardless of the urban challenge. These two versions of the fit are instrumental in applying the fit to different domains.

5.2.1 Tailored Fit

A tailored fit, so named here in reference to the way clothing can fit on a body, can be understood as those game design combinations that always evoke a similar city model. Like medium sized clothes fit on medium sized bodies, certain game designs always afford the same city models and their associated interactions. Many designs are mistakenly seen as tailored, hence the many ill-applied scavenger hunts that do not serve a singular purpose. Yet patterns between design and city model can exist, as outlined by Raphael et al. and Schouten et al. (2010; 2017). Raphael et al for instance explain that "Games high in agency and expediency will most effectively teach a citizenship of influence" as one of their twelve identified tailored fits (2010, 219). Schouten et al. in their turn explain how several games focused on role playing and open debate work well for instilling understanding and empathy (2017, 36). As such, there are certain design combinations that are tailored to achieve certain city models.[69] Yet when it comes to adapting pre-fabricated games, tailored fits can offer an initial judgment to streamline the choice of games to be adapted. Note though that the tailored fit is a meta approach to the fit: it depicts a reflection between a loop groups, linked to a city model as discovered *over multiple games*. It therefore differs from the prevaluative fit that tests a singular design on its communication of specific city models.

For a tailored fit, the elements that match are the combination of mechanics and a city model that is always conjured regardless of the shape of the game. A scavenger hunt can for instance always match a city model related to movement, for that always happens, regardless of semiotic intention. POKÉMON GO and GEOCACHING, for instance, both contain fitness models due to their walking focus. When more games are analysed, this pattern of recurrence can be spotted and the tailored fit can be identified. Recurring loops and metagames can then be said to be tailor made for affording a specific city model. But the tailored fit can still serve as identifier when analysing and as a searchlight when designing.

The tailored fit serves two specific purposes: reflection and prevaluation. In chapter four, games from the four general domains of game classification were assessed. In order to determine tailored fits, in-depth studies of multiple games from the same category are required. With several of these inventories side by side it becomes possible to identify recurring groups of loops and metagames. The fitness and exploration loops are some of these tailored fits, although judged from the very limited scope of chapter four. The design observables that contribute to these city models are embraced in running games like ZOMBIES, RUN! (Six to Start 2012). Semi-guided movement through space – as done in POKÉMON GO - is focused on distance. The tailored mechanics are then cleverly recognised and expanded. Just designing

[69] These are what expert game designers base their decisions on, although these insights are not always shared, tracked, and collected.

a game with tailored fits does not ensure players will also engage with those; the tailored fit is just one of the possible interactions with the loops and metagames, albeit one that occurs in every design it is used in.

The prevaluative powers of the tailored fit can inform hypotheses in statistical validation, giving an idea as to what specific games and their mechanics can do. This quick and dirty indication of correlation can also be of use in the design stage, when statistical validation is both impractical and undesirable. The tailored fit then has various uses after being determined, but is ultimately product of multiple fit studies.

5.2.2 Conditional Fit

The conditional fit instead stands for those city models that keep recurring over various games. The fit is then based on these city models being particularly suited to be conjured with games, able to adapt to different designs. The name derives from Charles Darwin's theory of "survival of the fittest," meaning "one general law, leading to the advancement of all organic beings, namely, multiply, vary, let the strongest live and the weakest die" (1859, 266). As such, if a particular city model has the best condition, or can adapt to most of the possible designs of games and their appropriations, they will be conjured by more games and thus persist longer than less prevalent models. This particular fit is then a useful metric to reflect on serious games in general. Some city models might arise with all games while other city models, pursued or not, can only arise with great difficulty. The conditional fit is a metric that can be used to dispel utopian visions of the capacities of games as well as optimise the use of games in urban settings, all by taking into account those city models best fitting with games.

The conditional fit is a different fit from those discussed before. Here fit denotes an adjective instead of a noun, relating to physical fitness. Conditional fitness can occur spread over all of the classification categories discussed in chapter four. The aforementioned movement through the semi-structured space of POKÉMON GO giving rise to a fitness model keeps popping up. All scavenger hunts and sport games conjure this model, regardless of their general purpose or game rules. City models of movement are conditionally fit in urban games. Conversely, the lack of fitness can also be identified. The lack of occurrence of certain city models outside highly specific games shows the niche nature of some city models. This does not make this city model better or worse, but does indicate that it is more selective in its context of functioning. These identifications of fitness can be used for a variety of functions, mostly related to criticism.

Knowing which city models occur across a variety of games and which do not allows for criticism of game use and identification of cultural tropes. City models that keep appearing can be interpreted as being well served by the medium of games. Since these city models pop up regardless of the specifics of the design, the interactive capacities of games can be seen as the main instigators. In realising this, criticising the use of urban games in the pursuit of certain city models gains more momentum. Those

games pursuing conditionally fit city models have a higher chance of succeeding, whereas those games that do not take the niche nature of some city models into account risk running aground. This offers criticism of mindless gamification of urban tasks. Some of the urban tasks pursued are by no means conditionally fit for games, like civic jury duty for instance. The conditional fitness of city models then provides a baseline form of data about what games can and cannot do.[70]

The tailored and conditional fit are an alternative to statistic validation as they function as a pathfinder, as well as offer a more contextual reflection on the validated findings. Both however are highly dependent on multiple analysed fits and the reverse engineering of multiple games. With these capacities in mind, specific applications of the fit in the domains of game design, policy making, and cultural criticism can be outlined.

5.3 Applying the Fit

With the tailored and conditional fit and their moments of efficacy outlined, the use of the fit and its capacities will be discussed below through its application in three different domains. First, the fit can provide several guidelines for the design of urban games; guidelines that may seem straightforward and self-explanatory, but are now chronicled and motivated by reverse engineering. Secondly, the fit provides an accessible tool for governments to judge game submissions. Having a more grounded approach to applied games can improve policy decisions. Finally, the possibilities of using the fit for criticism is displayed by offering elaboration on smart city critiques through data gathered with the fit. These more specific applications show the broader contributions the fit can provide for a specific domain.

5.3.1 Game Design Guidelines

As a metric to gain a closer understanding of how urban games function it stands to reason that the fit can offer several insights when it comes to game design. The fit can offer specific highlights and guidelines when it comes to cyclical design. Functioning as a searchlight and checklist, the fit offers markers to continuously check in order to keep the efficacy of a design on track. Experienced designers

[70] Survival of the Fittest in the Darwinistic sense of the word is a historicised concept. The process of natural selection happens over a large period of time. Games however can be played often for a long time, regardless of the specific moment they are released. While there are some factors which can contribute, like POKÉMON GO releasing in the summer holiday, the game itself is not positioned squarely in a time period. Therefore, judging the cultural value of the conditioned city models remains less plausible through the fit. However, specific ludic interventions or urban events could be subjected to such cultural criticism.

are familiar with these spotlights intuitively, yet the fit allows for a systematic outline and support for the points of attention. The main additions the fit can offer to game design are prevaluation and reflections based on tailored fits.

The prevaluation and reflection work together to complement the iterative design process of game design. Tracy Fullerton, in her comprehensive outline of the player-focused game design process, states that iterative design means to "design, test, and evaluate the results over and over again throughout the development of your game, each time improving upon the gameplay or features, until the player experience meets your criteria" (2014, 14). As per the action space analysis used to determine the fit, playtesting is used throughout the design process to figure out if the game contains any game-breaking bugs. During the same playtesting steps, the reverse engineering necessary for the fit can be performed by simultaneously observing and charting all possible interactions the players exhibit. With this overview in hand the afforded loops and metagames can be determined and subsequently be transformed into the afforded city models. This determination of the fit at this early stage offers the chance for a prevaluation; the efficacy of the game is assessed in this unfinished form and possible secondary loops can be identified and eliminated or incorporated. Based on the possibility inventory provided by the fit, game designers can attempt to steer the design by adding signifiers to specific loops and metagames. Prevaluation in game design then offers an early assessment which allows for adaptation, targeted signification, and exploration of alternative play modes.

Iterations are informed further by the identification of tailored fits after reflection. With reflection, the prevaluated results can be used to discover patterns. Especially when more games are taken into account, tailored fits can be identified and exploited. Should the prevaluation show that the pursued city model is not necessarily achieved or fits less with the current design, a tailored fit can be called upon in the next iteration in order to direct the player interaction. Contrariwise, if a close link between specific loops and metagames and the afforded city model can be discovered, future iterations can built upon this newly discovered tailored fit. The latest POKÉMON GO clone, HARRY POTTER: WIZARDS UNITE! is based on its precursors, not least of which POKÉMON GO itself, as they are designed by the same studio. The clone however expands on POKÉMON GO through an added story and more complex mechanics of tracing patterns instead of tapping. Reverse engineering the precursors of this clone would have allowed the identification of tailored fits that occur in each of the games: the exploration, walking, and catching models. Identifying these tailored fits allows the designers to cleverly expand on them instead of creating a clone. HARRY POTTER: WIZARDS UNITE! did this better than GHOSTBUSTERS: WORLD, which only changed the animation and nothing else. All in all, the fit adds a reflection to game design that can offer guidelines for future iterations, designs, and projects.

To gain most benefit from this reflective capacity of the fit, the larger the corpus of games reflected upon, the higher the chance of discovering tailored fits. A pattern discovered from the analysis of very similar games will not necessarily hold true on a larger scale. Instead, a pattern discovered both in a

scavenger hunt and a communication facilitator can be a more promising tailored fit, as here the loops and metagames seem to act on their own, regardless of the kind of game. The construction of a database for tailored fits can then be a fruitful endeavour for starting designers.

For game design, the fit and its action space analysis offer a means for an inventory to structure iterative game design and playtesting, by explicitly highlighting and tracking strengths. The tailored fit is a start of a recipe book of best practices. But as seen in POKÉMON GO clones, merely copying these clichés does not always work. The tailored fit offers waypoints for further innovation and fashioning.

5.3.2 Informed Policy Making

As attested to in the ONTDEK OVERVECHT case, city governments invest in alternative approaches to citizen interaction. This can be implemented as a tool for tourism or civic input. However, as expressed from the beginning of this study, the lack of understanding of or critical engagement with gaming as such an alternative approach results in a simplistic understanding and application of games. This study and the introduced metric of the fit are a means to combat this simplistic understanding and misuse. The fit offers the tools and intelligence to approach urban games with an informed understanding when determining policy decisions and therewith public expenditure. While it is too drastic to claim that the fit will be a money saving measure of municipalities, this section will make the contribution the fit can offer to governance clear. The necessity comes from misunderstandings, new political agency, and the rise of data.

Firstly, the need for the fit in governance settings stems from misunderstandings. Depending on how the games are used, municipalities can fall into two distinct traps. The first is a simplistic understanding of gamification, which Michael Ferrara in his Meaningful Play Keynote explained as the idea that "games can be strip-mined for their ''useful'' elements, disregarding the rest of what makes a game a game" (2013, 291). This pitfall is based on the idea that every game element, such as leaderboards or achievements, will automatically improve motivation or enjoyment of an otherwise menial task. For a municipal government, making participation or civil activities more enjoyable and improving motivation would be a dream come true. Yet, as Ferrara argues, this understanding does not hold true as it disregards the design of games and what makes them unique (2013, 292). Simply investing in gamified solutions because they supposedly work is frankly a waste of money. The second trap is partly responsible for the simplistic understanding. In his article 'Why Gamification is Bullshit,' Ian Bogost explains that gamification is more a rhetorical force than a successful practice by stating that marketers rely on the unknown entity of a game and attribute it with magical properties (2014, 68). Bogost argues that "[t]he bullshit is not found in the product or even the outcome, but in the process of presenting that product or outcome as exactly what it needs to be in order to benefit the agent doing the presenting" (2014, 69). The simplistic solutions Ferrara resents fit this understanding of gamification, despite its

polemic nature. When it comes to allotting public money, these simplistic approaches to games, wrapped in clever marketing rhetoric, pose an ineffective expenditure at best, and a malign exploitation at worst. The fit, and the associated knowledge, offers grips on the unknown entity of games for policy makers.

Secondly, the necessity of a more critical perspective of games becomes all the more pressing with the rise of networked smart cities and a decentralisation of control. Municipal governments have significant freedom in their approach to local issues. While it may not be true, as Benjamin Barber hopes for, that mayors rule the world, he does characterise the city well by saying that they "have little choice: to survive and flourish they must remain hospitable to pragmatism, to problem-solving, to networking, to creativity and innovation, and to cooperation" (idem, 13). Cities have to cater to the mundane existence of its citizens, regardless of national pressure. While the reality might not be so civic-centred (Hollands 2008), cities do have considerable freedom when it comes to catering to citizen provision. As shown in ONTDEK OVERVECHT, this can mean an exploration of new approaches such as gaming. However, the drive to creativity which Barber accredits to cities as governmental institution might open the door to games as investment possibility, yet does not necessarily pair with a critical assessment of the options. Using games 'because they are new and available' only exacerbates with the rise of datafication.

Albert Meijer explains that cities have become more and more datafied, which he describes as "all aspects of the city and urban life are captured through data" (2015, 10; Author Translation). With new possibilities for governments, such as a "cockpit" control over city infrastructure, or "bird swarm" reliance on participation society (idem, 18; Author Translation). Within these new measures of control also identified by Barber, Meijer argues that governance agencies, citizens, and market societies are engulfed in a series of games. In these power plays of "data collection, data storage, data usage, data visualization and data access," stakeholders vie for larger degrees of control in order to shape the future of the city (Meijer 2018, 202). Urban games in this case can function as a tempting tool to gather data through, especially with digital apps. However, games addressing urban issues, used for the sole purpose of data gathering are based on a misfit. While there are games that can cleverly be used in the data game, mindlessly investing in games for their data ultimately can derail the design of the game. What these two trends show is that the necessity for urban games exist in urban governments, both to stand out creatively and win the data games. The empowered and data stakes show the fertile ground for games but the misunderstanding of gamification shows a tension between will and expertise.

As prevaluative measure, the fit enables policy makers to gather the information needed about a game in order to judge whether it is worth the investment. As an affordable, and accessible method, the fit allows policy makers to transpose themselves into the world of the game designer and the player. This will provide them with the insight into the game necessary to make an informed decision about whether to use a game to approach an issue and which game is best. Next to prevaluation, the fit also allows for assessment, to see if the proposed game actually achieves the desired outcome. While it is not necessary

for policy makers to chart all the possible city models that can be conjured with a game, a specific check for their own purposes can be of extreme value.

The fit as metric in the toolbox of the policy makers can be used for the following purposes. When a call for a game is put out and designs are pitched, policy makers can inform about playtesting sessions. This forces the designers to delve into their mechanics and gameplay. Such a reflection already filters through designs that simply slap a game on something instead of designing in tandem with the issue. Furthermore, if designers suggest the adaptation of an existing game, results of earlier reverse engineering and fits can possibly be consulted. Any tailored fits or conditional fitness associated with these kind of games can bode well for the chances of the design achieving the desired goal. With the knowledge of the afforded interactions, the policy makers can criticise the design as it is presented, with informed arguments, which can make the further creation of the desired game better communicated. As the game design progresses, the policy makers can inform about changes and determine if these changes still ensure the conjuring of the desired city model. The fit as a metric then helps the policy makers assess and evaluate the design both before the allotting of funds and during the design. By ensuring that the ability of playing is considered, as well as the meaning and production of games, urban games issued by municipalities will pass an informed filter, ruling out the bullshit Bogost laments.

The call for the alternative uses of POKÉMON GO after its success could have profitably be tampered through such reflection. Had policy makers reflected on the game then they would have seen that, at the time, POKÉMON GO was not yet capable of getting players to a shared space at a specific time, thus making it less suited as a tool for civic participation.[71] Furthermore, other unintended uses could have been foreseen, which would have improved the situation in the Dutch town of Kijkduin – marketed as the POKÉMON GO capital of the country, due to a beneficial corridor of spawning points on a boulevard. At the start this label was a commercial boon with many players flocking to Kijkduin and indulging in the local commerce. Yet the disinterest of the players with the space other than a Pokémon source would later cause trouble such as public hindrance, trespassing, and loitering in natural reserves. The fit helps policy makers to gain a semblance of control over these unpredictable game wildcards, possibly making them think twice before embracing a temporary hype for commercial gain.

The fit provides policy makers with a filter to determine whether proposed games are even capable of achieving the desired result. How this is done is up to the designers, but the policy makers can hold them to a certain standard, instead of believing their word alone. It also gives policy makers the power to improve and sophisticate the call for games. Policy makers are provided with a reference frame to

[71] With the inclusion of Raid Battles on June 23rd, 2017 POKÉMON GO has introduced a mechanic that brings players to a specific place at set times by making a stronger Pokémon available on gyms for a set amount of time that requires cooperation between players to be defeated and caught. This was however a year after launch.

determine the feasibility of their investment. The fit as democratizing approach fits a broader approach to ludoliteracy.[72]

5.3.3 Fitting a Smart City

Having an informed opinion with qualitative and quantitative values to support it can also be used to provide a supported criticism of an urban situation. The critical potential of the fit will be illustrated in this section by diving deeper into the often proposed smart city and its promises. A great deal of criticism has already been directed towards the utopian ideals of smartness, but the fit as a measure can offer more support and nuance to these arguments. This section will showcase how the fit can offer a criticism of a city model – in this case the smart city – akin to more discursive arguments. It will do so by first outlining the rise and characteristics of the smart city model. Then, based on recurring discursive criticisms, the city models of the smart city that are criticised and those suggested by the critics will be compared in order to demonstrate the misfit identified. Finally, this added value of the fit will be further demonstrated through the analysis of the smart city game of IBM CITYONE.

At the heart of many criticism and misfits is a misunderstanding of the smart city actually is. Anthony Townsend explains that technological developments such as increasing Wi-Fi access and mobility of technology by untethering from the grid, occurred together with massive urbanisation (2013, 2). This urbanization caused a mass of new urban issues to sprawl, such as a demand for efficient city building and more coordinated governance. Many new solutions to these issues took on the shape of information and communication technologies (ICTs) that facilitate the interaction between users but also between objects. This opened the door to new interactions which help in governing the city through technology. Broadly speaking, using technology as a means to address rising social issues was the basis for smart city models. A rather general approach, which is where the confusion began and where the standardisation of the city model offers solace.

The variation and confusion, according to Vito Albino et al., lies in the fact that "the term "smart city" is often treated as an ideological dimension according to which being smarter entails strategic directions"(2015, 3). Depending on this ideological dimension, the way the city should function, what the most important elements are, and how the citizen is positioned can differ. Albino et al. acknowledge these ideological dimensions and distinguish three levels on which the many contesting definitions differ. Smart city models differ on the basis of a) their reliance on ICTs, b) the role of the citizen, and c) the requirements of the community (Albino, Berardi, and Dangelico 2015, 3). Given these elements – the ideological motivation, the technology, the citizens, and the community – the smart city can have a variety of city models that all conform to the general understanding of smart, but all have different

[72] Note that policy makers are still no designers (per se). The fit provides them with rubrics for assessing viability but ultimately how to design for their demands is an expertise in the purview of the designers.

approaches to it. When designing an urban game then, it stands to reason that the city model designed into the game can clash with interpretations of players as all of the characteristics are going to have a different manifestation, thus resulting in a misfit.

A clear illustration of this confusion can be found in the case of Transparent Chennai, discussed by David Sadoway and Satyarupa Shekhar (2014). Designed by Cisco, Transparent Chennai was envisioned as a platform that served as a smarter and more efficient way for citizens to be informed about infrastructure plans. Users could mark and flag points of interest on the map which would (supposedly) be checked by government officials. For some users this would be the fastest way of reaching executives as remote regions remained rather isolated. A smart solution indeed.

However, citizens appropriated the platform for their own purposes. Through community participation, the citizens of Chennai used the affordances of the platform to instead show underrepresented local issues and held the government accountable. They mapped the rich public data that in turn made governance issues more transparent. A smart city solution thus received a completely different interpretation of what it meant to be smart. While it could still fulfil its original purpose, this was more than what the government had bargained for. The fit of Transparent Chennai then ultimately attests of a misfit, but what can be learned from such a misfit?

The fit can explain misfits in smart city approaches, such as Transparent Chennai, by showing that the smart city is a zone of contested power. Aptly grasped in the question 'who is smart in the smart city,' the tension between smart city solutions and lived reality of citizens is a central source of criticism and misfits. For instance, smart city models from engineers and entrepreneurs investing in the smart city, according to Townsend, "often want to cut to the chase, find the killer app, and corner the market-this dynamic is already at work in corporate plans for cookie-cutter smart cities" (2013, 11). Added to this, the smart city and the associated technologies "rely on the citizens to fulfil normative values of citizenship that prioritize neoliberal efficiencies, individual citizen instrumentality, and prescriptive pathways to citizen action" (Gordon and Walter 2016, 250). This approach to the smart city ultimately predetermines the city model characteristics of actor (corporate), ideology (one size fits all), aspect (general applicable), carrier (the killer app), and citizen actions (follow suit). By leaving no space for affordances and interpretation by the citizen, any other city model will ultimately not fit with these predetermined approaches. Critiques against such smart city models then spawn from many citizens "eschew[ing] efficiency, instead seeking to amplify and accelerate the natural sociability of city life" through the available tools (Townsend 2013, 8). This criticism on smart city models can then be elaborated upon through the fit by looking specifically at mismatching characteristics. By making the understanding and expectations of the city explicit and standardised in city models, the fit offers an overview of what frustrates the incorporation of new smart city approaches. The added benefit of this explicit overview is that ascertaining the fit also recognises that some aspects of the smart city can be considered beneficial. Instead of discarding everything based on several ill-fitting characteristics, the

smart city still remains feasible, just reliant on alteration. Analysing the criticisms on city models from a fit perspective offers pointers on where improvement can take place.

Alternatively, the fit – or misfit – can also be anticipated and then the action space analysis can explain what contributes to this result. Nicos Komninos even argues that "to date most smart/intelligent city solutions have had limited impact on the competitiveness, employment and sustainability of cities. This mismatch signifies several things: either smart cities are not well targeted on city challenges [or] that solutions are more technology push than demand driven" (2014, 92). With such a conviction on smart city solutions, reverse engineering can highlight Komninos' reasoning from within the game.

An example can be found in IBM CITYONE, the smart city HTML game, discussed in chapter two, whose qualification and quantification show that there hardly is fit, functioning more as a sales pitch. In the game, the player is confronted with urban problems by a blue dot on the main screen. These challenges are related to water, energy, banking, etc. The player can choose from a selection of solutions, all related to a technological fix (by IBM) which can be read about and discussed. Each turn the player will earn respect and money based on the decisions taken. The final goal is the creation of a truly successful smart city. The core loop then consists solely of clicking and choosing. Secondary loops consist of pursuing a specific kind of city based on the three choices made possible for each issue, or gain the highest score as there is a world ranking shown at the end. The metagames are very limited. The informational metagame is made up of real world knowledge of the solutions implemented, happily provided by IBM in the game. Fictional there is a minimal narrative of a CEO (not a mayor) helping to organise the city. There are no transactions possible in the game, only resource management in the game world. The game remains a private symbolic engagement with the city. On a deeper level, all the solutions presented are existing IBM projects, giving the game a more ad-like shape. Players can try to perform well enough to appear in the ranking as performative metagame. However, the game is more a performance of the repertoire of IBM; showcasing projects and painting them as successful and helpful for citizens. Finally, the contextual metagame is a simplistic flash game that ultimately is embedded heavily in a technological utopian context. The inventory of afforded interactions in loops and metagames are shown in Collection 15.

While the main job of the player is to choose the direction the smart city develops in, thus giving three different loop groups, ultimately it is funds that govern all choices. Without funds the scope of choices diminishes, nor will the high score be breathtaking. As such, the game implicitly signifies the profit city loop group and pursued loop group.

Figure 49 IBM CITYONE Main Screen (Source: Games for Cities)

Core Loop	Secondary Loop	Informational	Fictional	Economical	Performative	Contextual
Choose (click, choose)	Profit City (choose profitable)	Urban Issues; Money solutions	CEO makes city better	Private Symbolic; Showcase IBM	Minimal; Predetermined choices	Subscribe to IBM as utopian city tool
Choose	Green City (choose sustainable)	Urban Issues; Green solutions	CEO makes city better	Private Symbolic; Showcase IBM	Minimal; Predetermined choices	Subscribe to IBM as utopian city tool
Choose	Innovative City (choose technological)	Urban Issues; Tech solutions	CEO makes city better	Private Symbolic; Showcase IBM	Minimal; Predetermined choices	Subscribe to IBM as utopian city tool
Choose	High Score	Efficiency	Personal Story	Private Symbolic; Subscribe to IBM	Highest Ranking	Disregard the city; acquire currency

Collection 15 Overview of afforded interactions in IBM CITYONE, grouped according to their loops and metagames. Each row corresponds to a loop group of core loop and secondary loop that only occur under the conditions set by the metagames. This collection should thus be read row by row. The signified loop group is presented in yellow. Source: Author creation

With these loops and metagames known, the city models propagated in IBM CITYONE can be reconstructed, as shown in Table 36. As the player tackles city-wide problems, the pursued city model will specialise the holistic city model category. Strikingly, all the city models afforded ultimately have very little to do with a city in general. The High Score city model solely sees the game as a playable experience to showcase talent. The smart city ideations behind it do not even register. The other three city models, shaped through the selection of IBM means, similarly do not capture a city at all. Instead, the city aspect addressed are presented problems and cookie-cut solutions. There is no local initiative, or any voice for that matter, as all the technologies presented are useful – there are no bad choices; only bad timing. As part of the campaign for an IBM smart city, this game hardly gives the player any insight

into what this city should be. With this clear, the fit can be quantified, as shown in the final column of Table 36

Loop Group	Key Actor	Ideology	City Aspect	Carrier	Citizen Action	Fit value with pursued city model
Profit City	IBM, CEO	Ideal solutions by IBM, just have to choose	Tailored solutions for urban issues	IBM Products	Citizens like the new technological additions	n/a
Green City	IBM, CEO	Ideal solutions by IBM, just have to choose	Tailored solutions for urban issues	IBM Products	Citizens like the new technological additions	78%
Innovative City	IBM, CEO	Ideal solutions by IBM, just have to choose	Tailored solutions for urban issues	IBM Products	Citizens like the new technological additions	78%
High Score	Player	Playing the Game for profit	Disregard for city	The system behind the game	Just cogs in a larger scheme	17%

Table 36 The reconstructed afforded city models of IBM CITYONE. Each loop group row shows the characteristics of an afforded city model. The pursued city model is represented in yellow. Source: Author creation

IBM CITYONE works more as a pamphlet for IBM than any take on a city. As long as the citizen blindly follows the presented ideas and technologies, there is some semblance of a city forming. Yet this is the form of a city rebelled against by the critics outlined above. The fully single player nature of the decisions made in the game, and the inflexibility of the solutions presented completely side-lines any action from the player or citizen. This even is hard to rhyme with the holistic city model category as there all agents involved at least have something to do. Even the complete opposite category, an expressive city, does not fit this game for there is no locality or individuality possible. The complete lack of any embedding in a city and a full on God-complex make this game unfitting to any semblance of smart cities, criticised or otherwise. The fit and the action space analysis managed to illustrate why these misfits occur. The lack of a link to reality keeps this smart city a wholly utopian and virtual city model. While the fit can thus be used to criticize smart city models, this does not mean the discarding of all things smart. The fit can highlight where city models and designs fail in appealing to a liveable city model, able to be appropriated by players. IBM CITYONE does no such thing, instead measuring the players with a fictional city only.

As a tool of criticism, the fit can serve to visualise conflicting ideas and expectations through the standardised notation of city models and it can support clear (mis)fits by highlighting the qualitative elements that (mis)match. These insights can then be used to properly identify, position, and critique the

games that are used to shape citizen perceptions of cities. It therefore has more functions outside of game design alone.

5.3 Conclusion

This chapter has explored the future capabilities of the fit. It has first however set the limits of the capabilities of the fit. It should be understood as a prevaluative metric that charts the general space of possibility of what a design can conjure. It can be used for probability research if paired with additional methods. Despite this limitation, the metric is fit enough to survive. As the use of the metric increases, further interpretations become clear in the shape of the tailored and conditional fit. These insights about the game design and the city respectively make the fit a metric with a broader applicability and context.

Furthermore, three possible domains of application have been illustrated. Game design benefits mostly from prevaluation and tailored fits. Reverse engineering a prototype to determine its fit will provide an early stage validation of effect, as well as inspiration of further affordances or applications. The fit effectively functions as an addendum to playtesting and as a recipe book of successful designs.

Next to that, policy makers can benefit from the insights the fit provides. Functioning as a more accessible form of quickly testing the capacities of a suggested design, the fit provides insight into potential subsidised investments. The fit is an accessible approach to understand urban games. No more hypodermic designs without a fit for the ludoliterate tailored policy maker!

Finally, the greater understanding of what urban games can do and what they cannot do without alteration allows for more based cultural criticism. Functioning as quantified and qualified addendum to already existing criticism, the fit can be used as predictive and descriptive norm of published games.

Conclusion – Sharp Dressed Games

This study looked at to what extent the pursued city model of a game can be reconstructed based on an analysis of the action space of the game and to what extent an analysis of action space can be used to improve the design of the game such that it better fits the pursued city model. Throughout this thesis we have shown that the action space analysis can indeed reverse engineer urban games in such a way that the fit between the pursued city model and those afforded in the designed action space can be prevaluated – evaluation predating the publication – for a singular design. The action space analysis of a singular urban game quantifies the overlap between the different afforded city models and the pursued city model, yielding a spread of fit values within a singular design. This spread shows that a singular design affords a variety of interactions that are more or less conducive to the pursued city model. The fit can subsequently be used to qualify this variation in fit values to analyse which aspects of the existing design (mis)communicate the pursued city model, and in doing so reflect on the efficacy of the design itself, or criticise the pursued city model for not being pursuable through this game. The fit and the action space analysis thus offer an alternative metric to statistical validation when assessing the design of a single game when pursuing a singular city model.

The fit and its action space analysis proved capable of prevaluating urban game design due to their interdisciplinary nature. Addressing the efficacy of interacting with various interpretations of the city through changing game design proved too complex to address from solely a humanities perspective. The algorithmic approach of reverse engineering allowed us to dive deeper into the design of urban games and their specific affordances, while still allowing interpretations of cities to be considered qualitatively. By basing the action space analyis on research design principles of social scientific experiments have ensured that this method can be validated and repeated, thereby sidestepping the common critique of humanities approaches as being one-offs. This combination is a new approach to urban game analysis, making the fit and the action space analysis a fruitful, novel approach that builds and expands on existing, partial, approaches.

The introduction and validation of this method happened in three parts. The first part answered the subquestion of how an action space approach to urban game design can incorporate appropriation of unpredictable affordances into the inventory of urban game design characteristics. We have shown that an action space approach goes against the magic-bullet theory - the faulty assumption that games unfailingly communicate the desired city model, without alternative player interpretation. By interpreting urban game design as the creation of an action space through affordances that can only steer player actions, we provided a perspective on urban game design that is more attuned to alternative uses that are bound to arise in urban settings. The perspective introduced in this thesis sees player interaction

as appropriation of the action space. This action space can be charted in loops and metagames, which ultimatey provides a tool to map appropriation of affordances – predicted or not.

The second part tackled the subquestion of how the design of city models into action spaces of urban game design can be canalised and compared. Instead of trying to force the city as a whole into a normative, singular definition, modelling allows the city to be represented as a manifestation of a specific theory behind the city. Acknowledging the understanding of the city as a model – one of many – allows pursued city models to be compared to those afforded in the designed action space. Based on these models, we identified eight general city model categories. Pursued city models specify one of such categories, and the afforded city models can thus be compared to their general communication goal to determine if the affordances are conducive to communication in a singular design.

The third step answered the subquestion of how an action space analysis can discover the fit value the pursued city model and the afforded city models in urban games. To this end we identified the procedural, ludic, civic, combo and attuned fits, and adapted reverse engineering into the four-stepped action space analysis. This new method was specifically focussed on prevaluating singular existing designs by checking whether the afforded city models correspond to the city model category contained in the pursued city model. With the introduction of the interpretative metric of the fit and its action space analysis, case studied could illustrate what kind of insights it could show in singular games. The interpretation of a range of differing discovered fit values shows that the fit of GEOCACHING illustrated that he scavenger hunt formula has a relatively limited fit with alternative uses, unless heavily integrated in a specialised context. A misfit in ONTDEK: OVERVECHT showed that a misdirection in the instructions of the game directs the players to an unwanted interaction – namely winning – instead of cooperation. For a fit in CITIES: SKYLINES, subscription to the internal logic of the game was a prerequisite, but, when done so, this entertainment game is well suited for cooperative brainstorming and testing. Finally, the high fit vales of POKÉMON GO showed that the afforded amount of freedom was encapsulated in the pursued interaction of franchise engagement. After this illustration of the functioning of the fit and its action space analysis, its use was expanded into broader design implications, finding its use in game design, policy making, and cultural criticism.

Having shown that the fit and its action space analysis manage to assess singular urban game designs, its relevance can be summarised in three capacities: its prevaluative powers, its alternative to statistical validation, and its independence from producing parties. Firstly, the fit is prevaluative, which means it can evaluate an urban game design, *before* the design is completed. By determining if a game fits the pursued city model a game can be steered in the right direction or denied/awarded funding. Secondly, the action space analysis and the fit sidestep some of the criticisms launched at statistical game validation. While more thorough, correlation-focused, and experimental, statistical validation takes highly skilled experts, creates a snapshot that is difficult to generalise, and is expensive to boot. Charting the fit will draw the general ballpark of what is *possible* with the game and whether this possibility is

acceptable for the stakeholder. Thirdly, the fit can be determined if only the design is available. This means that prevaluation does not require contact with the designers or carefully picked experimental subjects. Instead, when some form of a game is available, the afforded and pursued city models can be reverse engineered. This intervention then grants greater agency over urban games, their understanding and improvement, as well as greater accessibility to this knowledge.

Future Research

The main question of this thesis has thus been answered by introducing, testing, and validating a new interpretative metric of the fit and its action space analysis method, yet future research can improve and expand the findings. The answer presented here has to be contextualised to understand the extent of the findings. Key in this contextualisation is the reflection on the sensitivity of the method and metric. The action space analysis helps ensure that the games designed to deal with urban issues actually fit their purpose. It functions as an alternative to playtesting and validation, although through different metrics. In doing so, it prevaluates the design of a singular game. To support claims about the general use of games for civic purposes requires further investigation of the sensitivity of the fit and the action space analysis. This can be done by assessing the fit with all possible city models (not just the pursued one), investigating more cases, and relating the method further to statistical validation.

Firstly, future research can explore such a stronger supported sensitivity by not just assessing the fit of the afforded city models with the pursued city model, but with all of the general city model categories. The focus in this thesis was on the introduction of an interpretative metric and its method to prevaluate the efficacy of urban game designs, but such a broader assessment can show to which purposes specific design combination are specifically attuned. Testing whether such a stronger supported sensitivity actually yields salient differences in fit values can both improve the method itself, as well as the general categories of the city models. This future research is then based on the use of the action space analysis in a singular game but in a broader context.

Secondly, future research into the fit can also use the action space analysis in a limited context, but applied over multiple games. To fully make the fit a useful metric, it should be standardised. Partly, this can be done by automating the reverse engineering processes, although the interpretation step will require expert insight nonetheless. Standardisation is also done by using the metric and determining more and more fits. This way tailored and conditional fits can be discovered, which can be used in the future as a standard to compare future designs to. While an insightful metric by itself, its repeated use, in combination with the further elaboration of city model categories for the sake of faster recognition, will ultimately make the fit more meaningful through comparison.

Thirdly, the future research outlined above has focused on the expansion of the fit as a concept and the sensitivity of the method. A different approach to future research envisions the expansion of the interdisciplinary nature of the metric and its method. The sensitivity of the general city model categories can be increased as well, thus ensuring the fit assessed through the action space analysis gives relevant insights about larger urban culture. City models have here been explained based on their formation in game design. However, the general categories of city models can be clarified further through a deeper cooperation with urban studies. Future uses of the fit could benefit from an extension of the understanding of the city by including urban planning insights. Especially when a higher sensitivity of the action space analysis is pursued, the assessment of the fit in a broader context of city model possibilities needs a greater sensitivity as well – at least beyond the singular game design focused modelling used here.

Fourthly, the fit as a metric has been presented as an alternative to statistical validation through different metrics. Still, the fit can benefit from statistical validation in future research in two ways: its method needs further validation, and it can function as searchlight and pilot study for statistical validation. The former echoes the earlier call to further application of the fit. In chapter four the action space analysis was validated by illustrating its arrival at similar, and even more, conclusions as statistical validation methods. However, some concessions had to be made in order for the action space analysis to cater to the limits of the statistical validation studies. For further validation of the method, a study of a similar game and phenomenon should be set up. Both a reverse engineering study of the fit, as well as a statistical validation of the pursued effect have to be performed in order to see overlap and contrasts. Alternatively, the fit and the action space analysis can help statistical validation as pilot studies. By charting what is possible in a design, as well as what possible city models are communicated, reverse engineering shows the whole range of effects that are possible with a game. From this range and from their fit, statistical validation can specifically dive into pre-indicated results as well as contextualise their findings. As statistical validation shows a snapshot of what the particular experiment sample takes from the game, the findings of this validation can be placed into the broader context presented with the fit. The cooperation between the prevaluative method of the fit and statistical validation deserves further research.

At the beginning of this study the literal world gripping effects of the release of POKÉMON GO were discussed. The mechanics of walking, searching, and catching that characterised the city model of Pokémon fit well with those the players expected, should Pokémon be real. Since then, dinosaurs to be cloned (JURASSIC WORLD: ALIVE - Ludia 2018), bustable ghosts (GHOSTBUSTERS: WORLD - FourThirtyThree Inc. 2018), and recoverable magical artefacts (HARRY POTTER: WIZARDS UNITE - Niantic 2019) have similarly attempted to impose a fictional city model on our mundane reality. None, however, have achieved the same success as POKÉMON GO. Their mechanics did not fit as well with the expectations of the players as exploring and catching Pokémon. Ultimately, POKÉMON GO proved the

fittest in the battle of survival, even going stronger than ever (Statista 2019; Lavorato 2019). In the changing urban landscape, with technological innovation changing living areas – wisely or not so – the citizen, the scholar, the policy maker, and the player need to be well suited for the rising tide of urban games. The fit as metric is sure to provide some cleverly tailored – dare we say ‘fitting’ – responses.

Appendix 1 – Translating City Models through Values into Game Design

A concept as complex as the city, even when modelled, does not directly translate to game design characteristics. As city models are based on implicit assumptions, it is these assumptions that get translated. Implicit assumptions arise from values that are attributed to the city. Mary Flanagan and Helen Nissenbaum define values as "properties of things and states of affairs that we care about and strive to attain" not just for ourselves, but as a common good, although sometimes too abstract to be achieved, such as world peace, good health, or equality (2014, 5). Flanagan and Nissenbaum have charted, added, and assessed values in videogames. Their explanation underlies the translation of concepts like the city into game design.

Flanagan and Nissenbaum's approach to values imagines values as perceived characteristics of objects or events, and not as ontological identifiers. They argue that "conscientious designers have the power to shape players' engagement with (…) values" (Flanagan and Nissenbaum 2014, xii). However, they also stress that "values embedded in games are not 'arbitrary' (to use McLuhan's term) but rather a matter for careful consideration" and that ultimately it should be understood that designs "create constraints that define the range of plausible interpretations within a game" (Flanagan and Nissenbaum 2014, 16). For conscientious designers then the choices they make to convey the values are conscious and focused on influence, but ultimately, they only function as constraints and signifiers to affordances. Players, again, can appropriate these affordances and thereby interpret or discover their own values.

Aspects in the design process of the whole game – product, campaign, packaging, etc – can be formative for the communicated values. The prime influence on the values can be found in the design phase in the formation of four elements:

1. Key actors: The people involved in creating the game.[73]

2. Fictional description: The explicit statement describing the game.

3. Societal input: Cultural contexts, standards, and other external factors bearing upon the game.

[73] The key actors discussed by Flanagan and Nissenbaum are solely related to the design phase of the game. In this case this means mostly the game designers and producers; the player only has a say in the creation of the values if the design includes an iterative interactive playtest loop with focus groups of playtesters (Fullerton 2014, 15) or if the designers design for, what game scholar Espen Aarseth calls, an "implied player" (2014, 184). This player is a construct that details "the role made for the player by the game, a set of expectations that the player must fulfil for the game to 'exercise its effect'" (ibidem).

4. Technical constraints: The software, hardware, and other game elements that together constitute the game (Flanagan and Nissenbaum 2014, 80)

Although a comprehensive list, Flanagan and Nissenbaum ignore the capacities of the game itself; player appropriation. A distinction can arise from their identification of technological constraints. The actions the player can perform can however also attribute values. While actions like sliding a meter does not necessarily carry value (the value comes from the meaning of the slider), if the mechanics of an urban game revolve around social interaction or urban exploration, then the required actions do attribute values to the players' activities. Still, this would mean not only the designed actions, but also those the players appropriate. The actions the players should perform then have to be carefully designed to convey the proper values. Not every form of play or interaction then suits a specific value. Therefore, possible player actions should be included as value communicator.

Values in games are determined by the key actors, the fictional description, the societal influence, mechanics, the technical constraints, and required mechanics, but can the self-same elements translate into a city model? As outlined before, based on the characteristics of a model, the city model consists of a specified city aspect, an underlying ideology along which this aspect should be addressed, a prescription of ideal citizen behaviour, a communicator, and a channel for discourse.

Key actors have values that they want to shape the city around. The values that make up the city model in CITYONE are determined by the key actor of IBM, whose corporate agenda will be expressed. They can make this happen by relying on the discursive construction of urban anecdotes or narratives. The fictional description then is one of the main aspects of a city model to shape the formative values. Using words like optimize, industries, revenues, profit goals, business process management, and budget, CITYONE is described in a fiction that revolves around corporate efficiency, profit, and optimal business conduct. It presents a specific ideology mostly focused on corporate benefit. The statement describing the city and the ideology behind it convey the main attributed values.

As a city model is enmeshed with views on society, the societal input, or more aptly described as the societal influence, can also be considered formative for city model values. Usually the city models draw upon certain contexts, assumptions, or current events to model a city and add positive value to a particular manifestation. For CITYONE, the societal influence is selectively chosen, picking only those elements that are valuable for IBM – choosing profit goals instead of employment equality for instance.

Finally, technological constraints determine values as well as specific actions that are linked to the user. Seen as constraints, technological formation can be seen as the main instigator of values. IBM's simple web-based game with sliders makes the carrier and possible actions severely restrict what actions count as valuable. Finding the perfect balance is business process management that yields most profit creates a city model that values obedient consumers that function in a well-oiled urban corporate machine. As

such, both the technology and the suggested citizen actions both convey values as they can either facilitate or constrain the actions requested from the user.

As shown, values as occurring in games show similarities to the categories that form a city model. Several interpretation steps show that the city model can be designed into games by approaching them as values. With this assumption discussed, we can dive back into the city model as important heuristic for urban games.

Appendix 2 – Academic Positioning of the City Model

In chapter two the new concept of the City Model is introduced. This is a novel approach to describe and model the city. However, this is not the only modelling approach to the city. Several comparable concepts were investigated and emulated when designing the city model. As the purpose of this thesis is on the introduction of the fit and its action space analysis, the complete history of the city model is of less relevance. For the sake of completeness, here the considerations into the selection of a new concept over an existing one is dealt with in detail. We will discuss the differentiation of the city model from the concepts of 'notions of cities' and 'city branding'.

Notions of Cities

The city model is mainly a generalisation of what Shahed Khan and Atiq Uz Zaman call "notions of cities" (2018, 218). They define their notions as "promoting distinctive features defined by their urban form, political and economic set up, social and cultural aspects, and environmental and technological aspects" (ibidem). Notions are formed on the basis of that "the underpinning shared value or purpose of all cities is founded on the prime objective of delivering optimum and most desirable urban experiences to its citizens" (2018, 218). This idealistic and broader concept is assessed by focusing on how societal circumstances and project shape the city. Focusing solely on empirical domains contained in the city, notions of cities have a strong reflective and critical dimension, but lack the multiplicity as well as citizen-inclusion of city models.

Through their multiplicity, the city model acknowledges that "[the urban] is always coproduced and transformed through its users, who may strive to appropriate its actualized or unrealized potentials towards collective social uses" (Brenner and Schmid 2015, 177), giving the citizens the capacity to critically engage with the communicated models as well. Something the notion of cities leave too indebted to empirical factors. Realising that citizens can use the empirical means available to create their own model undermines the empirically rooted notions of cities.

The inclusion of the citizen in the discussion of the approach to a city can be illustrated using historical examples. Peter Hall, Eduardo Pérez and Simon Levy in their book *Cities of Tomorrow* explain that in the post-war era visions of cities did not manifest right away but only later when they were appropriated by parties who used the visions for their own unique purposes. Hall et al. argue that "world's cities, in the years since World War Two, can be traced back to the ideas of a few visionaries who lived and wrote long ago, often almost ignored and largely rejected by their contemporaries," such as those by Le

Corbusier (P. Hall, Pérez, and Levy 2014, 2). While as a notion of cities, Le Corbusier's ideas might well imagine the best possible state for the citizen, but as a model, these city visions were not delimited and instead were "not merely an alternative built form, but an alternative society," offering a whole new description of life propagated by a single visionary carrier (P. Hall, Pérez, and Levy 2014, 3). Such a singular vision does not mix well with the implicitly handled models of the executives or citizens, who only after appropriation, dealt with the suggested vision.

While this reflection on historical architecture can be useful for critical purposes, this is not to say that city models cannot be extreme or one sided. Dario Goodwin in an analysis of CITIES: SKYLINES (Colossal Order 2015) – a city simulation game – argues that "CITIES: SKYLINES is as stripped down and streamlined an articulation of urban philosophy as Le Corbusier's Ville Radieuse or the New Urbanists' models(2015). Literally played from a top down perspective, this game bows to the singular vision of Le Corbusier, focusing on the layout of a city, instead of the specific spread of buildings. The game is won through building connected yet separated villages that ultimately give the inhabitants more money and possessions, which results in happiness. Any consideration of nature, architectural appeal, or social cohesion are instrumental to this. City models can thus be considerably one-sides as well, yet accepting this model as just that – a one-sided view – make it can be comparable and open to retort through appropriations. The acceptance of alternatives makes city models more suited to the appropriative nature of games than the induction of notions of cities.

Notions of cities can include a variety of takes on the city that can serve reflective purposes due to its empirical roots. Yet they do not systematically account for the differences and on which ground they occur. Due to this lack of attention to the agent forming the notion important comparison notes are missed. Justin McGuirk in his book *Radical Cities* explains the Latin-American response to failures in Western urban planning. Architect John Turner introduced an alternative to utopian planning visions of social housing in many Latin American countries. McGuirk explains that "Turner proposed that it was actually an advantage for the poor to build their own homes" (2014, 10). Despite many military dictatorships investing heavily in social housing, the top down strategies were heading to "pure architecture, to form without utopia; in the best cases, to sublime uselessness" (idem, 14). While a civilizing force to the outside world, these new developed city models were not liveable. Instead, later generations of architects followed Turner and started to base their city models on the informal networks and logics existing in slums. They took what was already there and made it more organised or sustainable with top down aid. This way a high-rise apartment building could become a micro neighbourhood in Torre David or isolated city parts were connected to the city through Bus Rapid Transit systems in Curitiba. Instead of imposing empirical notions, the radical solutions embraced different models in order to reconcile them through informal links.

An example of this can be found in the Urban Think Tank game – or playful experience – EMPOWER SHACK (Urban Think Tank 2013). Originally designed for the South African housing market, Empower

Shack is an answer to a housing crisis. Too high prices lock a large portion of the population out of the housing market while the arising slum housing risks unhealthy situations and is only met with ineffective governmental campaigns that still makes houses too expensive and does not accommodate different kinds of families. With a new architectural model using low cost materials and always built around a 'sanitation core,' for access to bathroom facilities, the Empower Shack offers a currently effective alternative. What makes this approach stand out from the city model presented in CITIES: SKYLINES is that is based on "preferential city-making', the user can input individual and community needs along with municipal planning frameworks" (Block 2017). Instead of seeing the city as a top down tweakable aesthetic money-making machine, Empower Shack sees cities as building ground that is rife with stories, expectations and preferences. Instead of a single player god perspective, empower shack thrives on participation, community feedback, and dense, vertical building. Making use of the logic of the slums that McGuirk writes so highly about, Empower Shack ensures that the prefab houses built fit the parameters and history set out by the players beforehand. This creates more successful, affordable, and liveable housing, but, granted, it would severely limit the player of CITIES: SKYLINES if their God-Player had to listen to every single citizen story. Great visions for marketing purposes versus bottom up liveability can then lay bare the conflicting stakes in land control and building regulations. Such a better understanding gained through the city model characteristics can streamline conversations and negotiations through better understanding of stakeholders, by taking their models into account instead of a singular notion that is supposedly the best.

City Branding

The city model further stands out through its focus on implicit expectations that are designed into games. As such, it stands apart from the associated term of city branding in that it includes looking at implicit values contained in a product instead of just the explicit ideal interactions. Sarah Banet-Weiser explains that a brand is an intersection between a product, the marketing of it, and the consumer, and that branding "impacts the way we understand who we are, how we organize ourselves in the world, what stories we tell ourselves about ourselves" (2012, 5). Branding then is a very explicit approach to the city, whose in-your-face nature is a necessity for retention. City models relate more to the implicit assumptions, values, and ideology that form a city, which can be used as marketing ploy but ultimately are more universally evocable. A city brand is based on a city model and has to compete with the models of consumers. By instead addressing this implicit and underlying partial model, city branding is a form the city model is poured into, just as urban games are another.

City models go beyond the "imagined consensus of its citizens" that is formative for brands (Banet-Weiser 2012, 108). While certain models obviously thrive on civic obedience, city models allow for the scrutiny of the flexibility of interpretation afforded, instead of just the communication of desired values.

By going against imagined consensus, the city model can lay bare and assess the key actors in approaches to cities. Depending on the particular model, the citizen can be seen as a radical agent or as a cooperative cog in the machine. Eric Gordon and Stephen Walter explain a trade-off between rigid 'good user' structures and 'meaningful inefficiencies' (2016). Rigid ideas on the good user are "based on normative structures of citizenship that situate the user solely within abstracted procedures (…)" and "are necessarily articulated outside of any other modes of social integration (…) that might otherwise compose political and civic identities" (Gordon and Walter 2016, 247). Ideal citizen behaviour is then, bluntly put, 'following the rules,' regardless of the kind of citizen you are, to ensure technological efficiency. Alternatively, Gordon and Walter argue for the acceptance of "meaningful inefficiencies," which "temporarily halt normal civic processes and create a delineated time or place in which play, disorder, messiness, and the ability to experiment and fail safely are utilized in productive—though not necessarily practical—ways" (2016, 253). By embracing this messier perspective on civic behaviour the city model is less singular in its possible effects, in that it does not focus solely on desired behaviour. Instead it is more epistemological in that it offers the means to see the role of multiple forms of engagements.

We argue that city models are ingrained in every action somehow taking place in the city. Understanding even the most everyday actions from this perspective can introduce less conventional approaches to city life. An example would be the playful action of *dérive,* introduced by Flemish Situationist Guy Debord, which is when "one or more persons during a certain period drop their relations, their work and leisure activities, and all their other usual motives for movement and action, and let themselves be drawn by the attractions of the terrain and the encounters they find there" (Debord 1958). Such an everyday practice of walking then becomes a means to let go of any city model the walker had, and instead see an inherently embedded city model built into the city by hitching onto streams of emotion. The group Debord was part of, the Situationists, called this psychogeography: "the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals" (ibidem). The dérive provides no other function than the reflection on the city for the walker. The experience will not impact on the larger functioning of the city, nor will it be marketable. It is a wholly individual take on the city. Exactly these individual actions are not addressed by existing approaches to cities, whereas the city model, due to its implicit and citizen focus, allows for the understanding of these. While larger city models (more akin to notions of cities) do arise from these actions, as seen in Constant Nieuwenhuys,' a fellow Situationist, city idea that was founded on a principle of play. Instead of thriving on spectacle and efficiency to spur consumption, his city was founded on 'disconvenience:' play around with efficient means to use them in completely new ways (Sadler 2001, 11). The dérive is a means to this end but ultimately these city models remained so vague and open that they never were adopted. Regardless, actions with high interpretability should not be

disregarded because they are not part of a master plan or are marginally important to the larger city functioning.[74] It is exactly these actions that can make games either fit their goal or not.

The city model differs from existing approaches to the cities mostly in that it includes the citizen in the consideration of its formation, focusing on implicit assumptions that mirror through more actions than just explicit and calculated ones, and thus can take many different shapes. This allows the city model to offer a more granulated vocabulary on which to compare takes on the city in order to make negotiations more level. With its strengths and differences in mind, now we should direct our attention to where to find the city model.

[74] While films fall beyond the scope of this study, the occurrence of city models in films is exemplary for the emotional impact possible through these models in whatever carrier. Patricia Kruth explains how using light, settings, and editing can give two very different interpretations of cities. She explained that films by Woody Allen center on humans in New York, focusing on point of view shots and colours, resulting in a human city. Contrariwise, Martin Scorsese creates a grim, fast paced and noisy city that can be likened to an Asphalt Jungle that swallows its inhabitants (Kruth 1997). The directors of media can use city models to convey a specific interpretation on an emotional level that serves as backdrop. This will not be enough to define a city by but ultimately it does convey what a city, for the moment, could be.

Appendix 3 – Literature Reviewed for monikers of City Model categories

City Moniker	Key Words	Authors	Dimensions
Smart City	Efficiency; Connection; Holistic; Entrepreneurial; Networked; Connected; Perspective	(Hollands 2008; Caragliu, Del Bo, and Nijkamp 2011; Aversano, Raju, and Ballon 2013; Townsend 2013; Deakin 2014; Blom 2015; Albino, Berardi, and Dangelico 2015; Cohen 2015; de Lange 2016; Hajer 2016)	Neighbourhood - City-wide Interacting individuals – Multi-Actor
Intelligent City	Technology; Networked; Democratic; Enabling	(Deakin 2014; Komninos 2014)	Local – Neighbourhood Multi-Actor
Technology Driven City	Technology; Connected; Solutionism; holistic	(Hollands 2008; Greenfield 2013; Morozov 2013; Cohen 2015)	City-wide Multi-Actor
Technology Enabled City	Efficiency; Technology; Participation; Guidance; Governance	(Barber 2013; de Lange 2013; Ampatzidou, Bouw, et al. 2015; Cohen 2015)	Neighbourhood – City-wide Interacting Individuals
Citizen co-Creation Cities	Smart Citizen; Facilitation; Communication; Community; Direct Contact; Experimentation; personal; social	(Landry and Bianchini 1995; de Lange 2013; Hemment and Townsend 2013; Sadoway and Shekhar 2014; Cohen 2015; Ampatzidou, Bouw, et al. 2015; Niederer and Priester 2016; Schouten et al. 2017)	Local – Neighbourhood Interacting Individuals – Multi-Actor
Datapolis	Data; Algorithms; Automisation; surveillance; networking	(Meijer 2015; Khan and Zaman 2018; Handler and Ferrer Conill 2016)	Local – Neighbourhoods – City-wide Individual – interacting individuals – multi-actor (Data is everywhere)
City Governance	Mayors; Facilitating; Regional Scale; Citizen knowledge	(Barber 2013; Greenfield 2013; Gordon and Baldwin-Philippi 2014; Sadoway and Shekhar 2014; Meijer 2015; Cohen 2015)	Neighbourhood – City-wide Interacting Individuals – Multi-Actor
Hackable City	Hacking; Citymaking; Facilitating; Enabling; Ownership; social	(Ampatzidou, Bouw, et al. 2015; Sicart 2016; Schouten et al. 2017)	Local – Neighbourhood Single Actor – Interacting Individuals
Creative City	Educative; Exemplary; Entrepreneurial; Social; place	(Landry and Bianchini 1995; Florida 2005)	Local – Neighbourhood Single Actor
Playful (Expressive) City	Appropriation; Enjoyment; Community; Interaction; Experimentation; personal; place	(Borden 2007; Alfrink 2014; de Lange 2015; Sicart 2016)	Local – Neighbourhood Single Actor – Interacting Individual
Modernist City	Readable. Educative; Imposed; Avant Garde; City Planning; City making	(Lynch 1975; de Certeau 1984; Berman 1988; P. Hall, Pérez, and Levy 2014)	Neighbourhood – City-wide Single Actor
Urban Space	Community, Street life; personal; place	(J. Jacobs 1992; Lévesque 2013; Dourish 2006; Harrison and Dourish 1996)	Local – Neighbourhood Interacting Individuals – Multi-Actor
Radical City	Bottom Up; Networking; Communication; Building on existing; local; community; social	(McGuirk 2014; Aversano, Raju, and Ballon 2013; Neustaedter, Tang, and Judge 2013)	Local - Neighbourhood Multi-Actor
Mobile City	Pervasive; technology; hybrid; tuning; expression; appropriation; ownership	(Coyne 2010; de Souza e Silva and Frith 2012; de Lange and de Waal 2013)	Local Single actor
Future Cities	Different Foci; Build on existing; Compromises; untameable cities; unplayable cities; educative; planning	(McGuirk 2014; Hajer 2016; Sicart 2016; Khan and Zaman 2018)	Neighbourhoods – City-wide Single Actor – Interacting Individuals

Table 37 Literature Review Results of publications on city models. Significant monikers were distilled, linked to their key concepts, and positioned on the Area of Effect and Involved Actor axes. This overview serves to identify the most suitable monikers for the general city model categories. Relevant terms were selected on the basis of them clearly positioning them on the extremes of the axes of distinction. Source: Author creation

Appendix 4 – Inventory of afforded loops and metagames, reconstructed city models, and relations to the pursued city model in GEOCACHING

In the reverse engineering of GEOCACHING the affordances of the game were charted as loops and metagames and grouped according to loop groups. Collection 16 shows the full overview of the afforded interaction possibilities of GEOCACHING.

Core Loop	Secondary Loops	Informational Metagame	Fictional Metagame	Economical Metagame	Performative Metagame	Contextual Metagame
Caching *(Select – Navigate – Search – Log)*	**Exploration:** Selecting itinerary – select first – navigate – search - log – select next	Knowledge of the city and the locations and game customs	Narratives of the spaces visited	Indebted to premium. Individual symbolic fun or actual environmental role	Secretive yet physical presence as formative	The physical context is the main appeal of the loop. Reinvigorate local.
Caching	**Exercise**: Selecting itinerary – select first – navigate – search - log – select next	Game customs to speed the finding	Player added narrative of fitness	Focused on individual symbolic fun.	Secretive yet physical presence	The distance is the most important element.
Caching	**Social:** Divide Roles - Select – Navigate – Interact – Search – Log	Game Customs shaping social activities	Player added narratives	Individuals symbolic fun with optional actual action	Exclusivity is attraction, now made physical	The interaction becomes more important than the find. Reinvigorate local.
Caching	**Tracking:** Select New Cache – Check Logbook – Navigate – Search – Log – Collect	Player profiles as information and goal	Player added narratives of achievements	Very indebted to premium. Individual symbolic interaction	Display findings online for own profile status	Context mostly relevant online, through external rewards
Caching	**Comment:** Select – Navigate – Search – Log – Comment	Player and cache profiles	Player added narratives of the process	Symbolic fun for multiple individuals	Explicitly show knowledge or own interaction with caches	Context mostly relevant online in own community

Caching	**Trackable:** Select – Navigate – Search – Take Trackable – Log Cache – Log Trackable – Move Trackable	Game customs, knowledge of city, online community and profiles	Trackable Narrative can be online, player made, or trackable dependent	Symbolic interaction for multiple individuals	Action shared explicitly online and profile showcase	Physical element with online influences and tasks
Caching	**Maintenance**: Select – Navigate – Search – Log – Read Comments – Maintain	Game customs, online community	Player added narratives	Individual and public actual action	Online visible responsibility	Action to maintain resignified context.
Hiding *(Make Cache - Find Place - Find GPS– Description - Log – Maintain)*	**Elaborate**: Make custom cache(s) – find place(s) – determine GPS coordinates – Guide player in Description – Log – Maintain	Game customs and considerable knowledge of space	Location narratives and narratives of cache	Indebted to Premium. Individual Symbolic fun and actual interaction of attention	Display of skill in hiding. Giving something back. Challenging other players.	Have to consider safety and accessibility. Can be a personal statement. Reinvigorate local
Hiding	**Kairos**: Make a Cache – Find teachable place – determine GPS coordinates – Add educational description – log – maintain	Specific attention to space and reliant on customs	Narrative of cache is essential to message	Public actual interaction in the form of teaching	Challenging other players. Orchestrated experience	Context of discovery is main element for Kairos
Hiding	**Digital Expression**: Make cache – Determine Places of expression GPS – Hide Caches – Description - log - maintain	Players profiles as a showcase. Game customs	Player added narratives as form of expression	Symbolic interaction for multiple individuals	Performative situation in online environment	Physical location is taken into account for expressive effects
Hiding	**Physical Expression**: Make Cache – Find Relevant place – GPS – write associated description – Log - Maintain	Knowledge of place to dress it up. Game customs.	Spatial narratives as form of expression	Indebted to Premium. Actual interaction for individual as well public benefit through attention	Performative action with physical repercussions	The context of hiding and discovery is a personal expression

Collection 16 Overview of afforded interactions in GEOCACHING, grouped according to their loops and metagames. Each row corresponds to a loop group of core loop and secondary loop that only occur under the conditions set by the metagames. This collection should thus be read row by row. The signified loop group is presented in yellow. Source: Author creation

The afforded loop groups are to be translated into city model characteristics. The complete collection of the different afforded city models can be found in the rows of Collection 17.

Loop Group	Instigators	Ideology	City Aspect	Carrier	Citizen Actions
Caching+ Tracking	Cachers, Hiders, and Community	Striving for more achievement (not necessarily city related)	City as resource or arena	Online Tracking and community	Get the most and the best to showcase your skill
Caching+ Exploration	Cachers and Hiders	City as one big treasure map full of stories; Cache in, Trash Out	Historical and meaningul city	Phone and visited places	Reinvigorate a space for yourself by looking and uncovering secrets
Caching+ Exercise	Cachers	Giving a new appeal to the practice of walking	City as your personal gym	Phone, minimally	Walking is essential, although now enhanced and structured by phone
Caching+ Comment	Caching, Hiders, Groundspeak	Experience the search together	Communal virtual engagement outside of city	Online interaction (computer or app)	Explicitly show expertise and be complicit in improvement
Caching+ Social	Groups of cachers	Game as social facilitator; shaping social action	Personal and shared experience of the city	Other players more so than phone	Social interaction is key; structured around minor pointers
Caching+ Trackable	Players, Hiders, Groundspeak, Sponsors	Deeper investment through shared interaction with objects	City as distance resource; globally connected through caches and network	Online community, trackable	Travel with trackable; gather as many; make plans for engagement
Caching+ Maintenance	Hiders, Groundspeak, Players	Communal maintenance and responsibility	Physical counterpart of online interaction	Caches, Online Community	Maintain cache and take responsibility for something not yours
Hiding+ Elaborate	Hiders	Create complex challenges for community; give back	Challenging others through setting; acout cache or place more than city	Cache	Challenge; Altruism; Creativity
Hiding+ Kairos	Hiders, Educational Instance, Tourism	Educate players through scavenging	Explicitly give targeted information at the right context	Cache; Description; Place	Create a route with information to create experience/lesson
Hiding+ Virtual Expression	Hider	Display knowledge of community through meta interaction	Online and digital layer get appropriated	Community, app, map, online environment	Display intricate knowledge of space or carrier; 'playing the interface'
Hiding+ Physical Expression	Hider, Community	Share something personal for public enjoyment/betterment	Personal narrative and expression attribution to space	Place; App; Description	Enhance locality by showing new place; personal expression; creativity

Collection 17 The reconstructed afforded city models of GEOCACHING. Each loop group row shows the characteristics of an afforded city model. The pursued city model is represented in yellow.

To quantify and qualify the fit of the afforded city models and the pursued city model, the formative elements of each loop group has to be compared to those of the pursued city model. If they match – completely, partially, or not at all – the fit value will change, as will the type of fit. The matches are shown in Table 38.

Loop Group	Loops	Informational	Fictional	Economic	Performative	Contextual
Exploration						
Exercise						
Social						
Comment						
Trackable						
Maintenance						
Elaborate						
Kairos						
Digital Expression						
Physical Expression						

Table 38 Overview of matches between the pursued city model and the afforded city models in GEOCACHING. Red stands for mismatch, yellow for partial match, and green for full match. The type of match has consequences for the quantification and qualification of the fit. Source: Author creation

Appendix 5 – Inventory of afforded loops and metagames, reconstructed city models, and relations to the pursued city model in ONTDEK OVERVECHT

In the reverse engineering of ONTDEK OVERVECHT the affordances of the game were charted as loops and metagames and grouped according to loop groups. Collection 18 shows the full overview of the afforded interaction possibilities of ONTDEK OVERVECHT.

Core Loop	Secondary Loop	Informational MG	Fictional MG	Economic MG	Performative MG	Contextual MG
Win (pick a neighbourhood, pick a challenge, *pitch your neighbourhood*, vote for best options)	**New Initiative** (pick neighbourhood, pick a challenge, create new initiative, it, vote best options)	Knowledge of Neighbourhood and strong initiatives	Dependent on the Challenge. Solutionist. Stress initiative beneftis	Private Symbolic with room for Public Actual	Pitch to win	Solutions can be general. Less tactile than the rest. Still have to count as logical solution
Win	**New Challenge** (pick neighbourhood, pick challenge your neighbourhood excells at, pitch solution, vote best options)	Knowledge of Neighbourhood and meta challenges that can be won	Specific Spin on Challenge. Completely laid out road by deciding the playing ground	Private Symbolic	Pitch to win	Solutions can be general. Less tactile than the rest. Fill in the gaps created by player
Win	**Connecting** (pick neighbourhood, pick challenge, pitch solutions by connecting different neighbourhoods, vote best options)	Knowledge of broader neighbourhood. Shared challenges	Inclusionist narrative. Shared interaction	Public Symbolic and Actual	Pitch to win, but open to others	Solutions can be general. Requires partners

Win	**Neighbourhood** (pick a neighbourhood you are familiar with, pick a challenge your neighbourhood excells at, pitch your solutions you've worked on, vote for best options)	Knowledge of Specific holistic Neighbourhood	Perfectionist. Show neighbourhood as best	Private Symbolic	Pitch to Win. Highly idealistic	Solutions are specific but possibly idealistic
Win	**Reflection** (pick a neighbourhood you are familiar with, pick a challenge, Pitch any missing initiative in your neighbourhood, vote for best options)	Intricate knowledge of specific neighbourhood	Completionist. Expertise	Public Actual	Pitch to Win. Complete knowledge	Specific solutions. Knowledge imbalance.
Ask (pick a neighbourhood, *pick a challenge*, pitch your neighbourhood, vote for best options)	**New Challenge** (pick a neighbourhood, introduce a pressing challenge, collect initiatives, vote for best options)	Knowledge of what is plaguing own neighbourhood. Recognition	Challenge determined	Public Actual	Receptive to other pitches	Specific Challenge Player searches for answers
Ask	**Connecting** (pick a neighbourhood, pick a challenge, pitch connections as a solution, vote for best options)	Knowledge of missing links. Recognition	Narrative of cooperation	Public Actual	Convince others of working together to supply own . Appropriation	More general solutions. Player searches for bonds
Ask	**Neighbourhood** (pick a neighbourhood, identify challenges of neighbourhood, collect initiatives, vote for best options)	Intricate knowledge of specific neighbourhood. Recognition	Neighbourhood with clear challenges in need of solutions	Public Actual	Receptive to other pitches. Clear idea of challenges	Local Challenges
Ask	**Reflection** (pick a neighbourhood, pick a challenge, collect initiatives, vote for best options, suggest alterations to address challenge in the future)	Conviction of missing elements. Recognition	Facilitating future narratives	Private and Public Actual	Make the addition to neighbourhood seem necessary	Suggestion for future use. Player needs to be invested in neighbourhood
Solve (*pick a neighbourhood*, pick a challenge, pitch	**New Initiative** (pick a neighbourhood, pick a challenge, introduce new initiatives,	Previous knowledge and initiatives	Introduce new initiatives as solution	Private and Public Actual	Pitch in order to introduce	Player needs expertise in area. Local solutions. Plausible

your neighbourhood, vote for best options)	pitch initiatives, vote for best options)					
Solve	**Connecting** (pick a neighbourhood, pick a challenge, pitch initiatives based on cooperation, vote for best options)	Knowledge of broad initiatives	Cooperation as the solution	Public Actual	Outside the box thinking. Actively looking for links	Expertise Required. Requires connections
Solve	**Neighbourhood** (pick a neighbourhood, pick a challenge, pitch plan for whole neighbourhood, vote for best options)	Holistic Plan for the neighbourhood	Current initiatives as best option	Private and Public Actual	Pitching has to be convincing in order to introduce solution	Solutions are local and implementable. Player has personal stake
Solve	Reflection (pick a neighbourhood, pick a challenge, pitch plan for whole neighbourhood, vote for best options)	Missing Links	Essential missed elements that are needed	Private and Public Actual	Pitching to convince others of legitimacy	Solutions have to be exemplary

Collection 18 Overview of afforded interactions in ONTDEK OVERCHT, grouped according to their loops and metagames. Each row corresponds to a loop group of core loop and secondary loop that only occur under the conditions set by the metagames. This collection should thus be read row by row. Most of them are focused on engaging with the challenges, either inquisitively or expressively, but some loop groups stress the playing of the game itself. The signified loop group is presented in yellow. Source: Author creation

The afforded loop groups are to be translated into characteristics. The collection of all afforded city models can be found in the rows of Collection 19.

Loop Group	Instigators	Ideology	City Aspect	Carrier	Citizen Actions
Win + Initiative	Player Focused	Winning over all	City in general as resource to win	Communication of Ideas	Create a winning pitch – does not have to be real
Win + Challenge	Player Focused	Winning over all	City in general as resource to win	Communication of Ideas	Create a winning solution – does not have to be real
Win + Connecting	Multiplayer	Cooperate to win	City domains as means to win	Communication of Ideas	Winning solution, but open to others and reality
Win + Neighbourhood	Player focused	Territorial favourites	Single neighbourhood	Communication of System	Make neighbourhood exemplary. Location specific and idealistic
Win + Reflection	Player Focused	Completion by Example	Single neighbourhood	Communication of ideas	Create a winning pitch. Location specific. Display Mastery
Ask + Challenge	Players, Experts	Engage expert help and aid from others	Specific Local problem	Communication. Physical Gameboard showing solution	Looking for answers to specific problem
Ask + Connecting	Player, other players, experts	Connections and cooperation as road to solution	Challenge as superceding specific locale	Physical gameboard shows relations. Communication based	Focus on cooperation for solutions. Collect partners
Ask + Neighbourhood	Player, other players, experts	Neighbourhood can be grasped through own challenges	Neighbourhood as isolated challenge zone	Communication. Physical Gameboard showing solution	Inventory solutions to list of local challenges
Ask + Reflection	Players, Game Masters	Challenges inadequately addressed currently	Specific Neighbourhood	Communication. Physical Gameboard as target	Ensure increased and more focused attention in future
Solve + Initiative	Expert players	Existing solution as answer	From local to city-wide	Communication. Physical Gameboard showing solution	Pitch own existing solution as answer – has to be real
Solve + Connecting	Expert Players, other players	Own initiative as answer, yet requires broad base	From local to city-wide	Communication. Physical Gameboard showing connections	Seek cooperation for your existing initiative
Solve + Neighbourhood	Experts	Holistic Plan as the solution	Whole neighbourhood	Communication. Physical Gameboard showing solution	Existing plans presentation to reinvigorate the neighbourhood
Solve + Reflection	Experts	Existing Plan is the solution	From local to city-wide	Communication. Physical Gameboard showing solution	Using own initiatives to fill in the map for the future. Be put on the map

Collection 19 The reconstructed afforded city models of ONTDEK OVERVECHT. Each loop group row shows the characteristics of an afforded city model. The pursued city model is represented in yellow. Source: Author creation

To quantify and qualify the fit of the afforded city models and the pursued city model, the formative elements of each loop group has to be compared to those of the pursued city model. If they match – completely, partially, or not at all – the fit value will change, as will the type of fit. The matches are shown in Table 39

Loop Group	Loops	Informational	Fictional	Economic	Performative	Contextual
Win + Challenge						
Win + Connecting						
Win + Neighbourhood						
Win + Reflection						
Ask + Challenge						
Ask + Connecting						
Ask + Neighbourhood						
Ask + Reflection						
Solve + Initiative						
Solve + Connecting						
Solve + Neighbourhood						
Solve + Reflection						

Table 39 Overview of matches between the pursued city model and the afforded city models in ONTDEK OVERVECHT. Red stands for mismatch, yellow for partial match, and green for full match. The type of match has consequences for the quantification and qualification of the fit. Source: Author creation.

Appendix 6 – Inventory of afforded loops and metagames, reconstructed city models, and relations to the pursued city model in CITIES: SKYLINES

In the reverse engineering of CITIES: SKYLINES the affordances of the game were charted as loops and metagames and grouped according to loop groups. Table 20 shows the full overview of the afforded interaction possibilities of CITIES: SKYLINES.

Core Loop	Secondary Loop	Informational	Fictional	Economic	Performative	Contextual
Build (Infrastructure, Zoning, public service, public transport, leisure, wait)	**Existing** (Explore Existing parameters, Infrastructure, Zoning, public service, public transport, leisure)	City Dimensions	Personal motivation; grounded in reality	Private symbolic	Test of skill	Pursued Ideal. Clear frame of reference
Build	**Sandbox** (Infrastructure, Zoning, public service, public transport, leisure, destroy, rebuild)	Minimal control of mechanics	Player stories	Private Symbolic	Experimentation	Open to interpretation
Build	**Freeway Fetish** (Optimise Infrastructure, feedback from parameters, share)	Existing Traffic Loops; Community	Community preferences	Private and Public Symbolic	Showing off creation	Very limited approach. Creativity or Reality
Build	**Profit** (Optimise Infrastructure, Zoning, public service, public transport, leisure, wait)	Intricate Game systems	Efficiency and Money are key	Private Symbolic	Beating the System	Regardless of locality. It has to work
Build	**Happiness** (Infrastructure, Zoning, public service, public transport, leisure, Feedback Citizens)	Intricate game systems	Citizens are the measure of success	Public Symbolic	Beating the System	Regardless of locality.
Build	**Modded** (Import mods, Infrastructure, Zoning, public service, public transport, leisure, wait)	Existing Mods	Something missing. Either fictional or mechanical	Public Symbolic	Bending the System	Frame of reference. Can be game or personal

Model (Determine Parameters, Topography, Infrastructure, zoning, public service, Public Transport, leisure, read variables, analyse)	**Experiment** (Modelling, Implementing, Executing, analyse values, reset parameters, Retry)	Testing Parameters	Testing of Hypothesis	Private Actual	Flexible Simulations for accessible results	Simulation Scientific Process. General or local
Model	**Participatory** (Modelling, Implementing, Executing, Gather feedback, tweak)	Stakeholder Demands	Avoiding Conflict	Public Actual	Incorporating multiple perspectives	Accessible Multiple Stakeholders. Often local
Model	**Tweak** (Mod to tweak conditions, Modelling, Implementing, Executing, Analysing)	C# Knowledge; Required Parameters	Something missing for accuracy	Public Actual; dependent on mods	Improving game for Science	General – suits research
Mod (Import Classes, Programme, Compile)	**Expressive** (Import Classes, Import Objects, Programme Tweaks, Compile)	C# Knowledge;	Player Stories	Private and Public Symbolic	Show off skill or humour	Personal but general
Mod	**Contribute** (Import Classes, Determine Parameters of existing object, Import or Design object, Programme Tweaks, Compile)	C# Knowledge; Community	Community interaction	Private and Public Symbolic Playbour	Giving back	General. Community embedding
Mod	**Existing** (Import Classes, Determine missing Elements, Programme Tweaks, Compile)	C# Knowledge; real world counterpart	Personal contribution	Private and Public Symbolic Playbour	Show off skill	Local
Mod	**Realism** (Import Classes, programme conditions, Compile scenario, upload)	C# Knowledge; real world counterpart	Something missing	Private and Public Symbolic Playbour	Show off skill; against the system	Local or general
Mod	**Scenario** (Import Classes, programme alternative game states, Compile modifier, upload)	C# Knowledge; Intricate Game Systems	Tellable stories	Private and Public Symbolic Playbour	Challenge others; Show off skill	Meta. Higher intimacy with the game
Mod	**Modifiers** (Import Classes, programme, Compile, upload source code)	C# Knowledge; Intricate Game Systems	Playing God	Private and Public Symbolic Playbour	Change experience; giving back; challenge others	Meta. Higher intimacy with the game

Collection 20 Overview of afforded interactions in CITIES: SKYLINES, grouped according to their loops and metagames. Each row corresponds to a loop group of core loop and secondary loop that only occur under the conditions set by the metagames. This collection should thus be read row by row. The signified loop group is presented in yellow. Source: Author creation.

The afforded loop groups are to be translated into characteristics. The collection of all afforded city models can be found in the rows of Collection 21.

Loop Group	Instigators	Ideology	City Aspect	Carrier	Citizen Actions
Existing Build	Player	Grounded in Reality. City as exemplary	Real world mirror as test of skill	Game, City Reference	Recreate as accurate as possible
Sandbox Build	Player	Complete city building freedom	Anything	Game and Player	Experimentation with City Models; irrespective of place
Freeway Fetish Build	Player, Community	Traffic as most skill-based element	Traffic is King; is where skill is	Traffic Mechanic, Reality reference	External Play with Traffic Focus
Profit Build*(Signified)*	Player	Profit as main goal for cities	The productive Side	Game	Focus on the profitable, regardless of locality or happiness
Happiness Build	Player	Citizen Satisfaction as main goal for cities	The Citizens	Game	Regardless of profit or locality, citizen happiness has to improve. Can be of different scale
Modding Build	Players, Community	Completing a game through own constructions	Missing assets are essential	Game, Community, Workshop, Reality	Complete the ideal city if something is missing. Need a frame of reference
Experiment Modelling	Scholar	Simulations are 'accurate' value testers	Limited to the goal of the study	Game, the study	Trial and Error of specific situation. Scientific process
Participatory Modelling	Scholar, Stakeholders	Accessible UI and interaction prevents conflicts	Limited to the goal of the study	Accessible Interface of Game	Create own version, compare and discuss.
Tweak Modelling	Scholar	More accurate representation of reality	Limited to the goal of the study	Game, community, modifications	Altering and coding the game for research purposes
Expressive Modding	Player	Game and city function as personal canvas	Limit Depending on player fancy	Game, Text Editor,	Indulge in personal expression, subversion, or humor
Contributing Modding	Player and Community	Adding assets as interaction with community	The moddable and visible aspect	Game, Text Editor, Community	Interacting with community comes first.
Existing Modding	Player	Complement Game with local knowledge	Specific asset	Game, Text Editor, Reality	Personal expression
Realism Modding	Player	Complement Game with better details	Specific Asset or whole city	Game, Text Editor, Reality	Improve the game out of own conviction
Scenario Modding	Player, Designers	Creation of rule-based scenarios to complement game	Meta perspective; about interacting with city	Game, Text Editor, Game Menu	Create missing elements for game instead of designers
Perspective Modding	Players	Missing elements or stresses are missing and have to be added	Meta perspective; about interacting with city	Game, Text Editor, Game perspective	Create new, unintended views on the game; highlight missings

Collection 21 The reconstructed afforded city models of CITIES SKYLINES. Each loop group row shows the characteristics of an afforded city model. The pursued city model is represented in yellow. Source: Author creation.

For quantification and qualification, the formative elements of each loop group have to be compared to those of the pursued model. If they match – completely, partially, or not at all – the fit value will change, as will the type of fit. The matches are shown in Table 40.

Loop Group	Loops	Informational	Fictional	Economic	Performative	Contextual
Existing Build						
Sandbox Build						
Freeway Fetish Build						
Happiness Build						
Modding Build						
Experiment Modelling						
Participatory Modelling						
Tweak Modelling						
Expressive Modding						
Contributing Modding						
Existing Modding						
Realism Modding						
Scenario Modding						
Perspective Modding						

Table 40 Overview of matches between the pursued city model and the afforded city models in CITIES: SKYLINES. Red stands for mismatch, yellow for partial match, and green for full match. The type of match has consequences for the quantification and qualification of the fit. Source: Author creation.

Appendix 7 – Inventory of afforded loops and metagames, reconstructed city models, and relations to the pursued city model in POKÉMON GO

In the reverse engineering of POKÉMON GO the affordances of the game were charted as loops and metagames and grouped according to loop groups. Collection 22 Overview of afforded interactions in POKÉMON GO, grouped according to their loops and metagames. Each row corresponds to a loop group of core loop and secondary loop that only occur under the conditions set by the metagames. This collection should thus be read row by row. The signified loop group is presented in yellow shows the full overview of the afforded interaction possibilities of POKÉMON GO.

Core Loop	Secondary Loop	Informational	Fictional	Economical	Performative	Contextual
Catch (walking, encountering, and catching)	**Eggs** (walking, hatching, encountering, and catching)	Which Pokémon in which eggs	Optional Pokémon Stories	Playbour, Private symbolic with corporate stimulus	Physical walking, yet solely on phone	Location (largely) irrelevant. Distance matters
Catch	**Item** (walking, encountering Pokémon or PokéStop, and catching)	Optional Pokémon and Location	Optional Pokémon Stories	Playbour, Private symbolic with corporate shortcut	Physical walking, yet solely on phone	Location relevant only in access to points
Catch	**Lure** (walking, placing lures in social spot, encountering, and catching)	Location insight and PokéStop corridors	Optional Pokémon Stories	Playbour, Public symbolic benefit with corporate backup Public symbolic by staying put in same profitable place	Physically group together to reap in game benefits	Location specific and shared
Catch	**Gather** (Grouping up, walking, encountering, and catching)	Necessary Pokémon Knowledge	Existing Pokémon Stories	Playbour, Public symbolic benefit with corporate backup	Phone facilitated but partly shared interaction. Pokémon Knowledge as skill badge	Location (largely) irrelevant Values on its shared activity

Catch	**Gym** (walking, encountering, and catching, battle in gym)	Game knowledge – strongest Pokémon	Optional Pokémon Stories	Playbour, Private symbolic	Virtual. Display own Pokémon – little visibility. Asynchronous battle	Gym locations essential. Possible team cooperation
Catch	**Photography** (walking, encountering, photographing, and catching)	Sharing sites profile	Pokémon in Real life Space	Playbour, Private symbolic optional public symbolic sharing	Augmented reality by placing Pokémon in world. Internet points	Sharing. AR central – Pokémon Overlay. Technology dependent
Fitness (walking, reach milestone, set new milestone)	**Pokémon** (walking, reach specific Pokémon, set new specific Pokémon)	No added benefit	No added benefit	Playbour, Player Actual benefit	Phone provides milestones	Location Irrelevant
Fitness	**Location** (walking, reach specific location, set new specific location)	Location Knowledge	Player Stories	Playbour, Player Actual benefit	Phone provides route	Location specific, but available everywhere
Exploration (walking, reaching a place, recognising new place, setting new objective)	**Pokémon** (walking, reaching a place home to specific Pokémon, recognising new place, setting new Pokémon place)	Necessary Location Information	Player Stories	Playbour Private symbolic. Dérive like	More aware of city setting. Phone Guided	Phone Centred with Location specific context
Exploration	**Location** (walking, reaching a PokéStop or Gym, recognising new place, setting new PokéStop or Gym)	Necessary Location Information	Necessary Location Stories	Playbour Private-Public Participatory benefit	Public Presence	Phone Centred with Location specific context
Exploration	**Social** (Grouping up, walking, reaching a place, recognising new place, setting new objective)	Organised Activities	Shared narrative to tour	Playbour Private-Public Participatory benefit	Interact with others guided along by game	Location discoverable yet shared activities
Exploration	**Photography** (walking, reaching a place, recognising new place, photographing new place, share, setting new objective)	Photography Skills. Location knowledge Share sites	Player Stories	Playbour Private-Public Participatory benefit	Skill sharing online. Personal display of skill	Shareable online. Location and framing matters. Technology dependent.

Collection 22 Overview of afforded interactions in POKÉMON GO, grouped according to their loops and metagames. Each row corresponds to a loop group of core loop and secondary loop that only occur under the conditions set by the metagames. This collection should thus be read row by row. The signified loop group is presented in yellow. Source: Author creation

The afforded loop groups are to be translated into characteristics. The collection of all afforded city models can be found in the rows of Collection 21.

Loop Group	Instigator	Ideology	Aspect	Carrier	Citizen
Catch + Eggs	Player with Corporate Backing	Citizen invested of content of the game	Virtual layer on the city traversed physically	Distance tracker	Individual phone focused activities throughout random space
Catch + Item	Player with Corporate Backing	Citizen invested of content of the game	Semi-Virtual layer on the city traversed physically	GPS device, Landmarks	Player walking to specific irrelevant locations that can have corporate backing
Catch + Lure	Player Groups with corporate backing	Shared exploitation of in-game locations	Shared appropriated city and in-game space	Phone, GPS, In-Game Landmarks	Appropriating location for in-game purposes, supported by corporate
Catch + Gather	Players together	Shared subscription to the franchise	Virtual layer on the city traversed physically together	Real contact on symbolic topic, phone as facilitator	Familiar with Franchise, now indulging together in physical space (e.g. autists)
Catch + Gym	Singular Players in Player Collective	Competitive Players for virtual good	Specific Landmarks with Virtual Role	Phone, GPS	Battling for glory in asynchronous interaction using provided means
Catch + Photo	Player with possible virtual backup	Augmenting reality by placing franchise in reality	Augmented Reality	AR camera, Real Background	Blending virtual and physical. Possible sharing
Fitness + Pokémon	Player	Physical Health	City as arena	Distance Tracker	Individual Betterment
Fitness + Location	Player	Physical Health	Guided Tour	Landmarks, Distance Tracker	Individual Betterment past landmarks
Exploration + Pokémon	Player	Drift through city	The city as governed by Pokémon	App guided	Following the hints of the app while staying aware of city
Exploration + Location	Player Collectives	Explore the city	App-guided landmarks. Cities as resource	Landmarks; phone information	Explore the stories of the city
Exploration + Social	Individual Players Together	Use App to organise activities	App space as arena or facilitator	App space	Interact with others guided along by game (e.g. dating
Exploration + Photography	Individual Players. Internet collective	Make the best photo and show skill	Space as possible photo background	App Camera; Space	Take great pictures; share online

Collection 23 The reconstructed afforded city models of POKÉMON GO. Each loop group row shows the characteristics of an afforded city model. The pursued city model is represented in yellow. Source: Author creation

For quantification and qualification, the formative elements of each loop group have to be compared to those of the pursued model. If they match – completely, partially, or not at all – the fit value will change, as will the type of fit. The matches are shown in Table 41.

Loop Group	Loops	Informational	Fictional	Economic	Performative	Contextual
Catch + Eggs						
Catch + Lure						
Catch + Gather						
Catch + Gyms						
Catch + Photo						
Fitness + Pokémon						
Fitness + Location						
Exploration + Pokémon						
Exploration + Location						
Exploration + Social						
Exploration + Photography						

Table 41 Overview of matches between the pursued city model and the afforded city models in POKÉMON GO. Red stands for mismatch, yellow for partial match, and green for full match. The type of match has consequences for the quantification and qualification of the fit. Source: Author creation.

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