Mobile persuasive apps: a proceduralist investigation

MA Thesis

University of Utrecht

New Media and Digital Culture

Student: Anne Verheul (3993663)

First reader: Jasper van Vught

Second reader: Imar de Vries

Words: 14431

Date: 10/08/15

Summary

Summary

Mobile devices are said to be the future's primary platform of persuasion as they are very pervasive and extremely widespread. Because a specifically tailored methodology to study the workings and normative characteristics of mobile apps is currently not available, this thesis explores the proceduralist reading as an option. It stems from procedural rhetoric: the art of expression through computational processes, and is used to derive or construct messages for videogames. The proceduralist reading provides a way to investigate the subject's processes and derive what ideas these express. After a comparative exploration between videogames and mobile apps, and a case study on the app *Moves*, I will conclude that the method is a valuable approach for mobile apps, although some differences should be taken into account. Where videogames engage the player in simulations that refer to real-life situations, persuasive apps render representations of personal processes based on tracked data of the user. Both can cause *dissonance gaps*: differences between ideas in the user's mind and those represented, which encourage reflection. Where games often involve a player-character relationship to motivate the player to achieve goals, the user commonly forms the sole subject of mobile persuasive applications. However, some persuasive apps may link avatars to the tracked data that transform according to the behavior of the user. Additionally, although apps don't generate constraint-based simulations like games, procedural constraints play an important role in emphasizing certain aspects of life through a process of selection, translation and representation. Thematic considerations can be used to formally address the evaluation that is expressed by such translation processes. Finally, normative characteristics can be derived from apps in a similar way as from videogames, and attempts can be made to combine these and form meaning derivations: comprehensive messages that can imply ideological framing.

Keywords

Persuasion, mobile media, mobile apps, procedural rhetoric, videogames

Contents

1. Introduction

1.1. Introduction

Technology currently has a more important role in the lives of human beings than it probably ever had in human history. We rely on technologies to communicate with others, navigate through cities, find romantic partners, keep our money safe, promote ourselves online, help us fall asleep at night; the list of practices goes on and on and the end will probably not be reached in any of our lifetimes. Technologies' ubiquity seems to have an effect on human behavior and the way we relate to others. Some technologies have the explicit goal to change human behavior for the better. Such technologies, like automatic speed limiters on cars, apps to help us watch our weight or quit smoking are referred to as *persuasive technologies* (Oinas-Kukkonen and Harjumaa 2008).

Many theorists, developers and designers have hailed such technologies as the perfect solution for common problems like obesity and environmental deterioration (Ana, Del Valle, and Opalach 2010; Oinas-Kukkonen and Harjumaa 2008; Fogg, Cuellar, and Danielson 2009; Simonite 2013). We can recognize such overly positive notions as being part of a *technological imaginary* (Lister et al. 2009). Technological imaginaries regard the hopes, dreams and desires that people in a society may project on technological advances. Such visions are said to play an important role in the creation process of every new medium as a soft element of dreams and desires, rather than hard calculated facts or predictions: 'It is a factor that interplays with actual technological developments, planning and modes of work into which the technology is designed to fit' (Flichy 1999, 34).

On the other hand, some theorists also fear the proliferation of persuasive technologies. Famous writer Evgeny Morozov recognizes a form of *technological solutionism* in our contemporary society: the trend to believe that technologies can solve all our problems, while they seem to only provide short-term solutions that defy the complex issues that underlie these problems (Morozov 2013a, 6). If for example an app tells us exactly what to eat, when to exercise and when to go to

sleep, this might cause us to lose track of *why* we should do these things (Morozov 2013b):

> We have an app that tells us what we have to do but don't know how it is generated. We are told that we should eat broccoli, exercise and all sorts of other things to be a good citizen, but don't have to think for ourselves anymore and don't know what is right and wrong (Morozov 2013b).

However, Peter Paul Verbeek, a Dutch philosopher specialized in the field of technology, argues that the proliferation of any kind of technology simply cannot be avoided, and that it would be pointless to fear, or on the opposite end, hype them. He asserts that technologies are not entirely neutral: 'Technological artifacts are not neutral intermediaries but actively coshape people's being in the world: their perceptions and actions, experience and existence' (Verbeek 2011, 8). And because their presence seems both unavoidable and influential, we should aim to closely study these technologies. This can help to form critique and creates space for debate about how they can be shaped into a desirable form (Verbeek 2014, 26). For this thesis, I will explore how a specific type of persuasive technology can be studied: mobile applications. I have chosen to explore the potential of the proceduralist reading as a method to analyze their workings, normative implications and potential embedded ideologies.

1. 2 Mobile persuasion

B.J. Fogg, an expert in the field of persuasive technologies, refers to the study of persuasive technology as *captology*, as an acronym of 'Computers As Persuasive Technologies' (Fogg, Cuellar, and Danielson 2009). He regards mobile devices as the future's most important persuasive platforms since they are very pervasive, personal and extremely widespread (Fogg et al. 2007). Mobile applications form a relatively novel field as they have only been around since circa 2008, and their potential has yet to be fully discovered. New apps are released into the App Store on a daily basis, competing for the attention of users and the highest number of downloads. In 2013, the counter of Apple's App Store passed 50 billion downloaded

apps and estimated that around 20 billion downloads would occur each following year (Slivka 2015).

Persuasive apps are available for a wide array of purposes, ranging from quitting smoking to calculating the most fertile days for women based on their period cycles. And where most traditional types of software are used in a single environment and in reserved timeslots, mobile apps are available anywhere, anytime. Wearable technologies to accompany them also become more advanced and accurate, such as wristbands that automatically keep track of vital information like heart rate, skin temperature or sleeping patterns (Jawbone 2015). These self-monitoring apps can be seen as part of the *Quantified Self* movement. Kevin Kelly, founding executive editor of *Wired* magazine, proposed this term around 2007, to describe a movement that aims to incorporate technology into data acquisition about aspects of a person's daily life (Kelly 2007).

In the book *Mobile Persuasion: 20 Perspectives on Behavior Change* (Fogg et al. 2007), Fogg has bundled a variety of different takes on mobile persuasion. It touches upon the current state of such technologies, running experiments around behavior change and predictions for the future. Most of the different approaches described in the book are either focused on psychological aspects of persuasion and design strategies to achieve behavioral change: 'Today the formal study of persuasion continues to be advanced, primarily through research in social psychology, which began during the early part of the 1900s' (Bogost 2007, 61; Fogg 2003, 24). In the article 'Mobile Persuasion for Everyday Behavior Change' for example, Sunny Consolvo et al. describe how persuasion on mobile devices can be used to monitor behaviour, draw attention to certain aspects of life and make the user more aware of certain habits and tendencies (Consolvo et al. 2009). The article describes the results of such technologies: what were the effects on users and what ideas can be used from these findings to impose greater influence in new projects? Another article, 'Designing Engaging Mobile Experiences', revolves around strategies that should help to keep users engaged and motivated with mobile applications, similarly to the article 'Mobile Persuasion Design Principles', which denotes a concrete set of guidelines to help achieve behavioural change (Fogg et al. 2007). So most of the articles are focused on the side of the

manufacturer of persuasive technologies, concerned with the psychological and strategic aspect of persuasion. I am, on the other hand, interested in a method that allows to analyze apps based on information that is available by studying the product, that enables to understand its functionality and derive potential normative characteristics it embodies.

I suspect that the field of *procedural rhetoric* will hold valid methodological starting points to be able to study the persuasive power of apps (Bogost 2007, 2). Proceduralism is most common in the field of game studies, where the theory is used to derive the deeper meaning or message from videogames, or to construct such a message while designing them (Bogost 2007, 2). Bogost argues that processes in videogames can give way to ideological framing, which encourages certain interpretations and discourages others: '[...] procedural interaction in the game can imply a particular ideological stance' (Bogost 2006b, 181). A proceduralist reading can help to identify the normative characteristics and bring such ideologies to light by closely studying the processes of the subject.

Processes in videogames define the rule-based behavior of different components, which can form simulations of systems. The popular game *The Sims* (Maxis 2000) for example consists of a wide array of processes that refer to human life, ranging from romantic relationships to finding a job. But these processes are not neutrally represented; they carry normative implications. When a romantically involved *Sim* character is caught cheating for example, the partner will get very upset and the relationship score will be decreased to a minimum: love turns to hate. This is an example of procedural expression that evaluates cheating as something negative. Expressing an idea like this doesn't have to be intentionally persuasive: one could argue whether or not the makers of the Sims explicitly want to condemn promiscuity. But this is not relevant for a proceduralist reading: it is first and foremost an attempt to uncover embedded ideas as they can be deduced from the subject.

I think that proceduralism is not merely valuable for videogames, but can also be relevant for mobile persuasive apps. Because these also have a procedural nature, I expect that a thorough focus on their processes can help to understand them on a deep level, and allow for a critical assessment of their expression. Just

like videogames they may, intentionally or unintentionally, express normative characteristics and promote certain ideologies. Being aware of such potential ideologies can help to form critique on these apps and create room for debate around them.

1.3 Processes in persuasive mobile applications

Many persuasive apps on the market allow users to track personal data like calorie intake, exercise routine, or even mood throughout the day. Such applications can present the user with personalized feedback, providing concrete insight in a certain situation. The app *Moodscope* (Moodscope Ltd 2015) for example features a daily psychological mood test and creates a graph of the user's mood over a longer period of time. This enables the user to look at this intimate information from a wider angle, which may bring certain tendencies or irregularities to light he or she was not aware of. Such raised awareness and insight could then serve as a nudge to make some positive changes. Presenting personalized feedback is a common persuasive strategy that doesn't force any behavior on users, but does force them to *relate* themselves to a certain issue (Verbeek 2014; Kool, Timmer, and Est 2014).

The input information and the calculations that are needed to generate personalized feedback based on personal data are part of a series of processes. This loop of data collection, analysis and feedback is displayed in figure 1 (Kool, Timmer, and Est 2014, 6). The image shows a general model of this process, but I am interested in examining it on a more detailed level, specifically focused on the way feedback is represented. This will most likely not be a plain representation of the tracked data, but will be evaluated according to a certain norm. It can explicitly be identified as right versus wrong, eco-friendly versus unfriendly or healthy versus unhealthy, but the evaluation might also be of a more subtle nature, communicated via differences in color, shape or size.

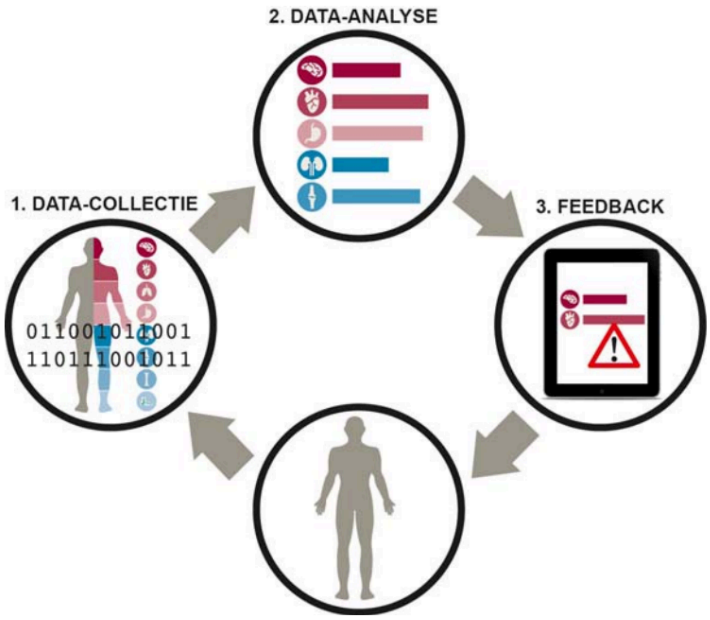

Figure 1. The process of providing personalized feedback (Kool, Timmer, and Est 2014, 16)

Evaluation can also be expressed through direct interaction with the user; via push messages or other types of audiovisual notifications. This general process of data collection, translation and representation is normative: it draws attention to a certain aspect of life, translates the data according to the app's predefined mechanics and presents it in a new context. I think the proceduralist reading methodology will allow me to study these processes and to analyze the normative characteristics that arise with them. It lets the reader explore the possibilities, constraints, theming and the relationship between different components of the subject, and evaluate their expression.

1.4 Research question

My research question is as follows: How can mobile persuasive apps be studied by focusing on their processes, through employing a proceduralist perspective? The main goal of the thesis is to test the relevance of the proceduralist approach in respect to apps as a tool for analysis. I hope to provide useful clues that enable scholars to analyze mobile apps on a deeper level and to help answer questions around their workings, normative characteristics and potential embedded ideologies. The thesis will be a critical exploration of the methodology that should ideally result in new areas of research.

1.5 Methodology

The structure of the thesis will be as follows: first I will provide extensive explanation on procedural rhetoric; its origins and current areas of use. This section will stem from a literary review with a predominant focus on works by Ian Bogost, Mike Treanor and proceduralist critic Miguel Sicart. This section will end in a comparative analysis between procedural rhetoric's relevance for videogames and mobile apps. In order to delineate such differences I will build on theory around the specific traits of mobile media by Andrew Schrock, supported with examples of existing videogames and current persuasive applications.

Subsequently I will concretely describe the way proceduralist reading is used to analyze games, and extend and adapt the theory where necessary to be able to utilize it for mobile persuasive applications. Mike Treanor, a colleague of Bogost, game developer and assistant professor, has collaborated with several other authors to describe how the proceduralist reading can be used as a method in the paper 'Proceduralist Readings: How to find meaning in games with graphical logics' (Treanor et al. 2011). Their description of the method will form the basis for this section because it provides a very concrete application of the proceduralist reading. I will make observations around possible differences between games and apps and support them with examples where necessary. This section will result in a concrete framework with different definitions I can revert to during the analysis.

Afterwards I will attempt to use test the methodology by analyzing the mobile application *Moves* (Protogeo Oy, 2015). This will allow me to reflect on the described framework, and determine directions for future research.

1.6 Case material

I have selected one particular persuasive app to test the procedural methodology: *Moves* (Protogeo Oy, 2015). *Moves* automatically tracks information about its users' whereabouts and movement, and presents them with visualizations of this data on a daily or weekly basis. On the website of the manufacturer the app is presented as a 'Digital Activity Diary', and doesn't seem to incorporate other goals apart from tracking the user's activity ("Moves - Activity Diary for iPhone and

Android" 2015). *Moves* utilizes the phone's built-in GPS tracking technology and accelerometer, and makes the user's movement a part of its processes. *Moves* is a good example of a pervasive app that tracks information about its user automatically, all throughout the day. The app regularly gives the user textual feedback via push notifications regarding activity, new records or problems with tracking. It translates the tracked data into visualizations that allow the user to reflect on a personal process from an angle that is both detailed and wide, as they combine information collected over a longer timespan. I suspect that these visualizations are not represented in an entirely neutral way as they are the result of a process of selection, translation and representation and make use of different colors, shapes and sizes. Because *Moves* incorporates different aspects that are common in mobile persuasive apps, like self-monitoring and personalized feedback, *Moves* makes for a good case to test the methodology.

2. Procedural rhetoric

2.1 Procedural rhetoric

Ian Bogost, an American game developer and researcher coined the term *procedural rhetoric* to describe the act of making arguments through processes: '[…] the art of expression through rule based representations and interactions, rather than the spoken word, writing, imagery or moving pictures' (Bogost 2007, 1). Rhetoric refers to the art of persuasive expression and consists of a wide array of techniques. Classic rhetorical techniques in literature include antitheses, paradox or the use of irony. Such tactics can influence the audience by providing an unusual perspective or emphasizing a certain idea. Successful rhetoric first and foremost means effective expression, not necessarily effective influence (Bogost 2007, 20). Knowledge in the rhetorical field can be very useful to address such techniques and understand their implications. Visual rhetoric, poetic rhetoric, rhetoric through speech: each field contains typical rhetorical tropes and figures (Bogost 2007, 12–13)

Procedurality refers to ways to understand, explain or create processes (Bogost 2007, 2–3). Processes can be found anywhere and define the way things work: the methods, techniques and logics that drive the operation of systems (Bogost 2007, 3) '[..] procedurality can be read in both computational and noncomputational structures. As cultural critics, we can interrogate literature, art, film, and daily life for the underlying processes they trace' (Bogost 2007, 3–4). Governmental institutions for example often consist of endless amounts of procedures that have to be followed meticulously. This leads the whole organization to operate on a frustratingly slow pace, or in other words: it leads to bureaucracy. This is why many people seem to associate procedures with a tedious, rigid following of rules, and a lack of flexibility (Bogost 2007, 5).

Janet Murray, who elaborated on the specific features of digital media in the famous work *Hamlet on the Holodeck* (Murray 1997), noted procedurality as one

of the four key traits of digital environments (Murray 1997; Bogost 2008). She describes computer's procedural power as the 'ability to execute a series of rules' (Murray 1997, 71). Such rules can define behavior for different components and be combined to create representations of systems:

> [...] procedurality is fundamental to computational expression. Because computers function procedurally, they are particularly adept at representing real or imagined systems that themselves function in some particular way—that is, that operate according to a set of processes (Bogost 2007, 5)

Although Bogost notes that proceduralism can be found anywhere, he specifically emphasizes its potential for videogames: 'videogames are computational artifacts that have cultural meaning as computational artifacts' (Bogost 2007, ix). He argues that the most important form of procedural rhetoric stems from videogame's capability to present the player with simplified models of real-life situations. Bogost builds on the idea here that everyone has formed abstract models in his or her mind of pretty much anything in the world. These models define how we understand things to work and how we relate to them. Videogames can present the user with simplified models of real-life processes by simulating the behavior of systems through their code-based nature. The real-life process that is used as the foundation of such a model is what Bogost refers to as the *source system* (Bogost and Partner 2007, 29). This can be anything, ranging from the daily pursuits on an American high school to the commuting sequence of workers, and from the busy dynamics in a modern city to a soccer match.

But games don't just present the players with such simulations; their input is needed to make the simulation work. And when the player interacts with this model, he or she is encouraged to reflect on the way the system is simulated: it may differ or it may correspond with his or her personal models of the world. These *dissonance gaps* evoke thought in the player and form the most important area of persuasion in videogames according to Bogost (Bogost 2006b): 'Persuasion is

related to the player's ability to see and understand the simulation author's implicit or explicit claims about the logic of the situation represented' (Bogost 2007, 333).

An example of such a simulated model can be found in *Grand Theft Auto: San Andreas* (Rockstar Games 2004). In this popular game from 2004, the player controls a young black character, CJ, from a ghetto-like neighborhood. CJ is involved in many criminal, extremely violent activities, and has to eat in order to maintain his energy. The only options the game offers are fast food restaurants like the 'Cluckin' Bell', or 'Well Stacked Pizza co', which are likely to resemble real-life restaurants like Taco Bell and the Pizza Hut ("Restaurants in GTA San Andreas" 2015). The player has the choice between cheap, fatty meals, or a low-fat but expensive salad. Cheap unhealthy meals fill CJ's energy bar up fast, but also make him fat and slow, impeding his missions. This is an example of a procedural simulation of a real model that encourages the player to question the real-life situation:

> The game's insistence that the player eat only at fast food restaurants draws attention to the social reality of poverty and its related health effects. Players of San Andreas might leave the game and make new observations about the world around them, and how social opportunity and disclosure often overshadow the issue of self-restraint (Bogost 2006b, 178).

2.2 Ideological framing

Procedural rhetoric can be seen both as a way to construct arguments using computational processes, and also as a way to derive such arguments from processes. In this sense it is just like written rhetoric, that is both useful for the writer and the reader: 'Procedural rhetoric is a technique for making arguments with computational systems and for unpacking computational arguments others have created' (Bogost 2007, 2). Additionally, the subject of a proceduralist reading doesn't have to hold intentional procedural rhetoric, the processes may also imply certain expression without deliberate intention:

> Commercial games may be less deliberate in their rhetoric, but they are not necessarily free from ideological framing. Such games may imply complex procedural rhetoric with or without the conscious intention of the designers (Bogost 2006b, 175).

Bogost refers to ideological framing here, which occurs when explicit perspectives can be derived from the game. *Balance of Power* (Crawford 1985) for example, a game dating back to 1985, revolves around a world that resides in a cold war. The player may use diplomacy, treaties or other non-violent attempts to maintain peace, but can finally resort to violence and incite a nuclear war. When this happens, the screen will go black and a message pops up: 'You have ignited a nuclear war. And no, there is no animated display or a mushroom cloud with parts of bodies flying through the air. We do not reward failure.' (Bogost 2006b, 167; Crawford 1985) This is a clear example of incorporating an explicit ideological view in a game, which condemns the decision to start a violent war.

Sometimes, a game will let the player take part in simulated models that are irreconcilable with personal beliefs. In such a situation, *simulation fever* can occur: a conflict between the player's ideas of the world, and the model simulated in the game, evoking sensations of discomfort and frustration: 'Procedural rhetoric also produces simulation fever. It motivates a player to address the logic of a situation in general, and the point at which it breaks down and gives way to a new situation in particular' (Bogost 2007, 333). The game *September 12* (Frasca 2003) for example is situated in a fictional Middle-Eastern village that is in a state of peril as terrorists roam about, threatening innocent villagers. In order to attack the terrorists, the player has to fire missiles, which can kill both terrorists and innocents (Bogost 2006b, 168). When innocent people die, others mourn their loss, but turn into terrorists themselves afterwards. This uncomfortable position forces the player to consider the difficulty of such a situation, and provokes questions about the ethics of violence. Greg Costikyan, a game designer who lived close to the twin towers that were destroyed in the terrorist attack of September 11, took great offense at the game *September 12*. He felt it did not show a believable representation of the difficult and multifaceted War on Terror, but an oversimplification of this real-life

process instead. According to Bogost, this intense reaction to the simulated process is a perfect example of simulation fever (Bogost 2006a, 111).

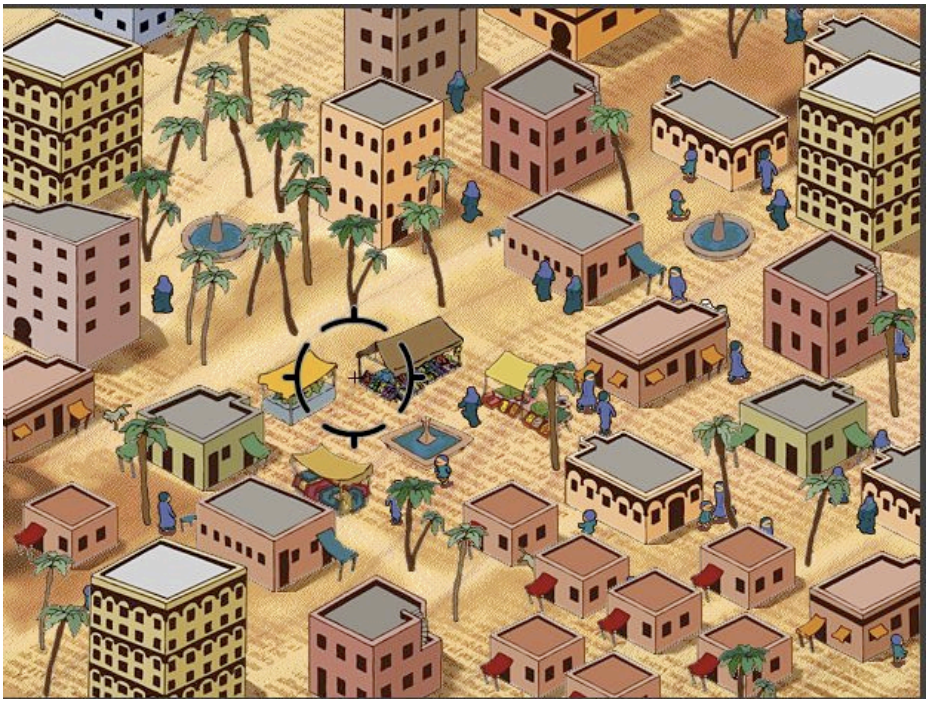

Figure 2. Screenshot of the game *September 12* (Frasca 2003)

Bogost's arguments have contributed to the reputation of videogames as artifacts that should be taken seriously because of this unique form of expression, separating them from more classical types of media like the written word, film or imagery (Sicart 2011).

2.3 Procedural rhetoric in mobile persuasive apps

So how might we see this kind of procedural rhetoric in mobile persuasive apps? Bogost doesn't recognize many persuasive technologies to hold procedural rhetoric as their main persuasive characteristic, because he feels they don't present the user with new perspectives regarding real life processes. Instead, he argues that most persuasive technologies, like mobile apps, are tools that simply build on knowledge that the user already has:

> For example, a self-monitoring technology like a heart-rate monitor assumes an understanding and acceptance of the relationship between

> cardiovascular exercise and long-term health. Thus, while captology does not explicitly align itself with the service of existing social, political, or corporate institutions, its formal structure [...] only allows persuasive technology to work in the service of existing material ends. (Bogost 2007, 61)

But in contrast to Bogost's idea that persuasive strategies like self-monitoring don't rely on procedural rhetoric to persuade users, I think that they show similarities. While mobile persuasive apps don't necessarily present the user with a new perspective regarding some general process, they can present the user with a new perspective about processes regarding him or herself. They can give the user feedback about habits he or she might have, based on manually or automatically tracked data. This is enabled by the many different technologies mobile media can incorporate, like a built-in accelerometer to track movement, a camera to photograph food or scan barcodes, or secondary technologies like wristbands or pedometers. American media scholar Andrew Schrock has noted this aspect of mobile media as their *multimediality* (Schrock 2015, 1238). Of course, videogames can also incorporate different technologies, but an important difference is that mobile devices' multimediality has centered many different *needs* into one single device that were previously scattered over other objects like the phone, calendar, camera, calculator, etcetera. This turns the smartphone into an immense source of information about its user, available for mobile applications to incorporate in their systems. Secondly, because mobile devices are so small in size and have relatively long battery life, they are available anytime and anywhere, showing a high level of *availability* and *portability* (Schrock 2015, 1236). Lastly, mobile devices can precisely identify the location of their users, even better than users themselves: 'knowing our exact geographic location is one form of context awareness in which machines are better than humans' (Rheingold 2007, 97).

All these aspects combined allow applications that run on mobile phones to track intimate information about the user and translate it into personalized feedback at any given moment or location. We could say that the representation of such data is not a simulation of a general situation like in videogames, but a

representation of a personal process instead. But this does not mean that there cannot be differences between the models in a user's mind of such processes, and those represented by the app. In apps, we might be able to speak of dissonance gaps when the app provides the user with information about him or her that he or she was not fully aware of. Someone might for example have a vague idea in mind about the amount of calories he or she eats per day, an abstract model so to speak, but the app can show a different image and prove the user's model to be inaccurate. So in this sense we could say that apps also evoke dissonance gaps in their users, albeit in a different way. Where videogames commonly provide new perspectives regarding more distant and impersonal situations, mobile persuasive apps offer a novel view on processes that are more personally relevant. This is an important manner in which apps persuade: it emphasizes a certain aspect of life, provides insight in a situation that might otherwise be unclear and encourages the user to reflect on it.

Bogost notes that constraints form an important area of expression through computational processes: 'While we often think that rules always limit behavior, the imposition of constraints also creates expression' (Bogost 2007, 7). By limiting the possibility options in a game, the player is guided through the simulated model that can be reflected upon. Bogost refers to this as *the possibility spaces* of a game:

> In a procedural representation like a videogame, the possibility space refers to the myriad configurations the player might construct to see the ways the processes inscribed in the system work. This is really what we do when we play videogames: we explore the possibility space its rules afford by manipulating the game's controls (Bogost 2007, 42–43; Hawreliak 2012)

Although persuasive applications don't engage the user in simulations that are limited to code based rules, constraints play an important role. These constraints don't have to impose hard limits on the behavior of users, but can be found in the process of selection and translation. Merely emphasizing certain aspects of life and not others is a form of constraint, which guides the attention of the user.

Another difference lays in the fact that self-monitoring mobile applications become a part of the same processes they track: they run continuously in the background and can intervene at any given time by providing feedback. By rewarding a high level of exercise, or by warning the user that he or she has crossed the daily calorie limit for example. And although the user may only be notified of their presence through short bursts, via push notifications or some other type of alert, the apps can be switched on all day without the user paying attention to it. Playing videogames on the other hand is a conscious activity that typically takes place for limited amounts of time. So we could see videogames as products that players engage with in an active and conscious manner, whereas mobile apps are constantly present, operating silently in the background, and don't have to be continuously used with attention.

2.4 Normative characteristics in apps

As mentioned before, the way the personal data is presented in apps can influence the way the user reflects on it. This can never be a plain representation, it will be subject to 'translation': a series of steps of transformation that the selected data undergoes so that it can be presented in a new context, like the screen of a mobile phone (Latour 1999). The app *Moodscope* (Moodscope Ltd 2015) for example creates a visualization of the user's mood throughout several days. This is initially a process of selection: the user has to enter data around his or her emotional state into the app, which emphasizes this specific aspect of life. By taking a short psychological test, the mood is attributed with a grade. This attempt to convert the fuzzy, multifaceted concept of 'mood' into a round number is a step of translation and can be seen as a normative process: it implies that mood is something measurable. Subsequently the app translates this data into a visualization of multiple consecutive days, allowing the user to see changes and reflect upon them. Such visualizations can also be said to be normative as they allocate the data with value, where a happier mood is evaluated as better.

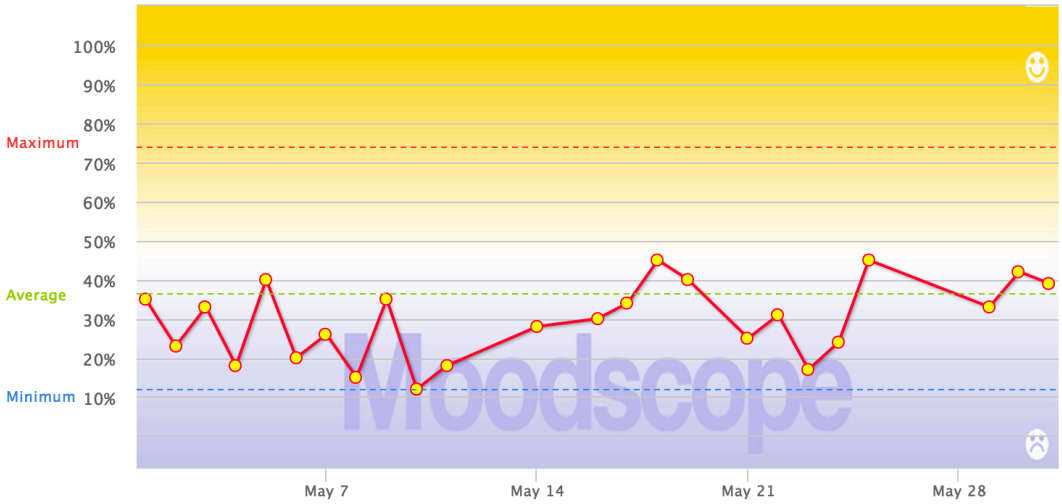

Figure 3. *Moodscope* mood visualization (Moodscope Ltd 2015)

So with each of these steps, the initial data is shaped into a new form, ready to be viewed in its new, normative context. The style of representation plays an important role here: theming in color, shape, size or textual explanation can all contribute to the apparent evaluation of the data. I will elaborate more on addressing this style of representation in the next chapter, where the proceduralist methodology is explored in depth. We could speak of ideological framing when the normative aspects of the different processes of an app can be seen to encourage a certain perspective. Bogost recognizes simulation fever as an important part of procedural rhetoric, caused by represented simulations that are irreconcilable with the player's models of the world. We could argue that when an application expresses certain ideas that cause friction with the user, something similar to simulation fever can happen: a sense of discomfort or frustration may be caused. However, since apps generally don't create simulations but representations instead, we could refer to this as *representation fever*.

So although the representations in persuasive apps often revolve around the user instead of some fictional simulation, that does not mean it is a direct representation of its real life equivalent: the data is transformed according to the app's mechanics. This process of selection, translation and normative representation seems to be the most important aspect of mobile application's procedural rhetoric, and should therefore have a major focus during the proceduralist reading. I have created a schematic image of this process shown in

figure 4, based on the model of Kool, Timmer and Est (Kool, Timmer, and Est 2014, 6).

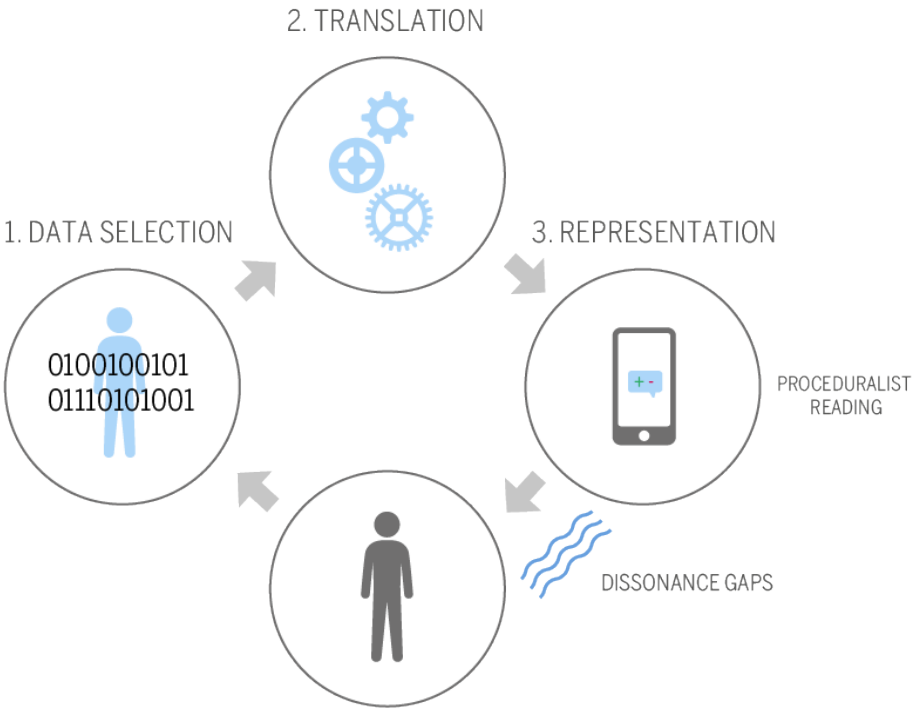

Figure 4. The process of selection, translation, representation and dissonance gaps.

3. Critical exploration of the methodology

3.1. Towards a methodology for apps

Treanor and several other authors from the game studies field have described how the proceduralist reading can be used as a concrete method in the paper 'Proceduralist Readings: How to find meaning in games with graphical logics' (Treanor et al. 2011). I will now elaborate on each step, explain how these steps may or may not be relevant for mobile apps, and alter or expand the theory where necessary.

3.2 Definitions

The first step of the proceduralist reading is to define all components, which Treanor et al. refer to as *definitions*. These different definitions are *entities*, *meters*, *goals* and *controls* (Treanor et al. 2011, 3).

Entities

An entity regards any element that can be described by a game mechanic, is involved in the dynamics of the system and can be themed to produce meaning (Treanor et al. 2011, 3). In a classic arcade game like *Super Mario Bros* (Nintendo, 1985) for example, such entities would include Mario himself, the princess he has to rescue and his mushroom enemies. Entities can be singular or plural, based on their behavioral patterns. When two enemy characters behave in exactly the same way, they count as one entity. Entities that can be distinguished by closely watching the games *graphical logics*: the visual elements on the screen that are subject to the same operational logic: rules of physics, movement or collision detection (Treanor et al. 2011, 2). Such logics are well suited to critical analysis, because they play out right before the player's eyes and don't require an

investigation into the source code of a game (Treanor et al. 2011, 2). The graphical interfaces of mobile applications don't always incorporate rules of physics or characters colliding with each other, but can show other types of entities.

Figure 5. Graph of sleeping patterns in *Sleepcycle* (Northcube 2015; "How It Works" 2015).

Push notifications that occur after certain events for example, or meters, tables, and other types of (audio) visual representations. The mobile app *Sleepcycle* (NorthCube 2015) for example has a graphical interface with elements like a graph that changes based on tracked user input, which can be seen as an entity.

Meters

Meters are a special type of entity that keep track of system events in a game. They can either be visible on the screen, but may also exist behind the scenes. Meters can track the progress of a player in terms of 'score' for example, but can also invisibly count the number of times a certain event has occurred. Persuasive apps are often used to track personal data about the user and commonly incorporate meters. They may be shown as progress bars, but I also understand graphs, tables or other types of visualization of data to be meters.

To illustrate different types of meters, Treanor et al. describe a game where the player has to deliver food to those in need. With every successfully delivered meal, a meter presented with the word 'hunger' would decrease. Where a more

generic meter could just count the number of times the meal-delivery event occurs, the hunger meter adds context to it, by implying it has an effect on hungriness (Treanor et al. 2011, 3). This contextual aspect is very important in the meters of mobile persuasive applications, because it provides clues on how the personalized feedback is constructed. It can either be a direct representation of the data, in the shape of a counter, but it can also be presented in a way that is more relatable. By translating the different types of food a user has eaten into calories for example. Or the amount of cigarettes that have not been smoked into the amount of money the user has saved. Another way of adding context is to compare acquired data to other peoples' data, or to a specific norm.

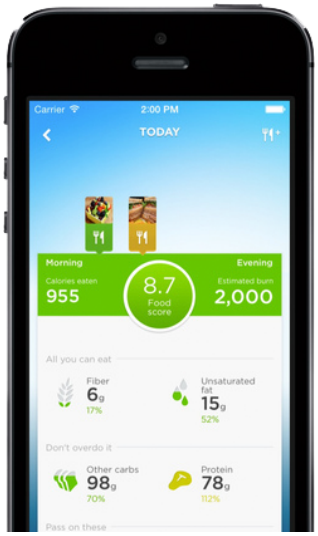

Figure 6. Different meters evaluating food intake in the app Jawbone UP (Jawbone 2015)

Because meters are essential for a lot of mobile persuasive applications, I propose an extra categorization in the proceduralist reading framework for the meter-entity. We could distinguish between *absolute*, *conversion* and *comparative* meters. In this sense, absolute meters show a direct representation of data, without converting it into a different unity. Figure 7 shows an example of a direct meter in the app *Moves*, which will later be the subject of a case study, showing the amount of steps the user has taken.

Conversion meters translate the data into another unity. This can be very straightforward, such as translating the amount of steps into kilometers, or kilometers into the amount of calories burnt. But it can also involve another added

contextual aspect to place the data into a relatable perspective. Shown below is a screenshot from a prototype of an app called *Barter* (Lancaster University 2014), that tracks where users spend their money. The aim of the *Barter* project is to stimulate people to spend more money in local shops, instead of in large, online retail stores. After buying items in local stores, a meter named 'loyalty' increases. This is an example of a conversion meter because it translates the act of buying something in a specific place into a more relatable, positive 'unity' of loyalty. This is a way of expressing an evaluation of the data through a meter.

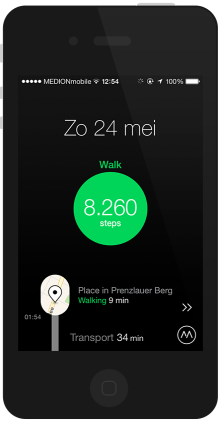

Figure 7. Steps meter in *Moves:* an absolute meter (ProtoGeo 2015)

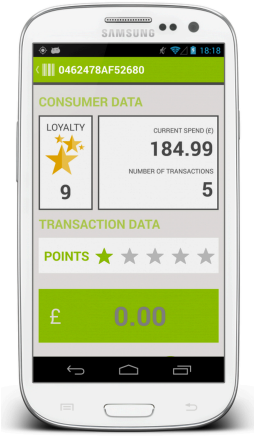

Figure 8. Screenshot of *Barter* app: conversion meter (Lancaster University 2014)

Comparative meters combine different types of data into its representation. Figure 9 shows a conceptual illustration of a meter of the *Barter* (Lancaster University 2015) app. The idea here is to show a real-time visualization of the money flows that go in- and outside of the local community. Such a meter would incorporate

the payment information of lots of different users and merge it into a single visualization, allowing individual users to reflect on a larger amount of data (Lancaster University 2014).

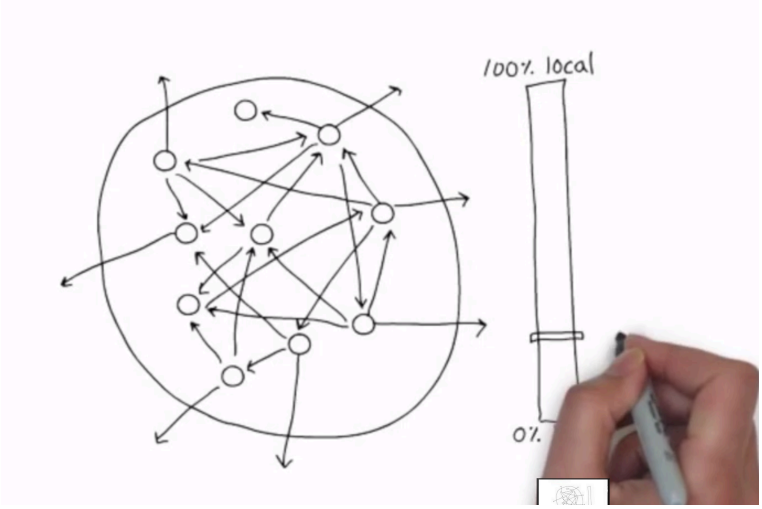

Figure 8. Concept illustration of a money flow meter in *Barter* (Lancaster University 2014)

The underlying calculations that define how meters increase and decrease are commonly invisible to the user. He or she has to rely on (audio) visual or textual explanation, or experiment with cause and effect in order to figure out what components are involved in this translation process. This way meters can form an interesting area of discussion in the proceduralist reading. The translation of buying behavior into a loyalty score for example is a positive, possibly encouraging approach, but the way it is calculated is unclear. One could wonder if such acts can actually be expressed in terms of loyalty or if the meter maybe shows an exaggeration of the real life process. Being aware of such normative translation leaps can contribute to a critical attitude towards meters.

Goals

Most definitions of games include a particular goal that has to be achieved in order for the player to win. A specific task may have to be completed such as killing all enemies, collecting a certain amount of rewards or reaching a high score. 'Game rules assign values to events, a subset of which may be end conditions that, once

reached, terminate the game'. (H. Smith 2006, 67) Jonas Heide Smith refers to this binary end state as the *ultimate goal* of a game. In order to reach this ultimate goal, smaller goals may have to be completed like taking down certain enemies, finding a special item or any other task that functions as a means to a larger end. Smith refers to such supporting goals as *proximate goals* (H. Smith 2006, 67).

However, popular videogames like *SimCity* or *The Sims* for example allow players to explore the game without such a specific ultimate, or even proximate goal to work towards. This is why Jesper Juul proposed to allow more flexibility for addressing goals apart from 'winning' or losing, by splitting the concept of goals up into three components. The first aspect is the valorization of outcomes where some are evaluated as positive, and others as negative. The second regards the effort a player has to take in order to achieve goals, and the third revolves around the attachment of the player to a specific outcome (Juul 2010, 253). When we think of mobile persuasive applications, goals are mostly related to this third component: the attachment of the user to a specific outcome. Persuasive apps are generally used to make a change in the user's life: to get rid of a bad habit, lose weight or to break certain patterns. These are goals that are related to personal wishes.

With some apps, the user can set concrete goals when configuring the application. The app *MyFitnessPal* (MyFitnessPal, Inc. 2015) for example allows the user to set a goal in terms of a specific amount of weight loss to be achieved in a certain timeframe. By tracking the amount of calories eaten throughout the day and entering changes in weight, this goal may or may not be reached: an ultimate goal. Personally setting up such a specific goal implies that the user is attached to the outcome of the application, and will strive to achieve it.

Additionally, one of mobile app's persuasive strategies may include setting a multitude of small goals for the user to complete. The popular running app *Nike + Running* (Nike, Inc 2015) for example rewards the user with badges after certain events: completing a run on a fast pace, running twice a day, running in a new country, etcetera. Such small goals support a larger and more ambiguous end goal of reaching increased health or a better shape.

Player & Control

While attempting to read videogames it is useful to describe which character the player controls and whether this character is controlled via the keyboard, mouse or some other type of technology. The relationship between a player and character is important for the player's connection to the game and can be a strong motivation to achieve goals. Game studies professor Petri Lankoski has elaborated on this relationship in the article 'Player Character Engagement in Computergames' (Lankoski 2011). He distinguishes between *goal-related engagement* and *character-related engagement*:

> [..] engagement with a game can come though goal-related and empathetic engagement. In goal-related engagement, players derive their goals from a PC, and this in turn structures the affective experience of a player. Goal-related engagement is fundamentally an "I" experience: It is about the players acting to reach their goals. (Lankoski 2011, 306)

Empathic engagement on the other hand occurs when the player feels a connection with the character in the game, for example because the character seems very sympathetic and morally right (Lankoski 2011, 302; M. Smith 1995, 167–227).

With most persuasive apps, the user doesn't control a separate character, but forms the subject of the application him or herself. This implies that such applications will evoke a sense of goal-related engagement: an 'I' experience. However, there are also persuasive technologies that translate the data not just in a straightforward visualization like a meter, but connect it to an avatar. The project *Emotional Flowers* for example was a persuasive experiment to stimulate workers in an office environment to convey a happier expression on their faces. Their facial expression was monitored throughout the day with a webcam and linked to a flower avatar: 'The game itself consists of a flower as avatar, which grows or shrinks depending on measured emotions in the facial expressions' (Bernhaupt et al. 2007, 42). Another example can be found in persuasive artworks, whose appearance alter based on the behavior of users. Figure 9 shows a conceptual image

of a tree that blooms happily when the user exercises regularly but shrivels and dies when the user slacks behind.

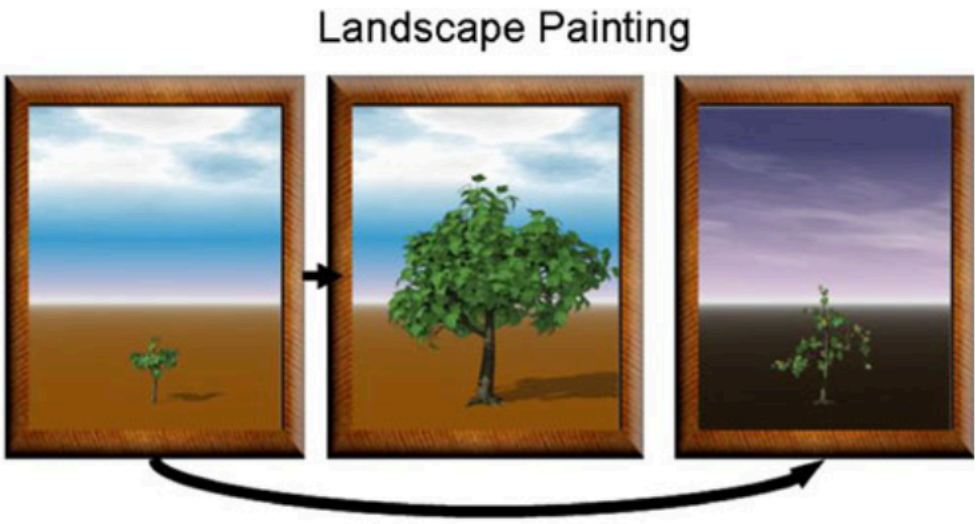

Figure 9. An ambient mirror in the shape of a tree (Nakajima and Lehdonvirta 2013, 110)

Such persuasive technologies are also referred to as *ambient mirrors*: 'systems that use visual feedback to effect changes in users' everyday living patterns' (Nakajima and Lehdonvirta 2013, 107). A similar tactic is employed in the app for weight loss *Carrot Hunger* (Grailr LLC 2015). This app tracks the calorie consumption of the user and connects it to an avatar in the shape of a man. This avatar, shown in figure 10 and 11, can transform from a skeleton into an overweight figure, based on the amount of calories that are being tracked. When the user feels connected to such an avatar, goal-related engagement and emphatic engagement could be combined as extra motivation to reach the app's goals.

Additionally, the controls can be described in order to understand in which way the app tracks information about the user: these include the different built-in technologies that arise with mobile media's multimediality, like the GPS-tracker, accelerometer or camera, but also secondary technologies like wristbands for example.

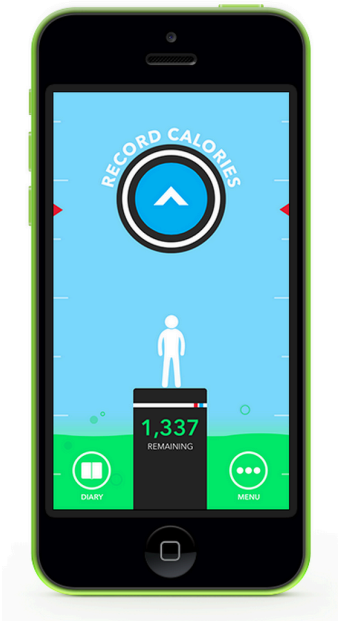

Figure 10. The interface of Carrot Hunger with an avatar (Grailr LLC 2015)

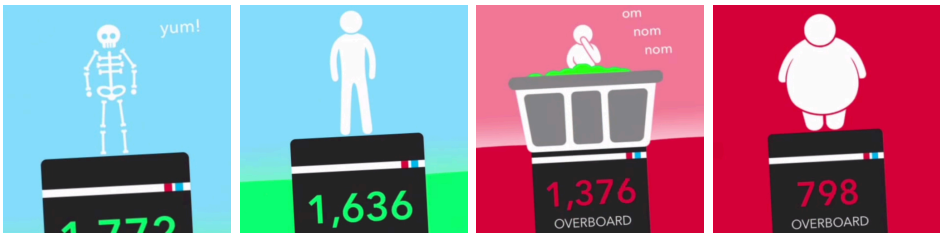

Figure 11. Carrot Hunger avatar transforming (Grailr LLC 2015)

3.3 Mechanics, dynamics, aesthetics

After describing all the components mentioned above, it is time to see how these components relate to each other. In order to describe these relationships, Treanor et al. build on the *mechanics, dynamics, aesthetics* model (Treanor et al. 2011, 1; Hunicke, LeBlanc, and Zubek 2004). This is a well-known model in the field of game studies to describe the way in which video games work. It assumes there are three general levels of games that have to be taken into account for development and analysis. The model itself is not related to proceduralism, but is used by Treanor et al to relate all the game components to each other in a logical way. I think that the mechanics, dynamics, aesthetics model is similarly valuable to link such components in mobile applications, as I will explain below.

The basic rules of interaction within games are referred to as the *mechanics*. Mechanics are specified in code and define the possibilities, restrictions and rules each component adheres to. An example from the game *Super Mario Bros* (Nintendo R&D4 1985) for example is that each time Mario bumps his head against a square with a question mark on it, this square will exert some kind of reward. For mobile apps, the mechanics define when meters increase, push notifications are being sent or any other types of rules that form a constant in the app.

The term *dynamics* is used to describe the 'emergent runtime behavior' of the mechanics, in interaction with input of the player (Treanor et al. 2011, 4; Hunicke, LeBlanc, and Zubek 2004): 'For example, the mechanics of card games include shuffling, trick-taking and betting, from which dynamics like bluffing can emerge' (Hunicke, LeBlanc, and Zubek 2004, 4). When we think back to the example of the question mark square mechanic, this would lead to a dynamic where the player continuously lets Mario bump into question marked-squares in order to receive rewards (Hunicke, LeBlanc, and Zubek 2004). So the dynamics can be seen as the behavior of the user and the processes in the game at the time it is being used.

In some mobile applications, the dynamics might not take place inside the app, but in real life instead. The dynamics of an application that helps the user to exercise more would involve running, cycling, skateboarding, or any other type of physical activity that is situated in the real world. In this sense, mobile applications and their dynamics show similarities to pervasive games. Pervasive gaming is defined as 'a genre of gaming systematically blurring and breaking the traditional boundaries of game' (Montola 2005, 1). Where traditional games are played in certain spaces, at certain times and by certain players, pervasive games may expand these boundaries in spatial, temporal or social ways (Montola 2005, 1). They might take place in cityscapes or and at random times, making it unclear for players whether they are playing or not. This way, the dynamics of the game also cross over to real-life, rather than merely being situated on computer screen or the board of a game

This presents a new challenge for analyzing the dynamics according to the traditional mechanics, dynamics, aesthetics model: 'Such influence presents new

challenges for the game design, since the dynamics of game and ordinary life have to be negotiated' (Montola 2005, 3). Where the dynamics of most traditional videogames are subject to strict code-based mechanics, the dynamics of these mobile applications are also subject to the mechanics of real life: an attempt at increasing running or quitting smoking are things that fall under the influence of many different things apart from the mechanics of the app. Unpredictable aspects like the weather, physical injury or specific life events may cause the user to deviate from the goals set by the mechanics of the app. And because life's mechanics might be a bit harder to describe than those of videogames, the resulting dynamics are also more difficult to predict. Moreover, the dynamics of an application might spread a lot further than initially is expected. An example of this would be the mobile dating application Tinder, which enables people to find potential romantic partners via a mutual opt-in mechanic. If we stretch the dynamics a bit further than the act of swiping left and right on pictures, we could say that a dynamic of Tinder is the act of dating. And if we take into account recent news that Tinder has contributed to an enormous growth in the act of 'arranging casual and often anonymous sexual encounters', we might also include this as a dynamic of the app (Goldman 2015). Taken to the extreme, we could then state that a dynamic of Tinder is the act of transmitting sexual diseases (Goldman 2015).

Of course, the previous example is a very far and maybe unconvincing stretch. But it does show that the dynamics of mobile applications with real life dynamics are harder to address. Therefore I propose to distinguish between *direct* and *indirect* dynamics. In this sense the direct dynamics would be behaviour that is a direct result of the app's mechanics, and indirect dynamics behaviour that is affected by these rules, but stretches beyond them. So for example, if there would be a meter in an app that keeps track of the amount of cigarettes a person has smoked and the explicit goal is to quit smoking, a direct dynamic would be to not smoke any cigarettes. A more indirect dynamic could be the act of eating excessive amounts of lollipops, as a withdrawal symptom of quitting smoking.

The *aesthetics* of a game regard a specific type of emotion that the game evokes in the player. This can be basic emotions such as joy or fear, but it can also be described in more specific terms as a sense of adventure, fantasy or solidarity.

The aesthetics of a game are influenced by its mechanics and dynamics, and also stem from a certain style or theming: 'Aesthetic judgments may be applied to definitions, rules or dynamics and are also informed by the theme of the game' (Treanor et al. 2011, 5). While designing a game it can be helpful to think of the possible aesthetics as an end goal to work towards: what kind of emotion should the game cause and how can this be achieved?

When we think of persuasive technologies, the aesthetics might provide clues about the way it influences the user to continue or discontinue a certain dynamic. If a dynamic causes positive emotion through the games' aesthetics, the user might be more likely to repeat it. In this sense the most logical desired aesthetic would be a sense of accomplishment, joy, or some other type of positive feeling, but more surprising aesthetics such as guilt may also be used. *Carrot Hunger* (Grailr LLC, 2014) for example, 'punishes' its users for overeating, in an attempt to motivate them to lose weight. Another important aesthetic of persuasive apps would be a sense of awareness: the feedback that the app provides makes the user aware of a certain habit or situation.

3.4 Theme

The theming of different processes is very important for understanding the way in which a game evaluates things. This is an area where embedded normative characteristics can be brought to the surface: 'Theming, which usually involves visual representation or textual explanation, clarifies assumptions being made about a game and shapes the interpretation of mechanics' (Treanor et al. 2011, 4). Treanor et al. argue that theming can be interpreted based on common sense knowledge and cultural conventions: 'The thematic knowledge domain comprises the common-sense knowledge about the real-world domain being expressed in the game' (Nelson and Mateas 2007, 629) When the theme is analyzed, assumptions around such conventions and common sense should be explicitly described. This is what Treanor et al. refer to as *thematic considerations*: 'In the process of analyzing a game, thematic considerations are where the interpreter concentrates his or her assumptions that give meaning to the mechanical arguments' (Treanor et al. 2011, 5)

In videogames, the theming of mechanics makes clear what the mechanics on the screen represent. To discuss this, Treanor et al. elaborate on *rhetorical affordances*: 'The opportunities for representation made available by the rules that govern the relationship between objects and processes in a system' (Treanor et al. 2011, 4). So a rhetorical affordance is a possibility for representing something, which exists because of the relationship between objects and processes. When two objects collide in an arcade game for example, the one might disappear and the other might stay on the screen. This mechanic can represent different things, according to the way the two objects are themed. If object A looked like a mouth, and object B like a piece of candy, the mechanic would most likely represent eating. But if object A was represented by a tunnel, and object B a car, the mechanic might represent travelling through a tunnel. So it is not possible to state that a mechanic alone, without any thematic context, represents the one or the other.

Rhetorical affordances might be less relevant for reading mobile persuasive apps that only incorporate meters, because these are commonly clarified via textual explanation. But in the case of *Carrot Hunger* for example, we could argue about what the avatar represents. We can conclude that the figure on the screen is eating and changing in weight because of the transformation of the avatar and context of the app: the app's goal is for the user to lose weight and calories are the tracked data.

But addressing the theme is very important to derive evaluation that is expressed in mobile apps, and can provide grounds for possible aesthetics. The interpreter may state for example that he or she assumes that an element pointing to the right has a positive connotation or conveys progress, whereas an element pointing left conveys negativity, or decline. Because such connotations may differ between different people and different cultures, the aspect of theme will likely be subject to discussion: 'Disagreements or points of discussion about an interpretation will often focus around the thematic considerations' (Treanor et al. 2011, 5).

So thematic considerations are very important for both videogames and apps. It can clarify assumptions around the embedded evaluation of certain components and is an important area where ideological framing comes to light.

3.4 Finding meaning

Treanor et al. describe a final step in the proceduralist reading method that involves combining all the described components and relations in the most coherent way possible, to add up to a specific message: a *meaning derivation* (Treanor et al. 2011, 5). In the paper 'BurgerTime: A Proceduralist Investigation' (Treanor and Mateas 2011), Treanor and Mateas attempt to derive meaning from *BurgerTime* (Bally Midway 1982), a classic arcade game from the eighties. They chose to investigate it especially because it seems to be devoid of any meaning: 'what happens when a game is interpreted that seems to not have any meaning?' (Treanor and Mateas 2011, 3). In *BurgerTime* the player controls a chef that runs over platforms, ladders and parts of burgers. This makes the parts drop down on each other, ultimately forming a complete burger. But different types of foods such as hotdogs, pickles and eggs are out to kill the chef, chasing him wherever he goes. The goal is to create as many complete burgers as possible without the chef getting killed.

In a first attempt, Treanor and Mateas form the meaning derivation that the game's message might revolve around cooking burgers in an unsanitary way: a dynamic involves the chef walking over the parts of burgers, and feet are not commonly associated with cleanliness. But many other game elements are left out of the equation in this type of reading. What do the 'enemy' foods have to do with this message, and why are they chasing the chef? After several unsatisfying attempts at reading *BurgerTime,* Treanor and Mateas turn to the experiences of hardcore *BurgerTime* player Bryan Wagner. As a true expert Wagner paid close attention to the game mechanics and figured out special tricks to reach high scores. He found that the attacking foods were most harmless as they grouped together and started to move as one entity. This leads Treanor and Mateas to a new idea: as the way to score high is to group ingredients in a specific way and the only way to figure this out is to closely observe their behavior, the game might actually be about the 'craft of a cook' or the 'art of being a chef' (Treanor and Mateas 2011, 12). So the aim when forming such meaning derivations is to make them coherent with as many different components of the game as possible: 'Any

claim that a game means something is only as strong as the supporting arguments' (Treanor and Mateas 2011, 7)

Bogost argues that videogames are computational artifacts that create simulated models of real life processes. These simulations are restricted to the boundaries of code that become expressive in the way users reflect on exploring their possibility spaces. Meaning derivations are strongly connected to figuring out which models are represented and what they imply. However, even though the models that are simulated resemble real-life processes, this does not mean that these are accurate representations of reality: '[…] it's a simulation of the designer's theories, not of reality ' (Pournelle 1990; Friedman 1999, 3) This is why it's so important to not just explain what models are represented, but also to see *how* these models are represented. The famous videogame *SimCity* (Wright 1989) for example is a simulation of life in a city, complete with economic flows of cause and effect. The game has been criticized for expressing a economic model in which low taxes lead to growth, nuclear power is discouraged and investment in mass transit is rewarded (Friedman 1999, 2). This is a clear example of procedural rhetoric: the game shows a simulation around economy in a particular way, expressing a political perspective.

Meaning derivations can work similarly for mobile persuasive applications. The difference here is that the models the app represents are often more related to personal processes, instead of referencing more general real-life processes, such as the life in a city. As mentioned in the previous chapter, the translation process that many persuasive apps incorporate is normative by definition: the app takes a small amount of data from someone's versatile life into a standardized system of mechanics where it is measured according to predefined norms, placed in a new context and evaluated in a certain way. By bringing these different normative characteristics to light and combining them together in a coherent way, meaning derivations may be formed.

4. Testing the methodology

4.1 Case study: *Moves*

I will now attempt to test the described theory on the app *Moves* (Protogeo Oy 2015). *Moves* is currently available for both iOS and Android devices and I used and tested the version for iOS 7. The app can be downloaded for free from the iTunes App store, where it is marketed as an 'Activity Diary of Your Life' ("Moves - Activity Diary for iPhone and Android" 2015). The app runs continuously in the background and registers GPS coordinates and data from the iPhone's accelerometer. By analyzing movement, *Moves* detects whether the user is walking, biking or moving via some other mode of transportation. It immediately shows a visualization of this data, and creates reports on a daily basis.

4.2 Definitions

The most prominent entities, shown in figure 12 and 13, are the different types of meters: to track walking, biking and running for example.

Figure 12. The general interface of *Moves*

These are represented with oval shapes, or bubbles, that increase in size as the user bikes, walks or runs. These meters can switch between showing an absolute representation in the amount of steps, to a conversion meter of calories or kilometers. Secondly there is a timeline-meter that tracks the user's location based on the GPS coordinates of the phone and connects it to the aspect of time, shown in figure 13.

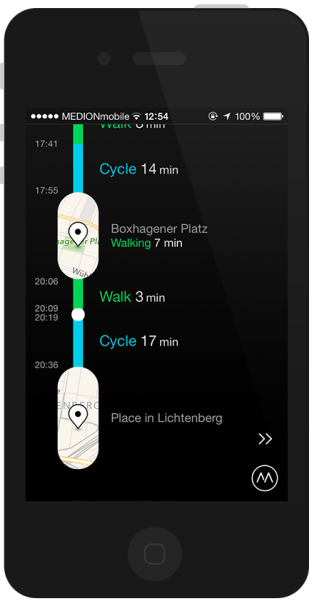

Figure 13. Location and activity timeline

This visualization is a comparative meter as it combines different types of data: location, activity and time, to provide context. The timeline is shown as a vertical line and gains a different color based on the mode of transport of the user: green for walking, blue for cycling, pink for running and dark grey or transparent for unknown mode of transport. The user can manually provide information about this by entering the mode of transport for the time the app was not able to track it. When tracking is switched off, the timeline appears broken for this time. After using the app for multiple consecutive days, the app also shows visualizations combining the data collected during a week, shown in figure 15.

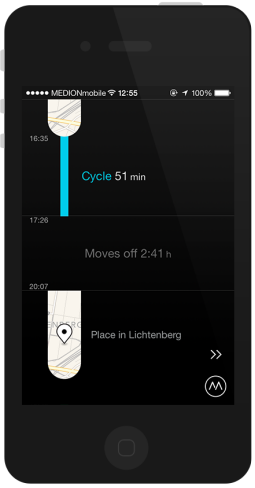

Figure 14. Tracking switched off

Figure 15. Visualization of activity on a weekly or daily basis

Other entities within the app are the different push notifications it sends (see a full list below), regarding new records in terms of activity or to warn the user of problems with tracking (figure 13).

(1) “Tracking has been off for a day”
(2) “You have cycled … km today”
(3) “You have walked … steps today”
(3) “You ran … km today”
(4) “You have broken your all-time record with taking … steps today”
(5) “You have broken your all-time record with cycling … km today”
(6) “You have broken your all-time record with running … km today”

Figure 13. A push notification from *Moves*

When the user walks, cycles or runs more than on any previous day, the app will display a badge-like text on the meter: 'All-time record' (figure 14). We can view this entity as a reward.

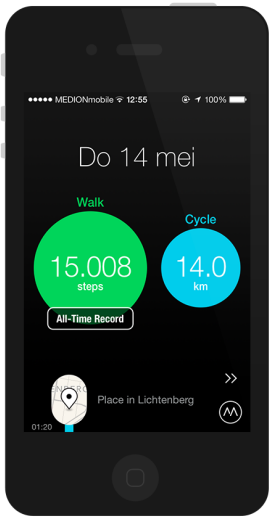

Figure 14. Reward for breaking a record

I previously mentioned translation leaps as an important area of discussion when studying the different meters. The steps and kilometer meters are straightforward in this sense: they are based on the phone's internal technology that track location

and movement. The calorie conversion meter is more problematic because this meter utilizes a single norm to translate the movement into calories, while the amount of calories someone burns depends on height, gender and age.

Goals

Moves is called an 'Activity Diary of Your Life' on the website of the manufacturer ("Moves - Activity Diary for iPhone and Android" 2015). This implies that the goal of the app is to keep track of activity during the day, but within the app no clear goals are posed. There are no tasks that have to be fulfilled in order to progress, or features that can be unlocked by doing so. However, we can think of different personal goals a user might have in mind to use the app: it may be to lose weight by keeping track of burnt calories for example, to gain more awareness about the time spent in certain locations or about the distance that is traveled during the day.

User & Controls

The app is automatically controlled via the movement and location of the user, combined with the phone's built-in GPS technology and accelerometer. Because the goals of the app are not explicitly posed by the app but will more likely be personal, the user will probably feel motivated through goal-related engagement. Empathy engagement, which would be caused by a positive player-character relationship is not present here.

4.3 Thematic considerations

Treanor and Mateas noted that the style of representation of the different components can be interpreted according to common-sense knowledge and cultural conventions. So if we assume that, according to western spatial metaphors, progress is something positive, we can state that the app positively evaluates walking, running and biking. If we take into account the colors of the meters, we could say that walking is evaluated as the most positive of all activities because it is colored green. And if we assume that something that appears broken conveys negativity, we can state that the broken timeline expresses the idea that not tracking data is negative. Lastly, if we assume that 'empty' is less good than 'full', or that color conveys more positivity than something transparent, we can say

that the timeline classifies identified types of transport as superior to movement that is unknown.

Treanor et al. discussed rhetorical affordances to help to clarify assumptions regarding the representation of game components. The meters in *Moves* seem to be quite unambiguous in their representation: although the shapes may not convey an immediate connection with the corresponding data, seeing there is no link between a growing bubble and bicycling for example, textual explanation clarifies this on every element.

4.4 Mechanics, dynamics, aesthetics

As the user engages in identifiable movement, the corresponding meters increase. Combined with the thematic considerations that activity is evaluated as positive, we could say that this mechanic leads to dynamics of increased biking, running or walking. Another dynamic could involve the user focusing all attention on performing one type of activity instead of multiple different ones, in order to keep receiving push notifications regarding records and the the 'all-time record' badge. The broken timeline when tracking is switched off conveys negativity, which could lead to a dynamic where the user keeps tracking switched on at all times. The mechanic that allows the user to manually enter the mode of transportation combined with the positive theming of identified movement, could lead to a dynamic where the user provides this information when it not identified automatically. Additionally, we could argue that when activity such as walking, running and biking is emphasized and rewarded, the user could start avoiding other types of transport, such as traveling by train or car.

An aspect that I described in chapter three, but am not able to derive from the components and their relationships are indirect dynamics. The act of walking, running and biking are all also subject to external influences, but what these are precisely, and how these relate to the mechanics of app is hard to predict. The analysis is purely focused on the interface and can therefore not provide solid arguments regarding such dynamics. In this sense we could say that indirect dynamics fall outside of the proceduralist framework.

Aesthetics can stem from the theming, mechanics and dynamics. If we take into account the previous statement about progress as something positive, we

could say that increased walking, biking or running will lead to a sense of *accomplishment* and *satisfaction*. On the contrary, not engaging in any of these activities may evoke a sense of *failure*. As mentioned before, aesthetics can function as a motivation to continue or discontinue a certain behavior. In this case, these aesthetics will likely encourage the user to engage in more movement.

Another important aesthetic the app evokes is a sense of awareness. By selecting data regarding the user's movement and translating it into steps, kilometers or calories, the user becomes more aware of his or her activity patterns. Secondly, it increases awareness around the fact that movement equals the burning of calories, which is evaluated as a good thing. By showing movement and location on a timeline, the user's attention is drawn to the aspect of time. Finally, it makes the user aware of the fact that movement is something that can be monitored and measured.

4. 5 Finding meaning

Drawing from the previous findings, I will now attempt to define the different normative ideas that can be derived from the processes and theme of the app:

- Movement in general is positive
- Tracking and burning calories is positive
- Tracking personal data regarding physical activity, location and time is good
- Walking is the 'best', or most positive activity to engage in
- Performing a type of movement more than on any other day is good

I have derived these characteristics mainly from the type of meter and the way this meter was themed: the selection and translation process. Because one meter translates movement into calories and positively evaluates this with a growing colorful bubble, I concluded that the app expresses the idea that burning calories is a positive thing. So the normative characteristics were indeed derived from the representations the app creates, instead of from a procedural simulation like videogames incorporate.

In order to form a sensible meaning derivation, I will now attempt to combine the described ideas to form a specific message. Let's take into account the

positive evaluation of any type of tracking, and specifically the tracking of identifiable movement, and combine it with the idea that more movement is better and burning calories is positive. This way we can compile the message that 'physical activity should ideally be monitored, so it can be measured, reflected upon and increased'.

Another idea could be to combine the notion that breaking records in terms of activity is rewarded and that walking is represented to be the 'best' activity to engage in. In this case, the app could express the following: 'one should ideally transport oneself by walking, and preferably walk more than on any previous day, everyday'. This message seems a bit ridiculous, but it can be supported by the positive theming of walking and the 'All-time record' badge that is only granted upon breaking records. However, it combines only two of the described aspects, and is thus not very convincing.

If we also take into account the fact that the app expresses a positive evaluation of tracking time and location and encourages the user to provide additional information about their precise location, the message becomes more general: 'Self-monitoring is beneficial, and the more data is tracked the better it is'. This message is less concrete, but corresponds with each of the normative characteristics described above. In this sense, we could say the app encourages a positive attitude towards the Quantified Self, which can be seen as a form of ideological framing.

Dissonance gaps may occur when the precise amount of tracked calories, kilometers, steps, or time spent at locations differs dramatically from the vague idea the user had of these things. If we build on the last meaning derivation, representation fever could happen when a user has very protective ideas around privacy, or disapproves of notions regarding the Quantified Self. However, because a user is likely to have prior knowledge about the functionality of the app before using it, he or she will probably not be offended by any this idea.

4.4 Reflection on the methodology

The methodological exploration described in chapter three most of all served as a convenient guideline to study different aspects that make up *Moves*. The framework described by Treanor et al., combined with my observations regarding

mobile persuasive apps, served as a step-by-step guide to explore the app. The mechanics, dynamics and aesthetics model helped to view these different components as processes and see how each behaves and interacts. Although these mechanics and resulting dynamics were very straightforward and rather unsurprising, it does show that the framework is relevant for analyzing mobile applications.

Secondly, describing the theme of the different elements by employing thematic considerations allowed me to pose grounded and formal statements regarding the evaluation that spoke from these components. Combined with the mechanics, dynamics and aesthetics, these thematic considerations enabled me to say something about the normative characteristics of the app. Some of these were maybe open doors, like the fact that the tracking of any type of movement is encouraged. This is a rather straightforward idea for an application that has the goal to be an 'Activity Diary'. But the fact that I was able to pose such statements implies that the method was successful in the sense of bringing such ideas to light. My attempts at forming a comprehensive message, or meaning derivation, showed me that the more of those normative aspects are taken into consideration, the more general and less concrete the message gets. We can compare this to Treanor and Mateas' attempts at reading *BurgerTime*, which started with a message revolving around the protagonist's dirty feet, and ended with a more universal notion about the 'art of being a chef' (Treanor and Mateas 2011, 12).

Yet there are differences to be noted between procedural rhetoric in relation to videogames and *Moves.* Although normative implications can be recognized in the processes, we cannot state that *Moves* expresses procedural rhetoric in exactly the same way Bogost envisions it. *Moves* works via processes, but doesn't resemble a simulation of a system like a videogame. *Moves* mainly consists of meters, that can each express different types of evaluation, and may evoke different dissonance gaps. This has lead me to focus mostly on the aspect of selection and translation during the reading. Addressing the different types of meters served as a first step to identify the emphasis of the app, after which the thematic considerations defined the evaluation of the tracked data. Videogames are likely to incorporate more entities and more complex theming, and probably

require a deeper focus on rhetorical affordances.

As *Moves* itself doesn't impose any goals on the user, he or she is likely to have personal reasons to use the application, which implies some prior knowledge regarding the relationship between, for example, physical activity and burning calories. In this sense the novel insights that Moves causes are small, caused by concrete insight in personal activity, location and time. But on a more general level we could also state that by showing how data can be collected and measured, the app offers a new perspective regarding the measurability and presumed malleability of aspects of life.

In the comparative exploration of the methodology I noted that the dynamics of videogames are more easily addressed since they are part of a closed system, limited to the possibility spaces of the game. This is also the case in *Moves*, the mechanics encourage the user to engage in more activity, but what its real dynamics will be is hard to predict. However, I found that the dynamics are not the most relevant aspect for deriving normative implications of the app: these can mostly be reasoned for by addressing the theme and mechanics. So even though potential external influences fall outside of the proceduralist framework, this does not greatly influence the proceduralist reading in terms of deriving expression.

Moves is a very simple application, which made it a good starting point to test the methodology. But the fact that it is so simple may have contributed to my positive evaluation of the methodology. Apps with more complex functionality and processes may be more problematic, because they may hold entities or aspects that are not included in the current framework. I have also described some aspects of mobile applications in chapter two, like the potential for user-character relationship and goals, which were simply not present in *Moves.*

5. Conclusion

5.1 Conclusion

Now it is time to return to the main question of this thesis: 'How can mobile persuasive apps be studied by focusing on their processes, through employing a proceduralist perspective?' I think we can state that the proceduralist reading proved very useful in some areas, although there are important differences between videogames and mobile apps that should be taken into account.

1. Where videogames engage the player in simulations that refer to a general real life situation, persuasive apps render representations of personal processes.
Bogost argues that the most important area for procedural expression for videogames lies in engaging the player in simulated models that refer to real-life situations. Persuasive apps that incorporate self-monitoring functionality, like *Moves,* don't present the user with such simulations, but with representations of personal processes instead. These processes can regard any aspect of life that can be tracked by technology, either automatically or via manual input: heart rate, movement, calorie intake, exercise routines and etcetera. This data is selected, translated and presented in a new context. But just like the simulated models in videogames will never show a perfect resemblance of its real-life equivalent and are rather a reflection of the designer's ideas, the representations within the app are never a direct mirror of the real-life situation. Instead, this 'mirror' is colored by a specific style of representation that expresses evaluation of the data. Although persuasive apps commonly don't involve player-character relationships, some may also link the tracked data to an avatar that transforms accordingly, which could form another area of expression.

2. Dissonance gaps can be caused by both games as apps, although games generally cause these by providing a new perspective around a general situation, whereas

apps are more likely to evoke these by raising awareness around personal processes.

According to Bogost, the simulations in games can express perspectives that may correspond with such models or differ greatly from them, which provokes questions around these differences and causes dissonance gaps. Apps are not likely to present the user with entirely new views since a certain amount of prior understanding regarding the processes of apps can be expected, like the relationship between exercise, calorie intake and weight loss. Instead, apps can provide the user with new perspectives regarding personal processes. When the representations of personal processes differ greatly from ideas the user had in mind, we could speak of dissonance gaps too. Additionally, persuasive apps can advocate a new perspective on the mere process of self-tracking, emphasizing the idea that aspects of life can be monitored, quantified and improved.

3. Although apps don't generate constraint-based simulations like games, procedural constraints play an important role in guiding the attention of the user

The possibility spaces and constraints of videogames are important for showing the nature of the simulations: they define what is and isn't possible and force the player to abide to these code-based restrictions. I have argued that constraints work similarly for mobile applications, although they don't create procedural simulations. Instead, constraints are imposed by the process of selection and translation process that emphasize certain aspects of life.

4. Thematic considerations are valuable to address the evaluation that is expressed by both games and apps. For games these are more focused on what is represented, whereas for apps these are more related to interpreting the translation process.

Via describing the theme of the different components by means of thematic considerations, grounded statements can be made about the underlying evaluation of such components for both videogames and mobile applications. Because such statements are the result of personal interpretation, they can be subject to discussion. But because assumptions around such interpretations have to be clearly described, the considerations can always be read in context. For mobile persuasive

apps, thematic considerations provide a way to say something about the nature of translation: how is the data represented? Noting the different types of meters (absolute, comparative or conversion) and posing assumptions around color, shape and size can help to formally address the style of representation and the evaluation that speaks from it. For videogames, the focus of thematic considerations lies more on the clarification around the representation of components, which can be addressed via rhetorical affordances. For *Moves*, rhetorical affordances didn't play an important role in the reading because the components were seemingly unambiguous in what they represented. However, mobile persuasive apps that are more complexly themed could benefit from discussing rhetorical affordances.

5. Normative characteristics can be derived and justified by employing the proceduralist reading on mobile applications, and be combined to form meaning derivations

By combining the described components, their theming and the mechanics, dynamics and aesthetics, grounded statements can be made around potential normative characteristics that are embedded in the apps. These are more closely related to the evaluation that speaks out of different components, than to a procedural simulation. Subsequently, combining such characteristics can give way to a 'meaning derivation', or overarching message, which can be related to potential embedded ideological framing. So deriving such a message works similarly well for mobile applications as for videogames.

Additionally, the mechanics, dynamics and aesthetics model, originally designed for video games, functioned well as a guideline to analyze the relationships between the different components. The framework forces the researcher to answer clear questions: what is going on in the app (mechanics), what behavior might it lead to (dynamics), and what feelings could this evoke (theme & aesthetics). However, during the comparative analysis I noted that in order to fully describe the dynamics of mobile apps it doesn't suffice to build only on the mechanics of the app, as they are also subject to 'real life mechanics'. In this sense we can state that indirect dynamics fall outside of the proceduralist framework. Because

indirect dynamics are an important part of the app's influence, additional future research could aim to expand the methodology with more means to address indirect dynamics. And in order to further improve the described methodology, it should be tested on more mobile persuasive applications. Preferably on apps with different functionalities, such as different types of goals or empathic engagement for example. This way the framework of different entities, meters, goals and controls can be expanded.

In the beginning of this thesis I described the importance of studying the functionality and normative implications of persuasive technologies, drawing from Verbeek's emphasis on the need for debate around them and Morozov's apparent fear of a world in which human beings mindlessly take orders from apps that they don't understand. The proceduralist reading can certainly contribute to such studies. It offers the possibility to dissect the subject as it were, and deduce meaning from these different components. Although it doesn't offer the possibility to make sense of the underlying code of apps, it provides a means to analyze the functionality and embedded ideologies by merely studying those aspects of the product that are also available to the user. This can help to form critique on these applications and give way to debate around them.

6. References

Ana, C, Andrés Del Valle, and Agatha Opalach. 2010. "The Persuasive Mirror: Computerized Persuasion for Healthy Living." Accenture Technology Labs.

Bally Midway. 1982. *BurgerTime*. Arcade. Data East.

Barter. 2014. "So What's BARTER All About?" *Barter Project*. Accessed July 2. http://barterproject.org/so-what-is-barter/.

Bernhaupt, R, A Boldt, T Mirlacher, D Wilfinger, and M Tscheligi. 2007. "Using Emotion in Games: Emotional Flowers." In , 41–48. ACE.

Bogost, Ian. 2006a. "Unit Operations." *An Approach to Videogame Criticism. Cambridge MA, London*.

———. 2006b. "Videogames and Ideological Frames." *Popular Communication* 4 (3): 165–83.

———. 2007. *Persuasive Games: The Expressive Power of Videogames*. Mit Press.

———. 2008. "The Rhetoric of Video Games." *The Ecology of Games: Connecting Youth, Games, and Learning*, 117–40.

Bogost, Ian, and F Partner. 2007. "Persuasive Games on Mobile Devices." *Mobile Persuasion* 20: 29–37.

Consolvo, Sunny, Kendra Markle, Kevin Patrick, and Kara Chanasyk. 2009. "Designing for Persuasion: Mobile Services for Health Behavior Change." In *Proceedings of the 4th International Conference on Persuasive Technology*, 11. ACM.

Crawford, Chris. 1985. *Balance of Power*. Novato: Mindscape.

Flichy, Patrice. 1999. "The Construction of New Digital Media." *New Media & Society* 1 (1): 33–39.

Fogg, BJ, Gregory Cuellar, and David Danielson. 2009. "Motivating, Influencing, and Persuading Users: An Introduction to Captology." *Human Computer Interaction Fundamentals*, 109–22.

Fogg, BJ, Dean Eckles, I Bogost, and others. 2007. *Mobile Persuasion: 20 Perspectives on the Future of Behavior Change*. Vol. 1. Stanford Captology Media Standford, CA.

Frasca, Gonzalo. 2003. *September 12*. Montevideo: www.newsgaming.com.

Friedman, Ted. 1999. "The Semiotics of SimCity." *First Monday* 4 (4).

Goldman, David. 2015. *Tinder and Hookup Apps Blamed for Rise in STDs*. http://money.cnn.com/2015/05/26/technology/rhode-island-tinder-stds/. Accessed July 2.

Grailr LLC. 2015. *CARROT Hunger*. Blue Bell, PA: Grailr LLC.

———. 2015. "CARROT Hunger." *CARROT Hunger*. Accessed June 8. http://www.meetcarrot.com/hunger/.

Hawreliak, Jason. 2012. "In Defense of Procedurality « First Person Scholar." http://www.firstpersonscholar.com/procedural-rhetoric-civ3/. Accessed June 15.

"How It Works." 2015. *Sleep Cycle Alarm Clock*. Accessed June 23. http://www.sleepcycle.com/howitworks.html.

Hunicke, Robin, Marc LeBlanc, and Robert Zubek. 2004. "MDA: A Formal Approach to Game Design and Game Research." In *Proceedings of the AAAI Workshop on Challenges in Game AI*. Vol. 4.

Jawbone. 2015. *UP by Jawbone | Find The Tracker That's Right For You*. https://jawbone.com/up/trackers. Accessed June 10.

Juul, Jesper. 2010. "The Game, the Player, the World: Looking for a Heart of Gameness." *PLURAIS-Revista Multidisciplinar Da UNEB* 1 (2).

Kelly, Kevin. 2007. "What Is the Quantified Self?" *The Quantified Self*.

Kool, L Linda, J Jens Timmer, and van QC Est. 2014. "Eerlijk Advies: De Opkomst van de E-Coach."

Lancaster University. 2014. "BARTER – ImaginationLancaster." http://imagination.lancs.ac.uk/activities/BARTER. Accessed June 10.

———. 2015. *Barter*. Lancaster: Lancaster University.

Lankoski, Petri. 2011. "Player Character Engagement in Computer Games." *Games and Culture* 6 (4): 291–311.

Latour, Bruno. 1999. *Pandora's Hope*. Cambridge/London: Harvard University Press.

Lister, Martin, Jon Dovey, Seth Giddings, Iain Grant, and Kieran Kelly. 2009. *New Media: A Critical Introduction*. New York: Routledge.

Maxis. 2000. *The Sims*. Electronic Arts.

Montola, Markus. 2005. "Exploring the Edge of the Magic Circle: Defining Pervasive Games." In *Proceedings of DAC*, 1966:103.

Morozov, Evgeny. 2013a. *To Save Everything, Click Here, Evgeny Morozov: The Folly of Technological Solutionism*. The Perseus Book Groups.

———. 2013b. Voor fundamentele technologiekritiek, klik hier. https://decorrespondent.nl/270/voor-fundamentele-technologiekritiek-klik-hier/6920100-33c2c9c6. Accessed July 8.

"Moves - Activity Diary for iPhone and Android." 2015. Accessed June 11. https://www.moves-app.com/.

Murray, Janet Horowitz. 1997. *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*. Simon and Schuster.

MyFitnessPal, Inc. 2015. *MyFitnessPal*. San Francisco: MyFitnessPal, Inc.

Nakajima, Tatsuo, and Vili Lehdonvirta. 2013. "Designing Motivation Using Persuasive Ambient Mirrors." *Personal and Ubiquitous Computing* 17 (1): 107–26.

Nelson, Mark J, and Michael Mateas. 2007. "Towards Automated Game Design." In *AI* IA 2007: Artificial Intelligence and Human-Oriented Computing*, 626–37. Springer.

Nike, Inc. 2015. *Nike + Running*. Nike, Inc.

Nintendo R&D4. 1985. *Super Mario Bros.* Nintendo.

Oinas-Kukkonen, Harri, and Marja Harjumaa. 2008. "A Systematic Framework for Designing and Evaluating Persuasive Systems." In *Persuasive Technology*, 164–76. Springer.

Pournelle, Jerry. 1990. "Untitled Column." *Byte*.

"Restaurants in GTA San Andreas." 2015. *GTA Wiki*. Accessed June 20. http://gta.wikia.com/Restaurants_in_GTA_San_Andreas.

Rheingold, Howard. 2007. *Smart Mobs: The next Social Revolution*. Basic books.

Rockstar Games. 2004. *Grand Theft Auto: San Andreas*. New York: Take Two Interactive.

Schrock, Andrew Richard. 2015. "Communicative Affordances of Mobile Media: Portability, Availability, Locatability, and Multimediality." *International Journal of Communication* 9: 18.

Sicart, Miguel Angel. 2011. "Against Procedurality." *Game Studies* 11 (3).

Simonite, Tom. 2013. "Bill Gates Says Smart Assistants Will Improve Education, and the Lives of Poor People." *MIT Technology Review*. July 16. http://www.technologyreview.com/news/517171/bill-gates-software-assistants-could-help-solve-global-problems/. Accessed June 10.

Slivka, Eric. 2015. "Apple's App Store Reaches 50 Billion Downloads, Now on Pace for 20 Billion Apps Per Year." Accessed June 19. http://www.macrumors.com/2013/05/15/apples-app-store-reaches-50-billion-downloads-now-on-pace-for-20-billion-apps-per-year/. Accessed June 10.

Smith, Heide. 2006. "Plans and Purposes How Videogame Goals Shape Player Behaviour."

Smith, Murray. 1995. *Engaging Characters: Fiction, Emotion, and the Cinema*. Clarendon Press Oxford.

Treanor, Mike, and Michael Mateas. 2011. "BurgerTime: A Proceduralist Investigation." In *Conference of the Digital Games Research Association-DIGRA 2011*.

Treanor, Mike, Bobby Schweizer, Ian Bogost, and Michael Mateas. 2011. "Proceduralist Readings: How to Find Meaning in Games with Graphical Logics." In *Proceedings of the 6th International Conference on Foundations of Digital Games*, 115–22. ACM.

Verbeek, Peter Paul. 2011. *Moralizing Technology: Understanding and Designing the Morality of Things*. Chicago: University of Chicago.

———. 2014. *Op de Vleugels van Icarus: Hoe Techniek En Moraal Meebewegen*. Rotterdam: Lemniscaat.

Wright, Will. 1989. *SimCity*. Maxis.