Persuasive Affordance Design
in "Mindful Meerkats"

*An interdisciplinary exploration of a smartphone game as a potential instrument
for behavioural change towards happiness-inducing lifestyles*

Jonas Wolterstorff

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An interdisciplinary exploration of a smartphone game as a potential instrument for behavioural change towards happiness-inducing lifestyles

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Date of Submission: 09.08.2015

Thesis for the graduation of the Master of Science (MSc)
in Sustainable Development
Copernicus Institute
Faculty of Geoscience
Utrecht University
30 ECTS

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"Watch your thoughts,
they become words;

Watch your words,
they become actions;

Watch your actions,
they become habits;

Watch your habits,
they become character;

Watch your character,
for it becomes your destiny."

~ *inter alia* Frank Outlaw [1]

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[1] Interesting discussion of the origin of the quote and the fact that there are more than one author considered to be responsible for this poem:
www.quoteinvestigator.com/2013/01/10/watch-your-thoughts/

Additionally, the following wordplay was uncovered: The starting letters of the central keywords *words, action, thoughts, character* and *habits* can be rearranged to form the word *watch*.

Abstract

Sustainable Development is in desperate need of understanding human behaviour. Most issues that are considered vital require being tackled from the ground up. However, other fields have to be pulled in to make sense of behavioural patterns. These are *Persuasive Technology*, *Human-Computer-Interaction*, *Design* and *Motivational Psychology*.

Grounding the argumentation on these schools of thought, this work argues that a smartphone game provides a wide range of capacities that can inspire individuals to make changes in their lives that multiply and become behavioural patterns that in turn have considerable impacts with regards to many of Sustainable Development's core issues such as Climate Change, economic, ecological and financial crises.

With an approach that focuses on personal wellbeing, playfulness and intrinsic motivation, individuals shall be excited for an in-game narrative that incentivises them to fulfil real-life challenges that will kick off positive, beneficial feedback.

Outline

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1 INTRODUCTION

1.1 THE NEED FOR CHANGE

Sustainable Development is one of the most pressing issues of our time. The current trend of development of the socio-ecological system, that is our planet, is threatening the future of humankind. Admittedly, the planet will be capable of recovering after the human species would have been wiped from the face of the earth, but that can and should not be seen as a truly resilient solution to the economic and ecological (others would probably include social and financial as well) crises that the planet and its inhabitants are facing. Being the greatest contributor to its deterioration, whilst being – *q.e.d.* – the most intelligent creatures on the globe, human-kind and leaders of it should feel a certain intrinsic motivation and accountability to find solutions. Aren't we part of the global ecosystem after all?

In this introduction, I firstly want to provide a short analysis of the state of affairs to then secondly, suggest an explanation for the fact that it seems that we are stuck as humankind. The third section shall interpret the results to outline in what place this paper falls when accepting the conclusions.

The state of disaster, to put it demagogically and bluntly, in which we currently roam, is most impressively summarised by the *Stockholm Resilience Center* and their account for *planetary boundaries* (Rockström et al. 2009). In their account, which can be seen as a direct continuation of controversial pieces like Brundtland's *Our Common Future* (WCED 1987) and Meadows' *Limits to Growth* (2005), they identify nine global priorities to halt biophysical processes and phenomena which are risking the human future in the current trajectory. Out of the nine *boundaries,* four are already vastly surpassed. In an updated article, they provide scientific evidence for the transgression of the *climate change -, loss of biosphere integrity -, land-system change integrity -* and *altered biochemical cycles boundaries.* This could *"drive the Earth System into a much less hospitable state, damaging efforts to reduce poverty and leading to a deterioration of human wellbeing in many parts of the world"* ("Four of Nine Planetary Boundaries Now Crossed – University of Copenhagen" 2015).

Even though the scientific community with a great majority is in consensus about the anthropogenic cause of climate change (Oreskes 2004; Tol 2003) and depletion of fossil fuels, other actors like politics, in the

form of decision-makers and governing structures, or free economic players like cooperations and conglomerates, are not diverting from the current behaviour. But these players are equally locked in into a metasystem of checks and balances, so that an easy way out is not possible.

The premise that informed this work is the understanding that *Behavioural Change* is difficult and that deep-seated values and worldviews prevent individuals from diverging from their usual course of action. Given that for a majority of issues, an elite will not be sufficient to make a leap forward into a next era of human-planet co-existence as opposed to a source-and-sink-relationship, we have to get greater masses of people convinced. Allowing oneself to buy into what the most prevalent political system, that is currently existing on this planet, is postulating, public opinion will eventually affect more influential actors of the wider system such as decision-makers or global corporations. Therefore, it has to be one of the major concerns how we can actually address the complex problem of behavioural change and inspire key figures to be part of the change. Even key organisations and actors are ultimately composed of individuals, so that a successful intervention that tackles individuals can have spill-over effects into the respective overarching structures.

The issue of Climate Change does not bring a buy-in from majority societies. There needs to be a more appealing narrative and flag to excite wider ranges of people beyond convicted ecological thinkers. Not only is Climate Change unpopular, the same lack of regard can be witnessed for the more marketable and anthropocentric notion of *The Good Life*. Many individuals do not see the implication of their actions for the system and neither how the system affects them. With a general notion of paralysis and incapacity to make a change at all, we are facing a difficult situation.

But how can a situation like this, sometimes referred to as *A Perfect Storm* (Flavin and Engelman 2009) or a *Crisis of Crises* (Harding 2015), of multiple dead-locks and great complexities, be resolved? How can the necessary critical mass be assembled to create enough momentum to change the trajectory from doomed humanity to a prosperous and happy future? The author is convinced that a great source of the problem is the fundamental divide between decision-makers and the ones affected of the decisions. But how can these complex issues be relayed to such a diverse global audience of individuals? And how can we frame it from a scientific perspective to gain ground?

The interdisciplinarity within *Sustainable Development* in comparison with other disciplines is notably high and diverse. And yet, the bouquet of potential insights does not include human behaviour and behavioural change. Therefore, this work sets out to draw in insights from Affordance Theory in Design, Persuasive Technology in Human-Computer-Interaction and Motivation and Self-Determination from Psychology. How does a human change his behaviour and why? What makes him happy to an extent that a behavioural transition ensues? Symptoms are treated without thinking about causes. Humans are treated without thinking about intrinsic motivations.

Games, as most holistic pieces of art and seduction, joy and entertainment, provide a useful blank page and scrap books to start an alternative process. Playfulness is inherent in human beings, but gets lost over the seriousness of modernity. Whether this is a necessity or the preferred trajectory, will not be addressed in this paper, but rather if a new sense of playfulness and ease can be instilled in daily life of humans. It is in play where all beings feel the greatest sense of ease, being captivated in flow and peace, experimenting with and testing real world dangers, opportunities and options. Isn't there a chance to apply this ease to life to bring out the intrinsic choice that individuals have, that can bring more joy to them?

This was the starting point for the work on the project that led to the research. How can we inspire individuals to make behavioural changes that will be better for their physical environment as much as for them with a game-like, mobile system? Creating a virtual representation, often referred to as *Avatar* that monitors personal real-life development and comments on it visually, was the first attempt to bridge short-term behaviour and long-term real world impacts in a humorous, non-resentful way. Alluding to the shape of the representation, the project was developed under the name *Mindful Meerkats* and shall be the sign post for this work. Can that work? Can individuals be consciously inspired or subconsciously persuaded to change their lifestyle with a mobile technology?

This then follows a trend of more and more specific mobile services that gives advice for specific domains. Health, both physical and mental, have certain apps, there is apps to measure footprint and food behaviours, personal finances and spending behaviour. Some of them have game elements, but they do not provide a full picture of opportunities.

By alluding to options and choices in the given daily routine, we will attempt to open the blinkers and create awareness for new behavioural patterns under the promise of an increase of joy and purpose.

1.2 PROBLEM DEFINITION

Aligning to different mental programming, there are different reasons for which people do not embrace big societal change, remain passive and lead unsustainable lifestyles. This wide array of different attitudes, values and behaviours demands an integrated tool capable to activate[2] a heterogeneous sets of people within diverse societies. The transition that is envisioned shifts from an unconscious, unaware life on autopilot to a life of conscious choices and constant curious reflection.

1.3 AIM

Every research should have a goal, an objective; a final vision that drives its executor. As it has been outlined this work is informed by the vision of the activation of passive parts of societies for sustainable practices. To achieve that goal, a smartphone game is assumed to be a useful tool to inspire lifestyle change. Smartphones have become popular devices in daily life and are thereby powerful tools for persuasion (Fogg et al. 2007). To determine which elements are most convincing in a future app, insights from science, theoretical and empirical in nature, shall guide the design.

1.4 RESEARCH QUESTION

The research question thereby reads as follows:

> *RQ: Can 'Mindful Meerkats', a smartphone game application, be designed to be capable to induce short-term (and long-term) behavioural change?*

It can be divided into two sub-questions, which can be answered by a different body of literature. The literature foundation, which will be illuminated in 2.1, predominantly consists of *Motivational Psychology*, *Persuasive Technology* and *Human-Computer-Interaction*.

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[2] *Activation* here refers to a change in behaviour and behavioural patterns

The first question, to be answered with the help of research grounded in *Motivational Psychology,* reads:

> RQ 1.1: *What are the elements of behavioural change, how can it be created and sustained?*

Subsequently, this work looks into how said elements can be created with technology and what approaches have shown to be effective in creating behavioural change. Several case studies and real-life examples of functioning technologies will be given. Although usually looking only at the psychological states and emotional impact, and not into real-life behavioural changes, the academic foundation here will be *Human-Computer-Interaction.*

The second sub-question accordingly reads:

> RQ 1.2: *What are digital, virtual elements capable of inspiring or inducing a behavioural decision and potentially a departure from usual habits?*

1.5 PROCEDURE

The development of the app that is envisioned is at current stage mostly informed by *common sense* and speculations. Assumptions about how game design affects a) attitudes and values and b) behaviour. There is no clarity about whether the app will have the intended effect, nor whether there is a link between behaviour and virtual worlds. The claim hitherto only stands that through the external motivation created by virtual world and game experiences sustainable choices and activities can be incentivised without a paternalistic aftertaste. The wellbeing, created as a by-product – insofar the assumption –, will create intrinsic motivation and thereby accelerate adoption. In other words, externalising motivation for sustainable activities will build up a momentum that will induce short-term behavioural change. This short-term change will then lead to greater-wellbeing. The enhanced – in relation to earlier life phases – well-being will then be noticed and consequently reflected upon by the users. The realisation that the behavioural change towards sustainability induced an increase in well-being leads to an internalisation of sustainable activity and thereby long-term behavioural change. As these claims are merely assumptive, this research is aimed at substantiating, fine-tuning, adjusting or falsifying these claims with an extensive literature research.

Coming from these assumptions, a mental model has been developed that functioned as a starting point to dive into the literature. Therefore, this mental model shall be illuminated in its initial form first, to then show what the literature had to be considered to set off the exploration and verification of the mental model. The mental model, used as a point of departure, will then be adjusted with each explored body of literature, deepened and substantiated.

2   METHODOLOGY

Foundation and Sources

Although Behavioural Change has been researched in many scientific fields, the terminologies and science is not exhaustive or concise (Fogg 2011). At this point, the reflection of behavioural change should stand in the middle of my reflections. It does not matter which ideological content or abstract objective is driving a planned intervention or persuasion, the tools to create a behavioural change should be grounded on the same framework. Therefore, the quest for a toolbox for behavioural change shall be at the core of this work. Only at the second instance the objective shall be to investigate the mechanisms of an individual's transition to a (more) conscious, mindful and sustainable lifestyle.

2.1   LITERATURE RESEARCH

2.1.1   RELEVANT DISCIPLINES

Given that Behavioural Change in itself is looked at from a wide array of perspectives, and adding sustainable lifestyle and a smartphone game to the mix, the disciplines that were brushed and partially covered, were diverse and numerous. Out of these, two main bodies stand out particularly with two respective sub-bodies.

HUMAN-COMPUTER INTERACTION

Being engaged with the relationship between humans and computers, and the impact that technology in the form of computers and other devices can have, it was a natural point of departure to explore the capacities for technology to induce behavioural change. More specifically, there are two field who specifically look into the persuasive capacities of technology:

GAMIFICATION

Gamification attempts to employ techniques from game design, game studies and the theory of fun into "non-game systems" (Deterding, Sicart, et al. 2011) to create joy for the individuals being part of that system. Often these non-game systems are businesses or customer relations.

PERSUASIVE TECHNOLOGY

While *Gamification* has its birthplace in marketing and game design, *Persuasive Technology* grounds itself in Engineering and Behavioural Psychology. Accordingly, attempts to intervene in behavioural decisions are more

specifically directed towards particular behaviours, called target behaviours. In contrast to *Gamification* where joy and fun shall be instilled in unpleasant environments, *Persuasive Technology* rather looks at ways to stimulate intrinsic needs.

PSYCHOLOGY

MOTIVATIONAL PSYCHOLOGY

As the goal is not only concerned with creating a behavioural change, but also with maintaining it and spreading it, the field of *Motivational Psychology* provides valuable insights. Mainly concerned with abstract concepts and notions, it allowed a deeper understanding of causal links between mental phenomena and behavioural outcome.

SOCIAL & ENVIRONMENTAL PSYCHOLOGY

Given the fact that the behavioural inspiration is intended to mainly address changes in the realm of social and environmental conditions, a starting point for literature research is the body of literature that explores why individuals are so little concerned with behaviours that protect their harmony amongst each other and with the planetary ecosystem.

2.1.2 CONCEPTUAL LINKAGE OF LITERATURE

The research approach is not intended to follow a practical line of work being guided by empirical research. It is also not aimed to be a purely theoretical approach, guided by literature research and the illumination of philosophical insights and principles. Instead, bringing fields together in a novel way, the route of a design-led, exploratory research is taken. Ultimately, the objective is the verification of the assumptions inherent in the current vision of the game app as instigator of behavioural change. This aligns with the research questions.

Research from *Psychology* will help identify abstract causal relationships between value and behaviour that will be operationalised with *Human-Computer-Interaction.* In other words, the impact of elements of *Human-Computer-Interaction* on barriers and triggers of behavioural change, grounded in *Psychology,* will be explored. Put into an example; *Motivational Psychology* argues that *identification* can be a strong determinant of behavioural change. *Human-Computer-Interaction* then illuminates the link between on one hand virtual-digital, personal representations like *Creatures* and in-game *figures* and on the other hand, real-life *identification*. Then in a third step, these two researches will be drawn together to make a case for

the app. The assumption that with the implementation of the avatar in the virtual-digital environment identification would ensue, which creates willingness to change real-life behaviour. Naturally, this is not an established causal line, yet, but it is only intended to illustrate the intended interwovenness of *Motivational, Social and Environmental Psychology, Human-Computer-Interaction* and *Mindful Meerkats,* the envisioned smartphone game.

Along these lines, a clear separation between an inductive and a deductive approach is not possible. The research will not only test hypothesis by looking into research (*deductive approach*) and thereby verify assumptions about value-means-behaviour links, but also derive new hypotheses from data and empirical observation (*inductive approach)* and thereby add new elements to the app design. With this explorative and open approach, it is hoped to expand the outcome and strength of the research and preventing a research bias. This endeavour is most prominently undertaken in section 7.2.

2.1.3   LITERATURE BODIES

Research into *Social & Environmental Psychology* can be started off with the comprehensive article *"Mind the gap: why do people act environmentally and what are the barriers to environmental behaviour?"* by Kollmuss and Agyeman (2002). They provide an overview into the research on correlations between knowledge, values and behaviour. Their title is a reference to Glasser's coinage of the term "gap" (2004; 2007) for the phenomenon of great disparity existing between "*a particular society's ideals and practical reality" [p. 39].* Hereafter, the same term shall be used on the individual level to refer to the apparent *gap* that exists between *knowledge, values and mindset* on one side and *behaviour, actions and lifestyle* on the other side. *Social Learning* as a concept will also play a major role in this work (Wals 2007).
Steg's *"Integrated Framework for Encouraging Pro-environmental Behaviour"* (2014) is a valuable source for further insights. Dietz' *"Environmental values"* (2005) will guide the exploration of values. Additionally, several articles by Hobson (2002; 2001; 2003) from a consumption perspective will illuminate the causal relationship further. A string of research circling around the concept of *Environmental Self-Identity* by Ellen van der Werf will provide additional detail on the link between self-understanding and behaviour: *"It's a moral issue"* (van der Werff, Steg, and Keizer 2013a), *"The value of environmental self-identity"* (van der Werff, Steg, and Keizer 2013b) and *"Normative, Gain and Hedonic Goal Frames Guiding Environmental Behavior"* (Lindenberg and Steg 2007). Lastly, the role of society, surrounding,

culture and social forces, e.g. the *Broken glass hypothesis*, will be investigated with the help of the following literature: *"Normative Social Influence is Underdetected"* (Nolan et al. 2008)*, "Norm, Network and Commons: The invisible hand of community"* (Lejano and Fernandez de Castro 2014)*, "The spreading of disorder"* (Keizer, Lindenberg, and Steg 2008) and *"Measuring cultural values and beliefs about environment to identify their role in climate change responses"* (Price, Walker, and Boschetti 2014).

As far as *HCI* is concerned, different strings of the stream have to be considered. Literature on *Gamification* would be the following: *"Gamification – Using Game-Elements in non-game contexts"* (Deterding, Sicart, et al. 2011), *"A Real little Game – The performance of belief in pervasive play"* (McGonigal 2003), *"Applied Behavioural Economics: A Game Designer's Perspective"* (Butler 2015) and *"Casual Social Games as Serious Games – The Psychology of Gamification in Undergraduate Education and Employee Training"* (Landers and Callan 2011). The impact of virtual representations, i.e. *avatars* on individuals can be examined by a closer look at articles like *"Virtual Superheroes: Using Superpowers in Virtual Reality to Encourage Prosocial Behaviour"* (Rosenberg, Baughman, and Bailenson 2013), *"My Avatar and me – Gender and personality predictors of Avatar-Self discrepancy"* (Dunn and Guadagno 2012)*, "Avatar Creation and Video Game Enjoyment "* (Trepte and Reinecke 2010)*, "Me, myself and I: The role of interactional context on self-presentation through avatars"* (Vasalou and Joinson 2009) and *"How the physical similarity of teenagers can influence the learning of emotion regulation strategies in teenagers"* (Wrzesien et al. 2015). Notable examples of games that try to implement and/or mimic real elements in their virtual environments are illustrated with the help of *"More than just a game: Impact of the Ingress Project on the internet and security"* (Kabernik 2013), *"What went wrong in the Sims online"* (Steen et al. 2006), *"Motivating Environmentally Sustainable Behavior Changes with a Virtual Polar Bear"* (Dillahunt et al. 2008) and *"Achieving Sustainable Society through Micro-Level Crowdfunding"* (Sakamoto and Nakajima 2013).

2.2 WRITING CONDUCT: THE SCIENTIFIC ITERATION METHOD

This thesis is intentionally written in such a way that the process of finding design imperatives for the app design gets transparent. In a startup as well as in programming and IT-development, the activity of going back on presumably static products and services and adjusting and improving them, a process called *Iteration*, is *commonplace*. For science, only recently with the popularity of post-normal science, *Uncertainty* and self-

scrutiny have fully entered the scene. But the extent of scrutiny and willingness to start over, is not very common in the scientific conduct. The scientific rationale has been mainly about finding unambiguous, law-like and mechanistic truths. Once this truth is found, a researcher has to stick to the stance as a musical group has to stick to their genre to deliver what the "brand" promises.

This stands in sharp contrast to programming and startup practices where temporary discoveries and decisions, constant adjustments and refining, are the norm. To break with that tradition, this work tries to employ the indicated iterative process. It shall be applied here to take the reader by the hand and allow an insight into the organic, simultaneous process of research and app design.

To pursue this *Scientific Iteration Method* every chapter within 3, the Theories Chapter will end with a mental visualisation of the integration of the theory into the logics of the thesis and how it fits into the mental model. After all the theories are introduced piece by piece, they will create a combined picture that illuminates the thesis' results. It will be an adjustment of the first mental model that has been set up at the beginning of the research process. This initial mental model on which the iterations will build will be outlined in the next chapter.

2.3 MENTAL MODEL – ASSUMED

Given the fact that this thesis shall be used for two purposes, finding new answers to a prevalent question, and verifying existing answers, as mentioned earlier, it is equidistant from a purely *inductive* and a *deductive approach of inquiry*. The thesis therefore has the purpose to check assumptions that have been incorporated into the app as well as coming up with new design imperatives derived from existing literature.

To make this distinction clear, the mental model derived from the assumptions will be set-up first. It can be seen as the half of this work which is based on *deductive reasoning*. Later-on, this *ex ante* developed model will be complemented and adjusted with the help of the literature.

Certain elements in the app have been purposefully included to achieve certain psychological states that were assumed to bring about willingness to change behaviour. They are therefore *Means* to create *Values* which in turn are intended to be conducive to voluntary change. The model, and the app respectively, was set up with the intention to create a mixture of *intrinsic* and *extrinsic motivation* and focus on *action* as opposed to *attitudes*.

The *Means*, vital app elements, that were initially assumed to be most effective to create behavioural impacts, are the following:

- High score boards, also known as *Leaderboards*
- An *online community* or *Social Network Site (SNS)*
- A virtual representation, also known as *Avatar*
- Playful elements in a non-game system, also known as *Gameful Design* or *Gamification*
- A way to monitor personal choice, also known as *Quantified Self*
- *Information*, leading to *Knowledge* and presumably *Empowerment*.
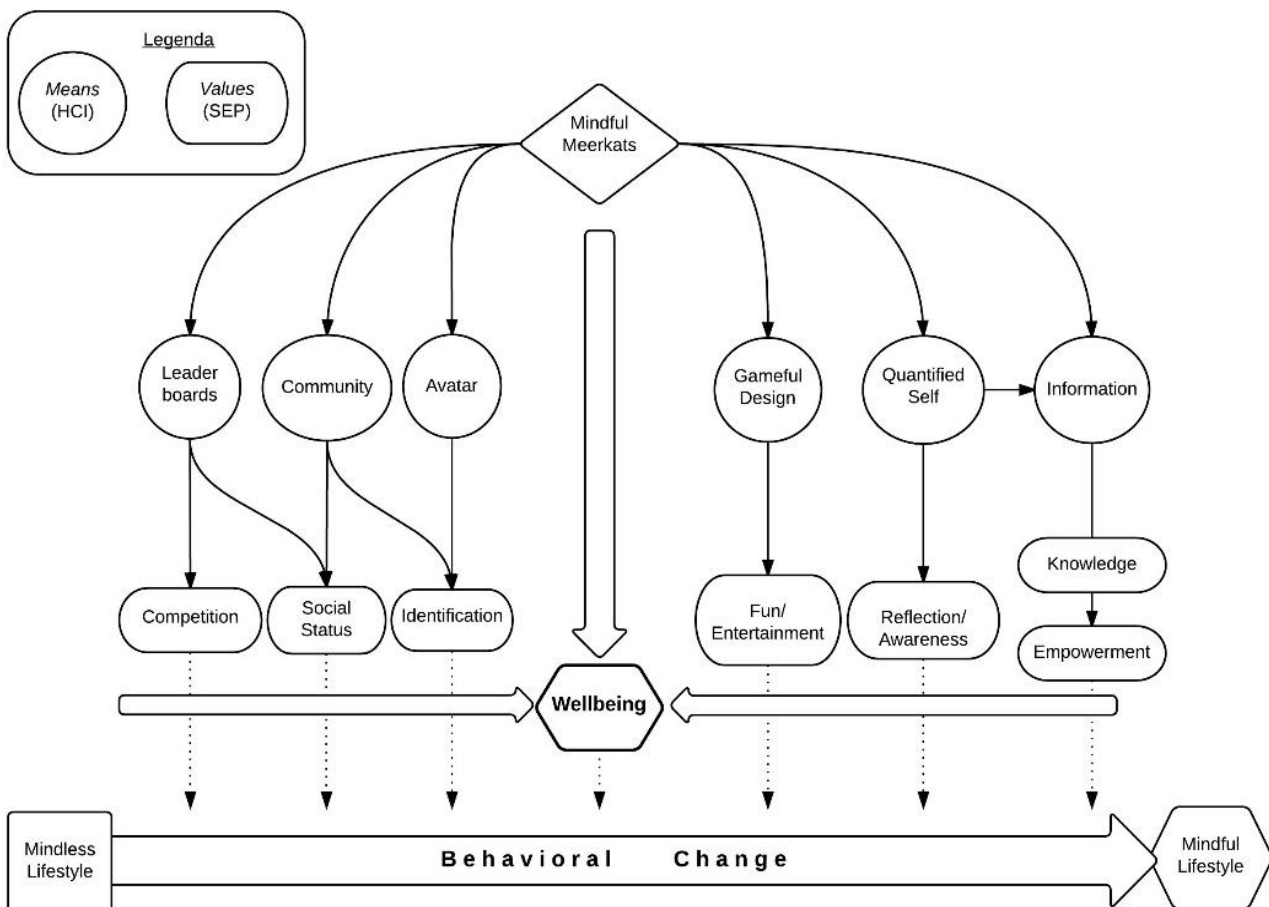
FIGURE 1: MENTAL MODEL OF "MINDFUL MEERKATS"
(HCI = HUMAN-COMPUTER-INTERACTION;
SEP = SOCIAL AND ENVIRONMENTAL PSYCHOLOGY)

Each of these *Means*, which can are generally researched in the discipline of *Human-Computer Interaction*, are further assumed to bring about mental conditions and emotional states. At the time where the app-design was

initiated, the terminology was unclear and so they were simply called Values.

This three-tier-approach can be broken down into manageable strings and nodes. In Figure 1, this mental model is depicted. Each *Means* of *HCI* – as well as intended element embedded in MM – is linked to a respective *value* identified by SEP to make a case for the behavioural change to take place.

These *assumptive strings* shall then become sub-questions. As the strings are currently based on very little concrete research and data, they are still subject to change throughout the course of the draw-up of the thesis. In the diagram *wellbeing* is at the center. It is assumed that the *values* and notions bring *wellbeing*. As such, at this point, the values, which the app wants to foster, are *competition, social status, identification, fun, reflection/awareness*, and *knowledge/empowerment*. Each of these values, so is assumed, contributes to behavioural change as it provides a motivation.

As an example, one of the *assumptive strings* denotes that change can be created via the *Identification* with a group or concept through an avatar. This change even takes place if the individual generally diverts from the groups or the concept's rationale he identifies with.

- FIRST TIER CHECK: Does Identification trigger change?
- SECOND TIER CHECK: Does a *virtual* game *agent*, i.e. a virtual representation of the real self, create *Identification?*
- THIRD TIER CHECK*:* Does the designed avatar in MM fulfil the criteria to serve the purpose of creating identification and change?

Due to time constraints, a choice regarding the number of *Means* had to be made. Proceeding with an exclusion mechanism, the instruments and elements that are more difficult to assess were neglected for the time being.
Gameful Design can hardly be limited to one particular aspect, and thereby it is hard to test it in its entirety. Furthermore, *Mindful Meerkats* strives to be entertaining as a system, which complicates the matter of verifying anticipated impacts of fragments.
Similarly, the impact of *Knowledge* cannot be limited or verified easily. Also, it is partially covered by the chapter around *Quantified Self (QS)*, acknowledging that the *feedback* inherent to QS is a form of relaying *Information* to individuals. That leaves us with the elements *Virtual Representation, Online Community, Quantified Self* and *Leaderboards*.

To be able to investigate these from a scientific angle, the next chapter will equip the reader and author with the necessary vocabulary and insights from *Psychology, Persuasive Technology* and *Human-Computer-Interaction.* Consequently, the said elements (later referred to as *Motivational Affordances*, which should get clear in the next chapter) as intended in *Mindful Meerkats* will be outlined. Applying vocabulary and insights from the literature onto the elements, *Behavioural Insights* will be collected. Afterwards, the model presented here, will be juxtaposed with the *Behavioural Insights* to be able to formulate *Lessons* for *Mindful Meerkats.*

3 CONCEPTS & THEORIES

3.1 PERSUASIVE TECHNOLOGY & MOTIVATIONAL PSYCHOLOGY:
HOW DOES BEHAVIOURAL CHANGE OCCUR?

If we break down the mental model into assumptions, it is clear that there are assumption about *Behaviour,* based on *Action,* as third tier; and *psychological states,* such as, most prominently, *Motivation,* that are conducive to behavioural change, as second tier, and *Impacts* of Elements of *Human-Computer-Interaction,* as first tier.

Yet, the first tier is only composed of instruments that are assumed to induce behavioural change. As it is ultimately intended to change the entire society's behaviour, it can be spoken of societal change. To achieve societal change, the social norms have to be adjusted. This conversion from single action to societal change can be tracked and accompanied with respective theories. At each of the nodes a different information system with different tools can be seen most applicable. Therefore, a conceptual delineation of these systems capable of changing behaviour through technology will be presented in the following section. Afterwards, the concepts, that are part of the action-society-chain, will be put in context resorting to the disciplines introduced above.

The following picture unfolds (Figure 2):
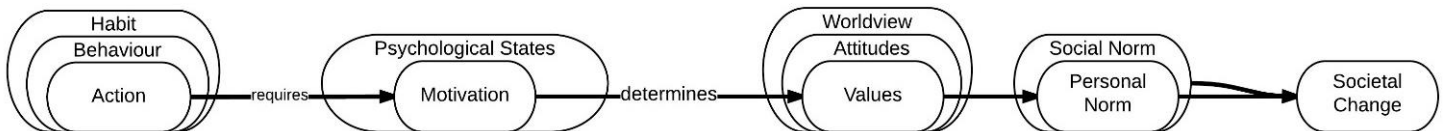
FIGURE 2: HOW A SINGLE ACTION CAN EVOLVE TO BE SOCIETAL CHANGE – CONCEPTUAL PROGRESSION (CREATED BY AUTHOR)

Actions of individuals are forming *Behaviours. Behavioural patterns* are forming *habits.* If this tripod is unpacked, the main component is considered to be *Motivation.* The *Fogg Behaviour Model* will bring more insights into the emergence of behaviours illuminating other elements apart from Motivation. *Motivation* will be discussed as understood by Ryan & Deci's *Self-Determination Theory.* The trifecta of *Values, Attitude* and *Worldviews* will be illuminated with research on the *Attitude-Behaviour-Gap* from Kollmuss & Agyeman (2002) and Ariely (2008). The topic of *Cognitive Dissonance* will be broached to substantiate the fallacy that attitude change alone leads to

Behavioural Change. The changed behaviours resulting in attitude change will then create a new personal norm. Stern's *Value-Belief-Norm-Theory* (1999) and contemporary adaptations thereof from Vandenbergh (2005) and Oreg (2006) will assist highlighting the transition from personal norm to social norm and finally to societal change.

3.1.1 ACTION/BEHAVIOUR/HABIT

The first node in our *Conceptual Progression Model* is *Action*. An individual performs an action when he or she engages with the environment in a voluntary or involuntary way. All actions together form individual *Behaviours*. Usually, especially in Marketing, *Behaviours* are assumed to mainly depend on *Motivation*. The following Model by BJ Fogg departs from that common notion and adds two other ingredients determining whether a behaviour takes place.

FOGG BEHAVIOUR MODEL

In his article "Behavioural Model for Persuasive Design" Fogg (2009)[3] describes the components of a behavioural model that condenses and synthesise different approaches from psychology, economics and sociology into one. It thus provides a consistent framework to understand what the components are for any behaviour to occur. The three ingredients of any behaviour according to him are *Motivation, Ability* and *Trigger* (MAT). Only if all three of them are present in sufficient quantities at the same moment in time, a behaviour will take place.

It is important to note that Fogg's (2011) perspective mainly relates to design imperatives and the intention to nudge people to do certain actions and form behaviours as opposed to just explain them after they have occurred. This is more of a theoretical disclaimer than an obstacle or impediment for this work as Foggs's *ex-ante* perspective is applicable in the case at hand. Given that the question driving this work concerns the design of a Behavioural Change-game where target behaviours are envisioned, it is more valuable to be aware how behaviours can be created as opposed to understanding how they emerged *ex-post* after the fact.

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[3] This chapter is relying heavily on this journal entry and its updates and adjustments on Fogg's website (Fogg 2011)

In the following diagram (Figure 3), the interrelation between the three components is visualised. He integrates the concept of the *behaviour activation threshold*. For a behaviour to take place, the *behaviour activation threshold* has to be passed. As the diagram shows, triggers fail when motivation and/or ability are not high enough. High motivation in an extremely hard situation may not bring the target behaviour. High simplicity/high ability/low difficulty for a person with no motivation will not bring the target behaviour either. Fogg summarises: *"In order for behaviour to occur, people must have some non-zero level of both motivation and ability" (Fogg 2011, 3)* However, extreme levels of one can lead to a compensation of the other. An over-simplification of a situation can create motivation and a high motivation can create new conditions that simplify the target behaviour to that extent that the behaviour can be executed: *"If motivation is high enough, people might do extraordinary things – even difficult things – to perform the behaviour." [ibd.]*
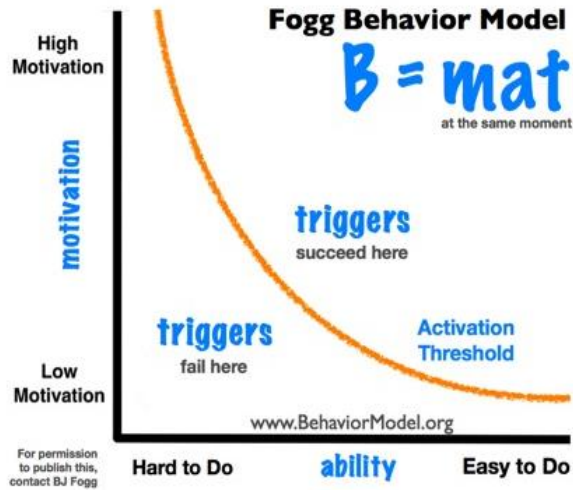
FIGURE 3: FOGG BEHAVIOR MODEL (FOGG 2014)

In that logic, it is not always the best option to attempt to increase motivation of people, but also to make the target behaviour less complicated and thereby increasing the ability of the target audience to fulfil the task.

MOTIVATION

Yet, *Motivation* is a vital element of a behavioural decision and also the most addressed issue from a designer's perspective. Designers and marketers often assume that it is the only necessary ingredient and therefore it is mostly tackled. Products are designed to be visually appealing and advertisements are intended to motivate to draw spectators towards a purchase.

According to Fogg, there are three types of motivation:

1. Sensation: Pleasure & Pain
2. Anticipation: Hope & Fear
3. Belonging: Social Acceptance & Rejection

He calls them *motivators*. I would like to build on this terminology, and, as this list is doubtfully exhaustive, thus add the specification *"core"*. They are certainly essential. Also, the key element of intrinsic dichotomy within them, allows for the additional specification *"dual"*.

Dual Core Motivators

DUAL CORE MOTIVATOR #M1: SENSATION

Pleasure & Pain

Clearly, humans' behaviour is dependent on their wellbeing. The experience of pleasure and pain coins choices and rationale. Learning is greatly induced by these constructs. The famous example of the child that touches the plate of a hot stove bares evidence of that. From the three dual core motivators, it is the most primal intuitive experience. It is a sensorial, bodily response to an external impact. It occurs immediately after or while an action takes place and thus is more of a projective experience with regard to how future actions and behaviours are impacted. The decision itself to perform a particular action cannot be affected anymore. In that sense the immediate motivation for that action is not subjected to the sensorial influence. It can be interrupted, but that makes its occurrence only shorter and not inexistent.

DUAL CORE MOTIVATOR #M2: ANTICIPATION

Hope & Fear

In contrast to *Sensation,* in the second dual core motivator *Anticipation* the time span between occurrence and event is not immediate but forwarded. Whenever an action is assumed to take have a consequence, this has an impact on our decision-making. If it is positive, it is *Hope,* if it is negative, it is *Fear.* In either case, the likelihood for us to engage in an action, increases, or decreases respectively, if we have an anticipation connected to an action. It is also far less primal than *Sensation* because it requires calculation and projection. Awareness of outcomes and capacity to quantify the personal value for these outcomes are necessary. These are qualities that require rational thinking and therefore supersede primal instinct.

Examples are joining a dating site in the hope to find a partner, obtain an insurance out of fear of loss or requesting a credit card in the hope to live better or in the fear to not enough money available when it is needed.

Even going to the gym is more motivated by the hope of leading a healthier or fitter life, as opposed to enjoying the *Sensation* of a strained body. Purchasing decisions can also be relayed to this motivator. Products catering for fear are virus programs, pepper spray, umbrellas and emergency buttons. Products catering for hope are self-help advisory books, headphones or makeup.

DUAL CORE MOTIVATOR #M3: SOCIAL BELONGING
Acceptance & Rejection

 The third motivator of *Belonging* out of the three motivators is subjected to the longest timespan. Social Norms and values regulate your behaviour with regard to fitting in or divert. Being excluded from social dynamics and happenings is a harsh consequence of certain behaviours. Attempting to avoid this repulsion from community and society creates motivations for otherwise unlikely behaviours. Looking at the rules of evolution, this behaviour can be put in context clearly, where expulsion from a pack and herd could mean certain death. Therefore, the tendency of individuals to try to adhere to the societal rules and the urge for *Belonging* gets exemplified.

 Fogg has intensively researched the powers of the Social Network of Facebook (See 5.2) and claims that *"Facebook gains its power to motivate and ultimately influence users mostly because of this motivator. From posting profile pictures to writing on The Wall, people on Facebook are driven significantly by their desire to be socially accepted."* (ibd., 4)

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 Looking at the three motivators in comparison, we have to acknowledge that they are not applicable for all design decisions. Physical responses like *Sensation*'s Pain/Pleasure are very hard to directly create in a design context. Yet, to understand the range of motivating elements, Fogg's framework is very valuable. An aspect which has to be kept in mind is the fact that Fogg's *Behavioural Model* is mainly designed to address so-called *tiny habits* and thereby not applicable for complex changes. As Mohr puts it:

> *"Fogg's model is elegantly simple and very useful within the constraints he outlines. However, the restricted focus does not fit the goals of many treatment interventions that attempt to address more complex problems such as reducing symptoms of depression or anx-*

> *iety, treating insomnia, improving self-management of chronic illnesses, coping with addictions, or implementing healthy lifestyle programs." (Mohr et al. 2014, 3)*

This criticism is valid in Mohr's context of designing health policies, but given that *Mindful Meerkats* is exactly aiming at changing small behaviours, this criticism is not a source for concern.

ABILITY (SIMPLICITY)

The second major component of Fogg's Behavioural Model is *Ability* or the mere capacity to perform an action. Conversely, the construct of simplicity applies. The less difficult an activity is for the motivated agent, the higher is the *Ability*. This framing allows for two approaches to increase the *Ability*: An individual can either be trained, and educated to be more capable to pursue a *target behaviour,* or the difficulty of meeting the goal can be reduced by simplifying it. To understand how we can reduce the barriers within behavioural patterns via the *Ability*-component, Fogg identifies six elements that shall be called *Ability constraints* hereafter. They are linked in such a way, that if one of them is too dominant or present in a choice environment, the behaviour is not taking place because the agent cannot cross the *behaviour action threshold.*

Ability Constraints

The six *Ability constraints* are: *(a) Time, (b) Money, (c) Physical Effort, (d) Brain Cycles, (e) Social Deviance* and *(f) Non-Routine.*

ABILITY CONSTRAINT #A1: TIME

Relatively self-explanatory, *Time* is an important factor in *Behaviour*. If an *Action* requires a long time, the motivation has to be high enough to be willing to bear the opportunity cost[4] of not being able to use the time on something else. The more time-intensive a *target behaviour* is, the more difficult it is and thus reduces *Ability*. As much as the sentence "I have no time for that" should rather say "I don't want to use my time for this", a ranking of activities comes to play. The shorter tasks are usually given precedence given equal *Motivation.*

ABILITY CONSTRAINT #A2: MONEY

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[4] Opportunity cost is defined as the amalgamation of value that has to be given up by making one choice. If you use 1 Euro on a piece of candy, you cannot buy a piece of chocolate. The value of the chocolate is the opportunity cost.

Similar to *Time, Money* is straightforward with regard to its action-hampering capacities. If an *Action* is connected to an expense of money, an individual that has limited means will be unable to invest this amount. Conversely, the lower the monetary barrier of a particular activity, the greater the simplicity.

Money is also linked to *Time* in the sense that it can be used to offset the *Time* constraint. A wealthy person has the capacity to invest into services and personnel that will reduce the limitation of his time. Time-consuming chores like laundry or dishwashing can potentially be overcome with a domestic assistant, being willing to pay money for the gained time.

ABILITY CONSTRAINT #A3: PHYSICAL EFFORT

The more strenuous an activity is, or the more physical sacrifice and investment it requires, the more difficult it becomes. Assuming the design challenge is the location and distribution of election chambers in a governmental election, it is more likely to increase the amount of participation if the meeting points are evenly distributed over the area in question, so that not much *Physical Effort, Time* or *Money* have to be invested to achieve the goal.

ABILITY CONSTRAINT #A4: BRAIN CYCLES/COGNITIVE EFFORT

Fogg calls this element of simplicity 'Brain Cycles'. It describes the fact that a *target behaviour* can be hindered by the necessity to think heavily. The author chooses to call it *Cognitive Effort* to be a clearer term and to align with *Physical Effort*. Many decisions are guided by habit and routine, so that the emergence of an unknown behaviour can be constrained by deep and old patterns and thoughts (Sabatier, Jenkins-Smith, and others 1993).

ABILITY CONSTRAINT #A5: SOCIAL DEVIANCE

Simplicity can also be threatened by a behaviour that requires social misbehaviour. If one has to diverge from the norm and breach social codes, this can potentially be detrimental and increases the difficulty for an agent to engage in such a behaviour. Conversely, also with reference to *Motivator #3: Belonging*, the more an *Action* is in line with socially expected or accepted codes, the more likely its accomplishment gets.

ABILITY CONSTRAINT #A6: NON-ROUTINE

Repetition of actions forms habits and several habits together form routine. The more habituated an *Action* is, the less conscious attention it

needs. Therefore it becomes easier the more often you perform it. Inversely, the more strange, unknown and far from one's routine an *Action* roams, the more troublesome one perceives it to be. For that reason, to offset the additional difficulty from doing something highly disparate from usual behaviours or routines, it is important to construct these *target behaviours* to be extremely simple and especially rewarding.

TRIGGER

For any behaviour to take place, it is important that the individual in question is not only able and willing, but also gets made aware of that *Motivation* and *Ability* via a timely fitting reminder. Fogg calls this *Trigger,* other theorists e.g. Duhigg (2012) call these *cues* or *prompts.*

They are especially important because oftentimes target audiences are able and willing to perform a particular *Action*, but they do not see that this is the case; they are unaware. All that is missing is their attention, which can be created via a *Trigger.*

Fogg differentiates between *(a) Spark, (b) Facilitator* and *(c) Signal.*

TRIGGER VARIANT #T1: SPARK

A *Spark* is the type of *Trigger* that is particularly designed to address a lack of *Motivation.* It should be combined with a motivational element, aiming towards the creation or stimulation of one of the three *dual core motivators.* In that way, the motivational message gets stronger. Examples are: A recipe for a vegetarian meal that creates *Pleasure,* an inspiring video to create *Hope* or a text message to invite you to an event in the vicinity to create *Social Acceptance.* It is important that the *Trigger* is clearly associated with the *target behaviour* to function.

TRIGGER VARIANT #T2: FACILITATOR

What *Sparks* are for *Motivation, Facilitators* are for *Ability.* They are in that sense appropriate for users that have high *Motivation*, but lack *Ability.* Similar to *Sparks,* they can be integrated in text, graphics, videos and more. It manages to link awareness of a particular individual to the full capacity of an *Action* that the person is already motivated for. Simplifying software services with One-click-option for instance is a way to facilitate a process. As all *Facilitator* it attempts to show how easy a particular behaviour can be via a) relaying the information and b) making it easier.

TRIGGER VARIANT #T3: SIGNAL

Out of the three *Triggers, Signals* have the smallest burden to bear. They are neither designed to create motivation, nor to create ability. Their sole purpose is making the agent in question aware of the simultaneous emergence of willingness and capacity of a certain action. It serves as a reminder. The same way that a *Spark* feels disturbing to a person that is already motivated, a *Facilitator* feels condescending to a person that is already capacitated. Informing the observer is enough.

3.1.2   MOTIVATION AND OTHER PSYCHOLOGICAL STATES

Although extensively treated in 3.1.1 as part of Fogg's Behavioural Model, *Motivation* deserves a separate look from the perspective of Deci & Ryan, who not only covered different elements of *Motivation* than Fogg, but also rather have a fully psychological perspective as opposed to Fogg's view that is also based on Design and technology.

SELF-DETERMINATION THEORY

Already introduced in 1985 by Deci & Ryan, *Self-Determination Theory* (SDT) was only popularised by Daniel Pink's book *Drive* (Lewis 2014, 14). The starting point of *Self-Determination Theory* a distinction between externally motivated and internally motivated actions. These are throughout considered as *extrinsic* and *intrinsic* motivation. *Extrinsic* motivational sources are external rewards which are connected to a particular activity by outside party is willing to provide. Examples for extrinsic motivations can be monetary benefits, such as discounts, salaries or wages, but also promises or favours from the realm of non-monetary, intangible rewards can be seen as *extrinsic* motivational drivers. For example: "If you come with me to my parents this weekend, I give you a massage tonight." Even if person x is not motivated on own accounts and from own rationale, which would be considered *intrinsic* motivation, the prospect of a massage, i.e. an *extrinsic* reward, potentially creates motivation. Vallerand et al. (2002, 37) create a hierarchical model of motivations, where he classifies the sources for intrinsic, self-perpetrating motivations on one hand and the extrinsically motivated behaviour to attain contingent outcomes on the other hand.

Aside from the seminal separation of motivation into *extrinsic* and *intrinsic* in character, the major contribution of *Self-Determination-Theory* is the understanding of *intrinsic* motivational sources to be exhaustively grasped with the three constructs *Competence, Autonomy* and *Relatedness*. All components have to be given, all conditions fulfilled, to create intrinsic motivation, or *self-determination* and devotion, in the agent in question. This bears

a shift from controlled, outside motivation to autonomous, inward motivation, a process known as *Internalisation*.

COMPETENCE

Competence describes the need to feel skilful and capacitated to achieve own goals. If tasks are optimally challenging and are accomplished with a sufficient amount of reinforcing feedback, the condition is fulfilled.

AUTONOMY

Autonomy relates to experiencing a full-fledged ability to make choices and influence the given environment. The feeling to be capable in any given moment to choose your path mostly brings additional willingness to continue that particular activity.

RELATEDNESS

Relatedness refers to the emotional state where the individual feels a connection and ownership towards the activity that is done or the goal that is pursued. Being capable of creating meaningful change and seeing an impact is vital for motivation and is manifested in *relatedness*.

COGNITIVE EVALUATION THEORY

Cognitive Evaluation Theory, also attributed to Deci & Ryan, emerged from SDT as an attempt to specifically look at the interrelation and spill-overs between *intrinsic* and *extrinsic motivation*: How does *extrinsic motivation* become *intrinsic?* What are the mechanisms of transitions of that nature? What are the dangers?

Empirical research on gamification by Hamari & Huotari back up the assumption of *Cognitive-Evaluation-Theory* that extrinsic rewards can jeopardise intrinsic motivation, in the sense that the external rewards potentially overwrite the internal drive. It therefore demands careful evaluation whether extrinsic rewards should be introduced into an environment, given that they might threaten the already existing, and ever more long-lasting, intrinsic motivations.

3.2 CONCEPTUAL SYNTHESIS: AN EXTENDED BEHAVIOURAL CHAIN

If now *Self-Determination-Theory, Fogg-Behaviour-Model* are brought together with *Gamification*'s *Motivational Affordances*, we can outline the following behavioural chain: *Motivational Need – Motivational Affordance – Psychological Outcomes – Behavioural Outcomes/Target Behaviour.*

3.2.1 MOTIVATIONAL NEEDS

Motivational Needs are first formulated in Zhang (2008) as antecedents of Motivational Affordances. An affordance generally, and the same applies for any *Motivational Affordance*, is only effective if it fulfils a need. A handle is only an affordance that suits a function, if there is a need to use that handle, e.g. steering a bike or lifting an object. Being a seemingly arbitrary example, this gets valid when juxtaposed with the case of *Motivational Affordances* at hand. Without being aware of what needs exist with the capacity to motivate, we cannot identify potential affordances that fulfil these needs and bring about their satisfaction.

In his analysis of *Motivational Affordances* in *Information and Communication Technology* (ICT), Zhang states: *"When using ICT involves our motivational needs, we feel interested (thus attend and engage). When using ICT satisfies our motivational needs, we feel enjoyment (thus want more)."* (p. 145). He further argues that *Self-Determination Theory* (SDT) provides a valuable point of departure to connect *Motivational Affordances* to *Motivational Needs*. SDT's three core elements are *Autonomy, Competence* & *Relatedness*.

Zhang complements each of these SDT cores with an additional abstract element. Thereby, he formulates the motivational necessities and breadth more clearly. For the pragmatic use of these insights, this does not pose an impediment, because they can be treated as one section when informing operations and design. He embeds these concepts in the categories of psychological, social, cognitive, and emotional sources of motivation, because they are more applicable to inspire behaviour when pitched against physiological and external sources of motivation. *Autonomy* gets completed with the notion of *Self*. *Competence* gets linked with *Achievement*. *Relatedness* gets parsed into *social* and *psychological relatedness*. (Details in Annex, Item A)

Another valuable Design approach is Lewis' *Design Patterns*. Departing from Reiss' Theory of Desires (2004), that identifies 16 Desires as sources of intrinsic motivation, Lewis (2014) comes to similar conclusions as

Zhang. There are internal motivational drivers that make us behave in a certain way. When setting up what he calls *Motivational User Stories*, a Reiss Desire is formulated into "As a User, I want <Something>, so that" (p. 24). Being aware of these desires, a designer can make sure to cater to one of them to increase motivation. It is important to note that these behavioural patterns are mostly subconscious, so knowledge alone cannot change the behaviour (See Attitude-Behaviour-Gap, Kollmuss and Agyeman 2002). He for example formulates the *User Story* for *Power* as "I can feel powerful and meet my goals". With respect to SDT, he states *"Reiss desires broadly subsume SDT. Independence relates to autonomy, power relates to competence, and social contact to relatedness."* (p. 18). Looking at how Zhang's understanding of *Motivational Needs* relates to Reiss' *Desires* and Deci & Ryan's *SDT*, it is noticeable, that Zhang has incorporated many of Reiss' Desires to extend SDT. Therefore, further elaboration of this work will rely on Zhang's conceptualisation of *Motivational Needs* as conceptual framework.

3.2.2   MOTIVATIONAL AFFORDANCES

Deterding (2011) defines *Affordance* as *"perceived opportunity for action" (p. 2)*. In the understanding of the author *Affordances* are defined broader. Any element and quality of an entity, be it an object, system or service, is an *Affordance,* as long as it enables their users to fulfil a particular functional task. Another word for affordance would be 'enabler'; an affordance enables the user of the respective thing to do something. In line with that, Gibson (1977) coined this term as *"Affordances of an environment are what it offers the animal, what it provides or furnishes, either for good or for ill"* [p. 127] and Chemero (2003) more recently refined, that *"an affordance … is a resource that the environment offers any animal that has the capabilities to perceive and use it"* [p. 182].

For example a cup handle enables users of the cup to drink from it without burning their hands. Conceptually, it can be applied for services or technologies as well, where an element serves a particular purpose. For instance the upgrade from a handheld planning device to an iPhone could be seen as mainly relying on the capacity of the iPhone to make and take calls, and thereby merging planning unit and mobile telephones. Location-monitoring like the Global Positioning System (GPS) enabling *Geospatial Logging* and *Location-Based Services* (Celino 2013; Tuite 2015; Matyas et al. 2008) and permanent internet connection coverage are in that regard the affordance that allows easier mobile communication.

In the realm of *Gamification*, it is used as a point of departure for *Motivation* and thus known as *Motivational Affordance*. In the context of information systems, such as games or gamified environments, Hamari (2015) state that a system is needed *"that fulfils the motivational needs of the user for them to be satisfied with the system and continue with its use. … they are stimuli designed with the intent of answering the users['] motivational needs and affecting the users' psychological states"* (Hamari 2015, 9) to effectively gamify a non-game system.

Motivational affordance	→	Psychological outcomes	→	Behavioral outcomes

FIGURE 4: ABSTRACTED ELEMENTS FROM THE DEFINITIONS OF GAMIFICATION (HAMARI 2015)

An element of a service, system or object that motivates a spectator to engage with the entity and become and stay a user of the system, can be seen as a *Motivational Affordance. (ibd.)* Beyond that, we can also use *Motivational Affordance* to refer to elements that manage to motivate you to perform a certain target behaviour. In that sense, it is a very utile operator in the field of technology-induced behavioural change, because technologies and their components can be parsed with regard to their motivational capacity.

Deterding (2011) also argues further that *Motivational Affordances* is not only the most researched and substantiated theory of intrinsic motivation, called *Self-Determination Theory* (Ryan and Deci 2000), but also has been widely applied to the realm of video-games, it has not yet internalised the transfer of positive emotions and other sources of satisfaction into the real world and the context and situation the game is located in. *Gamification* can thus only be applied effectively where the situation and environment in which the gamification is embedded is not in opposition to the emotions that are created in the environment*: "Their focus is by-and-large limited to the properties of the game artifact, ignoring the impact of the social situation or context in which the artifact is engaged with." (Deterding 2011, 2)*

Consequently, he suggest to establish a new understanding of *Situated Motivational Affordances* vs *Artifactual Motivational Affordances* to highlight in which contexts there is an added or decreased gain in *motivation* from the surrounding situation. Only if the emergence of the two does not create friction, satisfaction of *Motivational Needs* can ensue, and a potential *Psychological* or *Behavioural Outcome* follows (See Figure 5).

FIGURE 5: SITUATED MOTIVATIONAL AFFORDANCES (DETERDING 2011)

3.2.3   PSYCHOLOGICAL OUTCOMES

If *Motivational Needs* are the basic human drivers of behaviour and based on natural desires, and *Motivational Affordances* are concrete technological tools within services and systems, then *Psychological Outcomes* are the concrete emotions and sensorial effects of a user being exposed to and influenced by a technological element addressing his own – potentially subconscious – needs. The separation of *Motivational Needs* and *Psychological Outcomes* is chosen in this thesis, because the direct impacts of the *Motivational Affordances* within *Mindful Meerkats* make it possible and advisable to hypothesise on the concrete impact on a player's psyche.

Due to the fact that these are so diverse potentially and are purely assumptive, no typology for psychological outcomes shall be provided. In quoting Sherry and Lucas' (2003) taxonomy for video game engagement reasons, Przybylski (2010) summarises, that "t*heir findings suggest that players use games as a means of accessing one (or more) of the following psychological states: (a) competition, experience defeating others; (b) challenge, experience success following effort; (c) diversion, escape an experience of stress; (d) fantasy, experience novel or unrealistic stimuli; (d) social interaction, have a social experience; and (f) arousal, experience activated positive emotions such as excitement.*" (p. 162)

In his very comprehensive and extensive account "Gamification – Motivation and Effects", Hamari (2015) identifies a number of psychological factors that are identified to be felt in or caused by games. These are *Voluntariness, Flow, Suspense, Relatedness, Immersion, Competence* and *Playfulness* (see Table 1)

Both of these lists are considered as subsets of the five *Motivational Needs* outlined in the previous section. These emotions, mental states and psychological conditions are based on *Motivational Needs* or even overlapping, such as *Voluntariness* and *Autonomy*. If there is a positive sentiment attached to experiencing one of these factors, the emotional impact can be referred back to the *Motivational Needs*.

TABLE 1: COMMON PSYCHOLOGICAL FACTORS LINKED TO GAMES (HA-

Factor	Definition
Autonomy / Voluntariness	a sense that the activity is taken up by the actor herself and is free of outside pressures
Flow	an optimal experience characterized as a state of being fully focused and engaged in an activity
Suspense / uncertain outcomes that are dependent on the actions of the actor	a positive sense of uncertainty of the outcomes (that promotes the sense of agency of the actors)
Relatedness	a sense of belonging, being connected with other people
Immersion	a feeling of being submerged/absorbed/engaged (in a virtual/game reality)
Competence / mastery / achievement	a sense of achieving, being competent
Playfulness	an exploratory curious attitude toward a task

In other words, if a *Motivational Affordance* is capable of creating a prolonged motivation for a user or player to engage with a game or system via the establishment of *Psychological Outcomes*, this ultimately boils down to a subconscious driver, or *Motivational Needs,* that are satisfied.

The correlation between Psychological Outcomes and Motivational Needs can be seen in Table 2.

TABLE 2: PSYCHOLOGICAL OUTCOMES & MOTIVATIONAL NEEDS

Psychological Outcomes	Motivational Needs
Voluntariness	Autonomy
Flow	Affect & Emotion
Suspense	Affect & Emotion
Relatedness	Relatedness
Immersion	Affect & Emotion
Competence	Competence
Playfulness	Affect & Emotion

FLOW

Coined by psychologist Mihaly Csikszentmihalyi (1990), it describes the phenomenon of creative potential and intrinsic drive for focus and concentration. He argues that in this moment of full focus, we are most joyful and productive at the same time. Most of the time this is experienced in artistic activity and creative ecstasies like painting, writing or playing music. It balances the elements of skill and challenge, both at high levels. I want to argue here that it can also be felt in games, the creation of imaginary worlds and daydreaming as daily exercises of creativity.

IMMERSION

The concept of *Immersion* has an entire body of literature on its own, where virtual environment and the creation of *virtual worlds* play a role. The effectiveness of a game in creating feelings in the player is dependent on these passive components as well. These are particular important for conventional games with the sole objective of creating entertainment. And even when *serious games* & *gamification* are concerned, the entertainment component is vital. In *serious games*, the primary objective is reinforced or relieved in severity through the inclusion of entertaining elements. In *gamification* a non-game environment gains a joyful and entertaining layer to make an activity more enjoyable (Deterding, Dixon, et al. 2011). However, as this thesis looks at a game that is particular in the sense that there is not only a virtual environment, but an entanglement of virtual and real worlds take place, the scientific analysis gets even more difficult. The immersion into the game is mostly dependent on the identification of real person with the in-game persona, the *Meeka* that he is.

FUN

Fun is the purely self-purposeful, innocent feeling of being entertained. Usually the target of criticism of *hedonism,* it is less complex than *Flow* or *Joy*. For the time being, it shall be used for this rather reductionist appropriation to delineate that a joyful experience can be a lot more complex than only being fun.

JOY

The pleasant sensation of achievements and fulfilling experiences cannot be equated with fun. The popular understanding of fun is *happiness* and *entertainment*. Games can truly deliver a wider range of emotions. The Web-Channel Extra-Credits beautifully shows in the video "Beyond fun" (Extra Credits 2012) how a game is truly immersive and engaging when it creates emotions beyond the momentous, short-lived pleasure.

3.3 PERSUASIVE AFFORDANCE

This viewpoint relates heavily to Fogg's establishment of the concept of *Trigger*, where timing is essential for any action to take place. This is ultimately the case because a *Situation* can be inappropriate for an *Action* to contain enough *Motivation*. In Hamari's and Deterding's view – who can shamelessly be called the eminent authorities of the scientific exploration of *Gamification – Motivation* is the key feature of behaviour. Accordingly, *Motivational Needs* and *Affordances* are the centrepiece of both their works.

However, if this is confronted with Fogg's notion of *Actions* and the emergence of *Behaviour*, as a culmination of actions, where each *Action* requires a balanced amount of *Motivation* and *Ability* while being incentivised with a rightly placed *Trigger,* the focus on *Motivation* alone appears reductionist.

Looking at the way Deterding posits the environment into the picture, the evolution of a *Theory of Persuasive Affordances* is conceivable. Integrating *Artifactual* and *Situational Motivational Affordances* to give way to environmental factors into Fogg's *Behavioural Model,* these *Persuasive Affordances* have to guarantee the timely would confluence of *Motivation, Ability* and *Trigger*. In other words, only if Designers of *Affordances* – in most of our cases Designers of *Mobile Services* like Apps – favour and be conscious of the *Situation* as well as the *Artifact* and the trinity of *Motivation, Ability* and *Trigger,* whilst having a final Behavioural Outcome – or to speak in Fogg's word, a *Target Behaviour* – in mind*,* a *Persuasive Affordance* is at hand.

In contrast to *Motivational Affordances*, which can be looked at from a determinist perspective, where it can be anticipated, whether a feature has the capacity to be a *Motivational Affordance*, this is not possible here. A *Persuasive Affordance* is due to their highly contextual power more of a rhetorical and constructivist figure, which is intended to inform the Design process. The Designer has to be aware of the following elements:

1. Target Action
2. Motivational Need
3. Artifactual Motivational Affordances
4. Situational Motivational Affordances
5. Ability
6. Trigger

3.4 CREATING CRITICAL MASS – THE POSITIVE FEED-BACK LOOP ASSUMPTION

A *Behavioural Outcome,* as Hamari et al. employ it, and Fogg's *Target Action* are two sides of the same coin. Hamari looks at a *Behavioural Outcome* as a result of a *Motivational Need* being satisfied via a *Motivational Affordance ex-post*. He observes from the perspective of an analyst. Fogg looks at *Target Behaviour* or *Target Action* as objectives of a *Persuasive Technology.* He anticipates and gears with the eyes of a Designer or an Engineer.

Given the divide between *Intentional* and *Unintentional Design*, this merged perspective is legitimate because whatever Design you propose, certain components will not be perceived the way you intended them. Just like an artist or poet will be reinterpreted because the piece grows with the audience interacting with it, a Design piece grows with its spectators and users. Only because an Object or designed entity has been intended with on feature that serves one function that does not mean that there are not inherent other *Affordances.*

In the same way, we should also look at science. In the spirit of the *Scientific Iteration Method,* research grows with its spectators and user. This research was set out to examine the entire behavioural change from a single action to a societal attitude and to a social norm from a perspective

FIGURE 6: ACTION-NORM-PROGGRESSION (CREATED BY AUTHOR)

of *Motivational Psychology* and *Group Theory*. Each of the conceptual stop-overs was intended to be backed up by a respective research strand.

Let us assume that *Action* changes behaviour and behaviour changes habits. Let us assume further that habits change attitudes, and attitudes change values. Only values can reach worldviews, because they are so subconscious. And only if we get to the *Worldviews* we can reach *Social Norms*, which are the amalgamations of *Worldviews* and *Social Practices*. Only if then norms start adjusting, in turn that wills start infiltrating people's minds. The new social norm will subconsciously reprogram people's behaviour and a positive attitude-behaviour-gap will occur where the subconscious positive operating system stands creates a *Cognitive Dissonance* with the non-mindful attitudes. Just flip it.

Accordingly *Motivational Affordances* were assumed and perceived to be able to affect social norms as well.

FIGURE 7: BEHAVIOURAL CHAIN (CREATED BY AUTHOR)

With passing time, the extent got apparent to which this massive intended undertaking was entirely underestimated in time, scope and available research,. Therefore, instead of pretending that this study was never intended to go that fear, the author wanted to outline here rather briefly what was intended, brushing over the topics that cannot be delved into deeply to provide the entire conceptual picture.

In the initial model that was planned, work based on Stern's *Value-Belief-Norm-Theory* (1999), Wals' *Social Learning* (2007) and van Hedlund-De Witt's (2013) *Worldview Framework* should have been applied to help to answering the macro-societal dynamics of norm-change.

3.5   RESEARCH FRAMEWORK

After the reorientation and a reality check, the main components of both literature bodies, Zhang's *Motivational Affordances,* Hamari's *Behavioural Chain* and Fogg's *Behaviour Model* can be compiled into an aggregated framework. It can be examined on the following page as Figure 8.

It is apparent that the roman numbers in the diagramme correspond to the line of thought that was pursued in the development of this work. It is important to note that especially the later elements are not as deeply investigated as the first sections. *Societal Change* for instance was only briefly addressed as a potential outcome of *Mindful Meerkats* in 3.3. However, aiming to verify the assumed impacts of *Mindful Meerkats* on a societal level, the disciplinary background would have to be very different with sociology, public opinion and population dynamics around authors like Lippmann (1922) or Bernays (1952) coming from the other, macro-societal side of the behavioural chain.

The conceptual progression from *Cognitive Evaluation Theory* to *Self-Determination-Theory* and from there to *Motivational Needs* and *Affordances* gets clear. The next step brings Hamari's elements of *Gamification* to then lead over to *Serious, Persuasive* and *Pervasive Games*.

FIGURE 8: RESEARCH FRAMEWORK

4   *WHERE ARE WE NOW?* - MINDFUL MEERKATS AS A WORK IN PROGRESS

A social Game for behavioural change

FIGURE 9: LOGO OF MINDFUL MEERKATS

> *Mindful Meerkats* is:
>
> - A Business in Creation
> - A Social Learning project
> - A Societal Vision
> - A Research Tool
> - A Social Game

Mindful Meerkats is a lifestyle app and a community game that assists you in finding self-directed happiness through habit changes. Through agency, accountability and ownership we show people that they can influence their happiness to a great extent. *Happiness* is expressed through six values like a *roleplaying game* monitors performance, which is defined here as happiness. By expressing these values in the shape of a virtual Meerkat representation, we can create a mirror image of the player and trigger reflection.

To be able to make *Mindful Meerkats* part of this research, it is necessary to outline the ready-made, conceptualised aspects and elements of the game. Four out of the elements of *Human-Computer Interaction* will then be specifically focused on to interpret their impacts and capacities of behavioural change with the additional help of *Gamification* and *Social & Environmental Psychology*.

Mindful Meerkats is aimed to be developed for the entire smartphone market, so both android and *iOS* within the next year. It has to be mentioned that most of the elements of the game that are depicted here are not executed yet, since the game is still in development. This research is intended to provide an academic justification for the choice of the technological behavioural instruments within the design and to allude scientific evidence for the probability of effectiveness.

Before the instruments, which align with what *Gamification* describes as *Motivational Affordances*, are described, two explanatory parts are necessary. Firstly, essential principles that were considered when designing the game concept are outlined. Secondly, the reasoning for the choice of the name *Mindful Meerkats* follows.

4.1 ESSENTIAL *MINDFUL MEERKATS* DESIGN PRINCIPLES

- Reward Not Punish
- Choice Not Pressure
- Encouragement Not Patronization

The *no-punishment* strategy shall prevent negative associations to come up in the players. The app market is so fluid and dynamic, that if a product displeases the consumer, it gets deleted immediately. Therefore it is important that our product/service/process does not create negative emotions for its users. Otherwise their incentive to use it vanishes. In that sense, it shall be refrained to implement *any* type of explicit punishment.

People shall be informed about their personal impact empowered to utilise their existing capacities. Sense of powerlessness is a strong impediment to action. It is easy to delegate the responsibility of changing the *status quo* to other actors like the government, business or the civil society. In that sense, users are encouraged to change their behaviour being empowered with the newly achieved knowledge about what they can effectively do.

Other existing apps like *EcoChallenge, JouleBug* and *MakeChange* or several governmental campaigns try to reach the same goal of awareness, but it is mostly associated with a bothersome obligation and not framed as a personal chance for achieving well-being. A feeling of patronization ensues.

4.2 JUSTIFYING THE NAME? WHY MEERKATS? WHY MINDFUL?

Meerkats share many of the behaviours and characteristics in real life that the game wants to nurture and produce in humans. Meerkats are very exposed to climate change and tough natural living conditions. Yet, due to strong communities and group identity, they manage to overcome vulnerability and prevail in the difficult surrounding. They live in so-called *mobs* or *clans* of 10 - 25 individuals. Their natural enemies are jackals, snakes and eagles. Meerkat groups can only survive against these threats by constantly having one Meerkat assigned to observe and monitor the terrain and the air to warn about approaching foes. This particular role, or the Meerkat engaging in that role, is called *sentry*.

There are a number of qualities that are unique to Meerkats. These are: *Individual vulnerability, collective resilience, climate exposure* and *permanent attentiveness & mindfulness*. We want to reproduce these values in the users and

represent them in our Meerkat context to attribute them to humans and their self-perception: By using an animal as a projective container that is also perceived as cute, we intend to increase the potential identification for users/players.

To have a more compelling narrative, essential elements of the game design refer to the reality of the zoological Meerkat. A rotating leader within the virtual clans, is called *Sentry*. The ranking chart for individuals is called *Master Lookout,* for *clans* it is called *Best Burrow*.

Interestingly, although incredibly social within their clans, Meerkats are protective, jealous and fierce when it comes to outsiders. Sadly, very gladly taken as domestic pets, this jealousy and aggression towards strangers creates so much trouble that they are often victims to maltreatment. Given that they perceive their families as their clans, every non-family member is an intruder and gets attacked.

4.3 DESCRIPTION OF *MOTIVATIONAL AFFORDANCES* IN *MINDFUL MEERKATS*

4.3.1 *MEEKA* AS VIRTUAL AGENT

FIGURE 10: MASCOTT OF MINDFUL MEERKATS

Each player/user gets a personal representation in the form of a Meerkat, called *Meeka*[5]. The *Meeka* can be customized with the colour of its fur, its size, the appearance of body parts and their size. These elements can be selected from a wide library. Furthermore, accessories like jewellery, single pieces of clothing or body art to reflect the diversity of humanity even in the digital environment and provide a blueprint for personal identification, can be chosen. The latter have to be purchased with a digital currency, *Scorpions,* which has to be paid for with real money. The idea is that the real-world condition shall be mimicked where you cannot pay for everything. So the things that can be bought in real life have to be bought in the game, and vice versa. Things that cannot be paid for by the player are physical and mental states. These are determined by *Attributes*. These attributes get manipulated by fulfilling real-life challenges.

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[5] *Meeka* is the abbreviated word "Meerkat", with the word "me" hiding in it as a convenient side-effect.

As this *Meeka* is based on an existing human being and individual, it is important to also show the link between them verbally. To distinguish a MM-playing human from an inactivated individual, we call the former *Meecat* and the latter *Humanimal*. Thereby, there is clarity of reference in the communication between game and user. Moreover, the community gets provided with an identity that allows them to refer to oneself as one.

4.3.2 *Mindful Meerkats* as Hybrid of Social Network & Online Community

After reaching a certain level of *Happiness*[6] in the game, the challenges in the game get more difficult. Among this higher difficulty is the necessity to form a *clan*. A clan is a group of players that is virtually linked and strives to fulfil challenges that are counted conjointly. Within that *clan*, it is not important whether the other players are *Meekas* or *Meecats*. To repeat and clarify, that means that it is not important whether they are acquaintances or friends in real life or only virtual contacts. There are certain benefits in the game though if you are in physical proximity. It is highly endorsed to form a *Clan* with your immediate neighbourhood, your street or your district.

The visualisation of the different performances and attribute levels will then create what shall be called *Collaborative Competition*. In an environment where progression will only work when there is cooperation between different players, digitally or in reality, the competition gains an additional layer. When looking at the comparative interfaces, it will be possible to parse the ranking geographically. In that way, the ambition to get better is more tangible. It is about being 'the best *clan* in the city' as opposed to the extreme and distant goal of being 'the best *clan* in the world'.

To reach these *Clan* goals and fulfil *Clan* challenges, it is eminent to communicate. And as our objective with the game is to create a happier world population through a more close-meshed and coherent global society, it is not important how the interaction takes place. The actors within the closer network are not important. Just by having to work together on these goals, having a common goal, brings integrity and a group identity. As a consequence, so we assume, happiness will be a part of that new societal interaction.

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[6] The italics indicate that it refers to the in-game element as opposed to the worldly concept.

4.3.3 DATA COLLECTION AND FEEDBACK TOWARDS MINDFUL-NESS

ATTRIBUTES: DOMAINS OF LIFE, BEHAVIOUR & HAPPINESS

There are seven *Attributes*. The *Attributes* directly affected by player performance are *Wellbeing, Fitness, Reputation, Thriftiness, Pawprint* and *Wisdom*. The seventh one, *Happiness* is a function of the others and can thus only be affected indirectly. Depending on the amount of points and the level of each of these attributes, the outward appearance of the Meerkat figure varies. In the following, each of the attributes and the respective visualisation shall be outlined.

There are three personal and three systemic values and *Attributes*, plus the cumulative *Attribute* of *Happiness*.

The personal values are physical and psychological health and cognitive capacity, also known as intelligence. However, the usual understanding of these terms is not holistic, but rather narrow. Health is usually understood solely physical, and the links between physis and psyche and what is known as somatopsychics and psychosomatics, are greatly neglected. Therefore we want to express them separately, but refer to them together as *Health*, to create awareness of the interdependence. Similarly, intelligence usually excludes what recently has gained traction with the term *emotional intelligence*, measured by *EQ*. Our terms are adjusted to appeal to a target group that is familiar with terminology from roleplaying games, also known as RPGs. They are *Wellbeing, Fitness* and *Wisdom*.

The systemic values are formed with reference to the triple baseline: environmental, social and economic sustainability, also known as 3P: Planet, People, Prosperity (Acaroglu 2013). In our case, they are sorted by personal relevance, as we want to provide user-centered service design. We conceptualise them as *Thriftiness, Community* and *Pawprint* to be innovative about the terminology and approximate a game vocabulary.

Wellbeing
The state and performance of bodily functions determine your *Wellbeing*. This attribute allows reflection about your healthiness. Real-life actions that are beneficial to your health affect its points and level.

Performance is visualised by the cleanliness and hirsuteness of the fur. (*Example*: Eat fruits & vegetables)

Fitness

Healthiness and fitness are closely linked in real life. In spite of that, *Fitness* in the game shall be measured and determined differently. *Fitness* reflects toughness, agility and stamina of the Meerkat avatar and its user. Low *Fitness* gets depicted by the Meerkat's corpulence and girth and high *Fitness* by muscles and brawniness. (*Example*: Take the bike instead of the car to work)

Wisdom

This attribute gives an idea about how much knowledge one has assembled and how important it is to the user to stay up to date with science and news. It gets visualised through speech and thought bubbles with symbols that represent different levels of knowledge and intellect. (*Example*: What is 'Corporate Social Responsibility'?).

FIGURE 11: PRELIMINARY, OUTDATED MOCKUP OF INTERACTION INTERFACE

Thriftiness

Economic resilience and ability to use resources skilfully and efficiently. This includes money, but is not exclusively money. This indicator should reflect performance in terms of: Is money well-spent with regard to benefit and is it a well-evaluated decision? Does the cost-benefit-ration legitimise the purchase? Waste streams are also part of this indicator as they fall under resources. The visualisation is a backpack that is well or badly packed. (*Example*: Buy a sweater in a thrift shop)

Community

Social activity, cooperation and conviviality determine the performance of this attribute. Happiness requires social interaction. The amount of Meerkats in the background and/or their posture towards you visualises this level. (*Example*: Lent a lawnmower to your neighbour)

Pawprint

Being the adapted and contextualised concept of 'footprint', this attribute shows the ecological and environmental impact that behaviour has. Water consumption, air pollution or waste production are possible factors of pawprint. It integrates the concept of *Handprinting* (Norris 2013), since hands and feet together are paws; plus, Meerkats have paws. (*Example*: Travelling to holidays by train instead of by car or by plane)

DAILY CHALLENGES - THE 4 *Qs*

With data security being a vital issue in the 21st century, it is not intended to collect and monitor daily activity and behaviour of users. But can these attributes be composed in a legitimate and valid manner if not via constant monitoring and evaluation? It is trusted in the honesty and willingness of the user. Therefore, a set of check-up interactions throughout the day will be the only tool used to provide the necessary input to be able to

determine the performance and corresponding points per attribute. Each of the attributes belongs to a certain domain of mindful life. But as real-life activities can have impacts on several different domains of sustainability, the interactions can also affect more than one attribute at once. The interactions are the so-called *4 Qs: Quest, Question, Quiz* and *Mini-Quest*.

Quest (3 per day, morning)

A *Quest* gets posed at the beginning of the day around 9 o clock. It entails a challenge that can be fulfilled throughout the day in exchange for attribute improvements, one at least. Users can refrain from accepting the challenge, if it will be too hard for them to comply on that particular day. Not accepting the challenge has no downsides. But if the user gets asked at the end of the day, about 12 hours later, – only in the case that he accepted the challenge – whether he managed to achieve the goal, and admits to failing, points from the respective attribute get deducted. Examples are: "Try not to use an elevator or escalator in the following 12 hours", "Don't use your car today" or "Do not use your phone today".

Question (3 per day, evening)

In contrast to a *Quest*, a *Question* shall reward sustainable behaviour that is uncalled for. A *Quest* allows to deliver after a request has been verbalised, a *Question* does not. Thereby even intrinsically motivated sustainable activities are rewarded.
Questions ask for quantities at the end of the day, so for instance: "How much money have you spent on things that you do not need today?" (affects *Pawprint* and *Thriftiness*), "How many hours have you spent in front of a screen today?" (affects *Health* and *Reputation)* or "How much meat have you approximately consumed today?" (affects *Pawprint* and *Health)*

Quiz (3 per day, throughout the day)

A *Quiz* is a multiple choice question with four options. The biggest share of points get to *Wisdom.* Depending on the domain of the knowledge, a small number of points will also get assigned to potential other attributes. It is therefore important that the question are not only tainted in green with an ecological-environmental bias, but rather belong to different fields of sustainability. Examples are "What is Watson?", "What does "Social Entrepreneurship" mean?" and "Which greenhouse gas has the most severe impact on Climate Change?"

Mini-Quest (3 per day, throughout the day)

A *Mini-Quest* is a small task that can be fulfilled immediately and does not require great effort nor does it have a great real-life impact. Therefore it does not grant a great number of points. They are intended to be funny and cheerful. Examples are "Hug

someone in your vicinity" (*Reputation*), *"*Leave the place you are currently situated in and run once around the block" (*Fitness)*, "Smile at three strangers"(*Reputation), "*Try to remember the last five state leaders of your country" *(Wisdom)* or "Call your energy provider and ask what their energy strategy for the next five years is" (*Wisdom* & *Pawprint*).

Quizzes and *Mini-Quests* alternatingly appear every two hours and allow to be answered for four hours. One can always push them away when they appear and/or choose to answer them later. The deduction in points for any of the Qs is only received if you try to take a challenge and miss or fail it.

DIARY ELEMENTS

The users have several options to report on their successes or moods. There will be integration of *Instagram*, *Facebook* and *Twitter*. Furthermore, to verify that challenges were fulfilled in order to receive *Scorpions*, the completion can be verified with the mentioned services or a *QR-Code*, one of the streaming services *Periscope* or *Meerkat*, or via *Geospatial Logging*.

Furthermore, there is the option for users to a) write a diary into the game to keep track of their progress or just b) answer a five-question survey, illuminating their satisfaction. It allows them afterwards to check whether their real happiness changed over time and how much it was aligned to the in-game happiness development.

4.3.4   LOOKOUT MASTER BOARD AND BEST BURROW BOARD

The Design of the app envisions to show own performance in comparison with other players. This demonstrative interface will not only show the personal values, but also the accumulation of values of everyone in the *clan*. What is mentioned in section 4.3.2 as *Collaborative Competition,* is a manifestation of *rankings* and *competition* as a tool for behavioural change.

Two types of rankings will be integrated: An individual and a collective one. Both of them can then be filtered to identify your performance on a geographical level. It is also possible to compare yourself (or your clan) with respect to acquaintances and friends, that are also playing the game, i.e. that are *Meecats* as well.

Per default, aside from the geographical ordering, a *Meeka* gets sorted into a *subgroup* or segment in which it competes against other specimen

of similar level. It is possible to look into geographical distribution aside from that.

Another option is to reset the ranking every week so that one is compelled to compete even with higher ups in the area and have a continued interest in staying on it.

4.3.5 OTHER MOTIVATIONAL AFFORDANCES IN MINDFUL MEERKATS TO EXAMINE IN FURTHER RESEARCH

Similar to a Loyalty card or Payback service such as *Miles & More* or Discovery Health SA's *Vitality* program (Armstrong, Lambert, and Lambert 2011), in *Mindful Meerkats* verified completion of challenges shall be rewarded. This can be justified because all fulfilling of challenges in some way or the other create a surplus value. This hybrid (virtual & real) currency which is called *Scorpions* – after Meerkats' preferred food – can then be exchanged for discounts or bonuses from partnering companies. These have to adhere to our rules of conduct, where all actions "Create a Happier You".

As this work is focused on creating intrinsic motivations, and *Scorpions* are a fundamentally extrinsic reward, it was chosen not to look at its behavioural capacities. Eventually it could be instated as a Social Currency that measured contribution to Societal Value.

Photographic Expression upon completion of challenges is another *Motivational Affordance* that potentially can be explored for its behavioural potency.

Similarly, the classic gamification tool of Badges as measurement of achievements, or more creatively, Narration as strong source of *immersion* or a Virtual World as instigator of *absorption,* imagining a greater number of virtual objects for the *Meeka* to interact with, is a *Motivational Affordance* worth illuminating.

5 *MOTIVATIONAL AFFORDANCES*: COMPILING LESSONS FROM CASE STUDIES

Exploring App components as Motivational Affordances

To be able to thoughtfully apply the concepts and theories from the previous section, to a new case at hand, i.e. *Mindful Meerkats*, it is necessary to find in the literature that this approach is validated and tested. For this purpose a small selection of *Motivational Affordances* that were particularly dominant within the literature, will be examined here. These are *Online Communities* and *Leaderboards*. Additionally, *Relatedness* at first glance seems most reliably covered by an Online Community, which explains B. *Online Community & Network*.

Furthermore, it is hypothesised that the strongest *Affordances* for *Behavioural Change,* i.e. *Persuasive Affordances*, are the ones that rely on *Self-Determination-Theory* and, as evolved from there, Zhang's *Motivational Needs*. For that reason the element of *Virtual Agents* is included, which directly addresses the first *Motivational Need Autonomy & Self*.

A literature review on the impacts and success of *Gamification* is a good starting point (Hamari, Koivisto, and Sarsa 2014): According to that study, one other successful component of *information systems* and the inherent *Motivational Affordances* is *feedback*. A common way of referring to different *feedback* instruments under the same concept is *Quantified Self*.

Another rather obvious factor in the choice for the *Motivational Affordances* is whether they are envisioned in the current design of the *lifestyle tracker*. Given that these cases shall serve as a blueprint to understand what the potential for *Mindful Meerkats* to create behavioural change, they all should appear in the planned version. Only in the second instance it is the research who can give new insights into other elements within the app.

5.1 VIRTUAL AGENTS – FINDING RESEARCH TO SCRUTINISE MEEKA AS MOTIVATIONAL AFFORDANCE

When thinking scientifically about games, the usual process would create a typology of different games or players (Hamari and Tuunanen 2014). As these typologies usually focus on mechanics and not so much on emotions – which are the key factor for behaviour change and thereby vital in this research – a different approach shall be chosen here. The compo-

nents of the game (See 4.3), which are expected to have the greatest impact on player experience and connection will be in the center of this chapter to then conceptualise which variation of each these elements results in which experiences and emotions. The connection between digital-virtual and real interface is the priority. Therefore, elements are compared even though they do not belong to the same type of game as long as they are capable of creating the integration of virtual and real worlds.

5.1.1   ANALYSIS: VIRTUAL AGENT

Every *Meeka* is a *Virtual Agent,* a representation of a player. To be more precise in identifying the impacts of different representations on emotions, a small typology of *Virtual Agents* is introduced. Depending on the interaction between the virtual creature and the player – how the *container* for the player's mind and reasoning is composed – *Identification* differs. *Identification* was singled out as one of the vital ingredients for emotions and consequently behavioural change. The strongest driver for behavioural change are namely emotions. Therefore, ultimately, each of the components has to be understood in its capacity to create emotions.

The most common term for *Virtual Representation* is *Avatar.* "Avatar" is defined as *"a being you've created as a representation of yourself in [an] online environment."* (Hemp 2006, 48) This is a definition that is too broad for the precision that is necessary to understand the link between in-game experience and real emotions and behaviour depending on the player-creature-interaction. Furthermore the range of objects and services that are subsumed under the term avatar also includes images, photographs and not only virtual creatures, which makes it difficult to allow comparison of experiences. These photos and images are usually used in online community such as Q&A and subculture forums.

The typology exclusively looks at *Virtual Agents* that create an experience for the player and are in the center of the gameplay being the 'protagonist'. That means that games or game experiences do not have some form of interpersonal transfer such as puzzle games like *Tetris* or Strategic Builders like *Age of Empire* are not considered.

A first thing to note is a distinction between *interaction* and *impersonation.* *Virtual Agents* falling into the category of *impersonation* are the ones dubbed *container for the mind*, who are controlled by you and whose fate you decide upon. *Interaction* describes the state where the creature in focus is not controlled by you, but instead reacts to your prompts.

The proposed parameters to categorise *Virtual Agents* are: *a) In-Game Personality, b) Immersion in Virtuality, c) Incorporation of Reality* and *d) Custom-isation*. All of these refer to the representational creatures. Before the different types of in-game creatures, or *Virtual Agents* will be analysed, the parameters shall be briefly explained to put them in context. All of them are determined over a three-point scale (strong (+), medium (o), weak (–)). The different categories are related, so that overlaps can occur. It is not an exhaustive model, but rather a set of parameters that is important to create *Virtual Agents* that appeal to players.

VIRTUAL AGENTS TYPOLOGY: PARAMETERS

IN-GAME PERSONALITY

The relevant aspect of this parameter is the extent to which the being in question has an own personality, backstory and narrative to it. The moment where a game has a story surrounding the character in focus, whose path you accompany, the personality of the being is set. You see the world through the eyes of that creature as opposed to seeing it through your eyes. These games usually – accordingly – have a *Third Person Camera View*. In that respect there is not much room for own imagination and identification from the perspective of real-life individual.

As indicated, the understanding of *Personality* here is *narrative* not *visual*. A graphic designer's choice is not impactful for *Personality* as seen here, but only a *scriptwriter* and/or *game-designers* choice matters.

IMMERSION IN VIRTUALITY

This category describes the capacity of the virtual system to allow the player to fully lose oneself in the game. The implied assumption is that the relationship between in-game controllable being and player determines the extent of *Immersion in Virtuality*. The higher the immersion, the greater the identification. This aspect has not much to do with the playing individual. No matter who is playing, the experience is similar, because it is not dependent on the player's input.

INCORPORATION OF REALITY

Every game has two layers minimum, the game interface and real-world actor, the player, in front of the interface. The interface is lately mostly a screen but can also be a table top. Aspect b) then regards to capacity of a game to be enticing and engaging in itself, whereas this aspect refers to the ability to create a personal connection to the real-life individual. To

give an example; most classical role-playing games are male-dominated in the sense that protagonists are usually masculine. Therefore, players that identify as feminine[7] might live through great *Immersion in Virtuality*, because of the quality and excitement of the playing experience, but would usually not feel personally connected, because of weak *Incorporation of Reality*. Some beings in Gameful environments have a great focus on allowing the reality to be incorporated in the game to create greater association with them. Games with a Virtual Reality are especially successful in creating an overlaps. Movement-tracking technologies like *EyeToy*, *Kinect* or *Wii* or Virtual Reality devices like the *Oculus Rift* are the strongest cases of *Incorporation of Reality*. They draw in real life activity into the virtual space and thereby create overlapping worlds.

CUSTOMISATION

The ability to customise the being that you control or that represents you in the gameful environment creates a greater sense of control. There are certain overlaps between *Incorporation of Reality* and *Customisation*, because the moment you customise something of what you consider your reality flows in the character. However, the overlap between real and virtual world is not diminishing by you determining the composition of the being's physical traits. Yet, this process of drawing in real-world factors into the virtual world, would be what is considered under *Incorporation of Reality*. Examples are the Nintendo Console *Wii's Mii*s or Android's *Androidify*.

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In a sweeping research, Trepte et al. (2010) correlated *Avatar choice* as dependent variable with *life-satisfaction* and *type of game* as independent variables. What are the impacts on Avatar choice from life-satisfaction and type of game? The result was that, in competitive games, individuals were likely to make a choice dissimilar to their appearance, whilst cooperative games elicited them to pick virtual representations similar to them. But the even more remarkable finding was that life-satisfaction had an impact on *Customisation;* people with low life-satisfaction were more likely to customise an *Avatar* in a way that was not similar to themselves. Conversely,

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[77] The terms male/female refer to biological sex. Masculine/feminine refer to social gender.

people with high life-satisfaction mimicked their real-world outward appearance in their virtual counterpart. Trying to embody a person or being which is not their own tells us something about satisfaction.

Additionally, *Identification* with avatars, logically progressing, but not unequivocal, increased with higher *Avatar-Player Similarity.* Relating this back to the parameters developed in this chapter, it becomes apparent that *Identification* sits at the intersection of v*irtual* and *real* world and is thus an important component of both *Immersion in Virtuality* and *Incorporation of Reality.* To increase *Identification*, the easiest way is to allow customisation. Another insight was that player *Identification* increased with game enjoyment, which in the *Behavioural Chain* can be traced back as *Psychological outcomes.*

VIRTUAL AGENTS TYPOLOGY: TYPES

This typology is not aiming to create terms for all different combinations of parameters evaluations, but rather to guide the contemplation of correlation between player-representation-interaction and emotional commitment. Consequently, only the 5 most frequently used inclusions of virtual beings in virtual environments will be analysed with the help of the grid.

It is important to note that this terminology is highly constructivist, since these terms are often used synonymously. Studies in the realm of Game Theory more often look at the games as pieces of art and culture, as opposed to tools for behaviour and of communication (Raessens 2006). The different types of *Virtual Agents* are ordered by the difficulty of creating them successfully.

To highlight the distinction between the different *Virtual Agents*, each character's view on the action of opening a door with regard to the player's perception of that action, is presented per *Virtual Agent.*

SPRITE

The word *Sprite* is introduced here to allow to distinguish it from an *Avatar* that allows *Immersion in Virtuality.* Usually, these more passive specimen are referred to as *Avatar* as well. Yet, the fact that there is a *Virtual World* that allows for roaming and exploration, such as Lara Croft in *Tomb Raider,* creates more immersive capacity. A *Sprite* in contrast to the *Avatar* is only a virtual representation of an individual within a digital system or network. Examples are Android's *Androify* or Nintendo Wii's *Mii*s.

Decisions are at most expressed through textual communication. To put it in an example. You would be told that you open a Door and imagine: "The Door is opened".

AVATAR

This paper defines *Avatar* as an in-game being or creature that you can fully control within the confines of a virtual world. As opposed to a game circling around a *Character*, the story is subject to your decisions, where you can also choose not to follow the intended path and stay roaming and exploring the world. The backstory is unknown and you inject life and character into the *Avatar*. Usually there are several templates on whose foundation customisation is possible to present you with a canvas.

This manifests in medium *In-Game personality*, high *Immersion in Virtuality* and medium *customisation*. Given that the customisation is limited to the templates, there is no strong *customisation* in comparison with *personas*. With respect to *Incorporation of Reality,* since there are no real, tangible elements incorporated into the game world, except the player's behaviour, it is relatively small. It is however much higher as with *Characters* and thus it is considered to be medium.

To get back to the door-example, the feeling would be that of looking at a separate entity – similar to an instrument – that opens the door: "It [the representation] is opening a door".

CHARACTER

This paper defines *Character* as an in-game being or creature that you control partially through a prescripted story. The choices that you have are limited to the respective part of the story. That does not exclude a wide range of choices on the way; many games allow different paths, but it takes away the freedom of permanent choice and deliberate movement. A *Character* has a fixed backstory, personality and behavioural patterns. *Narration* & Narratives– also a heavily researched topic in Game Studies – are the most essential ingredient. Examples of *Characters* are Ori from *Ori and the Blind Forest* or Solid Snake from *Metal Gear Solid.*

There is compassion, but no insertion of personality. The figure is seen as a connected, empathy-inducing but separate identity: "S/he opened the door".

PERSONA

Out of the four *Virtual Representations*, the *Persona* is most difficult one to create, because it needs to combine *Virtual Immersion* as well as *Incorporation of Reality* via choice and control. Where the balance between story, and player-input is balanced, alterative identities are created. Players do not perceive them as separate entities, but rather extensions of themselves. This is entirely subjective, so depending on the susceptibility of the player and his tendency to enmesh in the *Virtual world,* a *Character/Avatar* can create the experience of a *Persona.* Despite subjectivity the MMORPG *World of Warcraft* is known to combine these aspects most successfully to create *Personas* (Smahel, Blinka, and Ledabyl 2008).

Clearly, the door-example would finally end up as "I am opening the door", where the *Virtual Agent* and the real-world individual overlap congruently with regard to the perception of the player.

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This typology is mainly inspired by Bartle's online-reflection, terminology and categorisation about the role of Virtual Agents for players' immersion (2014). He makes no distinction between *Avatar* and *Sprite* and does not provide the parameters to fill the grid below (Table 3). In his pop-scientific rant, he expresses dissatisfaction about the fact that:

> *"Many of the people who write about avatars actually mean characters, but they don't understand there's a difference. Avatars are dolls, characters are simulacra. Neither avatars nor characters, though, are people. Neither are [sic] anything to do with what makes online worlds so completely absorbing. There's a level of immersion beyond that of the character: the persona."* *(Bartle 2014)*

The example with the feelings connected to an in-game opening of a door are also inspired by his discussion of the terms.

TABLE 3: VIRTUAL AGENT TYPOLOGY (BY AUTHOR)

Virtual Agent Typology				
(+ = *strong* o = *medium* - = *weak*)				
	a) In-Game Personality	*b) Immersion in Virtuality*	*c) Incorporation of Reality*	*d) Customisation*
1) Sprite (e.g. Androidify/ Wii Mii)	-	-	+	+
2) Avatar (e.g. WoW)	O	+	O	O
3) Character (e.g. Metal Gear Solid)	+	O	-	-
4) Persona (e.g. GTA/ Assassins' Creed)	+	+	O	-

OTHERS VIRTUAL REPRESENTATIONS

Other representations exist that were not included, because they serve different purposes than the engagement of *users, players* or *spectators*. These are for instance the so-called *Virtual Spokespersons* e.g. in *Second Life* as digital advertisers, or *Pets* such as *Pou, Talking Tom* or *Tamagotchi*.

5.1.2 EFFECTIVENESS FOR BEHAVIOURAL CHANGE: STUDIES OF CASES OF VIRTUAL AGENTS

To understand the effectiveness of *Virtual Agents* for behaviour change a number of studies investigating this correlation will be looked at. These are the following:

a) A set of studies exploring the impact of changed virtual *Self-Representation* on online and offline behaviour (Yee and Bailenson 2007; Yee, Bailenson, and Ducheneaut 2009)

b) A look at *Second Life* and its impacts (McLeod, Liu, and Axline 2014)

Potential sources for further insights are Bessiere's "Ideal Elf" (2007), Hemp's "Avatar-Based Marketing" (2006) and Smahel's Addiction & Identity Exploration (2008).

THE PROTEUS EFFECT (YEE)

Yee in his study from 2007 translates the seminal findings from Snyder on *Behavioural Confirmation* – where male participants were nicer via phone

to female participants just because they thought they were more attractive – to the online world. He does not make this link, but the author noted that the later findings approve, that it shows that the correlation between *perceiver* and *target* can also be considered to be true for a single subject. In other word, Self-perception can also lead to Self-fulfilling prophecies, not only external perception as in *Behavioural Confirmation*. *Self-perception-Theory* and *Deindividuation* explore this correlation:

> *"According to Frank and Gilovich, wearing a black uniform is a behavior that the subjects used to infer their own dispositions – 'Just as observers see those in black uniforms as tough, mean, and aggressive, so too does the person wearing that uniform' (p. 83)[…]" (Yee and Bailenson 2007, 273)*

Further insights are that *Deindividuation* leads to further connection to group norms, and depending whether identity cues that are given are positive or negative respective behaviour can be witnessed. Looking at these correlations in his experiments, he connects these facts to the conclusion that the *identity cues* given to us via the *Avatar* determine the entire behaviour, because there is no real *group identity*. *"Thus, we might expect that our avatars have a significant impact on how we behave online. Users who are deindividuated in online environments may adhere to a new identity that is inferred from their avatars." (ibd., 275)*

Yee calls the phenomenon *Proteus Effect*: internalising perceived *digital Self-Transformation* into behaviour in the same environment. To test the *Proteus Effect assumption* participants were confronted with each other in a virtual Reality space. Through immersive and monitoring technologies, participants would perceive themselves differently than others would perceive them. That was necessary to single out the *Behavioural Confirmation Effect* from the *Proteus Effect*.

Modulating the perceived *attractiveness* and *size* of the avatar of the participants, the assumed *Proteus Effect* was put under scrutiny with regard to the following factors: *a) Interpersonal Distance, b) Self-Disclosure* and *c) Confident communication*. And indeed, the study showed conclusively that the specimen that were presented with more attractive *Selves* moved closer to the respective virtually modelled Other and were willing to offer more information about themselves. Also, the second experiment, where *Confident communication* was the dependent variable to the independent variable *Height*, resulted in the participants perceiving themselves taller showed more aggressive bartering skills.

It can be concluded that virtual representations' appearance as well as real-world appearance have significant impact on behaviour. The perception is what counts and not the actuality. Accordingly, modulations and alternations of the perception of *Virtual Agents* can have great impacts on real-life responses. Even if one is not really the *Avatar* in reality, just the fact that one feels connected to the *Avatar,* because there is full control over it, increases your identification to that extent that behaviours are adopted which the Avatar's visuals point at and imply. The mere association of certain behaviours and characteristics to what one is represented with, allows the modification and subconscious real-life *Self-transformation*, of own roles and behaviours. The parallels to the *Behavioural Confirmation* phenomenon should be investigated.

Yee's approach changes in a study in 2009, where he attempt to prove a) Generalisability of the *Proteus Effect* to Actual Online Communities and b) Persistence of behavioural change as induced by the *Proteus Effect*. Via monitoring of player behaviour in *World of Warcraft*, firstly, the attractiveness/height-performance-correlation was be tested. Interestingly, all of these tests follow the line of action where a change in what is perceived subconsciously leads to a change in behaviour, and this in turn creates a new attitude along the lines of "I behave that way, so I must be that".

Three hypotheses were presented. Taller avatars outperform shorter avatars, more attractive avatars outperform less attractive ones in a VR trading game, and the same game was repeated face-to-face. However, the tests of these assumptions were fairly inconclusive. That could partially be an effect of a requested immediate response after the virtual experience and not a continuous exposure to the avatar of oneself. Yee et al (2009, 38-39) conclude:

> *"As more and more people don [sic: use] their avatars to interact in virtual environments for business, learning, and entertainment purposes, it becomes more and more important to understand how our avatars change our behavior in turn. While avatars are usually perceived as something of our own choosing, it is also the case that our avatars come to influence our behaviors and interactions with other. […] The behavioral repertoire that is shaped by our digital avatars in virtual environments carries over into physical settings. Together these studies suggest that neither the virtual nor the physical self can ever truly be liberated from the other. What we learn*

> *in one body is shared with other bodies we inhabit, whether virtual of physical." (Yee, Bailenson, and Ducheneaut 2009, 38-39)*

As little insight is directly gained from the assumptions and tests themselves, as much is gained from his last comment. His perspective on the direct translation of lessons from body to the other, virtual or analogue, allow for optimism regarding the implementation of *Mindful Meerkats*.

SECOND LIFE, SELF-PERCEPTION & BEHAVIOUR (MCLEOD)

McLeod (2014) in his study explores the correlations between the so-called *Big Five* or personality and virtual experiences. The *Big Five* are *Extraversion*, *Agreeableness*, *Conscientiousness*, *Emotional Stability* and *Intellect*[8]. He then continues to explore the implications of these personality traits on online behaviour and vice versa. His main-result was that *User-Avatar-Similarity* and *connection to virtual environment* were the great modulators for players to feel the virtual events impacting their real lives. Interestingly, *Emotional Connection* had a greater impact on real life changes than *Absorption*. With regard to identification with the Avatar is more dependent on personality than it is dependent on visual similarity.

The last aspect is a particularly curious insight when juxtaposed with Trepte's research into User-Avatar-resemblance as a predictor of *life-satisfaction*. The question arises how an identification with the Avatar without the visual similarity plays out with regard to *life-satisfaction*. This string of research bears a lot of potential application for *Mindful Meerkats'* academic journey.

5.1.3   APPLYING LESSONS FROM PSYCHOLOGY AND HUMAN-COMPUTER-INTERACTION TO DECIPHER *VIRTUAL AGENTS*

If we look at potency for *Behavioural Change* from a perspective of intrinsic motivation and self-determination again, it is apparent that *Virtual Agents* can certainly instill a sense of *Autonomy* into their "handlers", i.e. the player or persons that are represented with the Agent. The more intense the *Identification*, the greater the sense of Autonomy, the greater the extent of *Immersion*. That relates back to *Psychological Outcomes* like *Joy* and

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[8] *"Extraversion – the extent to which a person is …talkative, assertive, and active … Agreeableness – the extent to which an individual is kind, trustworthy, and warm; Conscientiousness – the extent to which a person is perceived as organized, thorough, and reliable; Emotional Stability … – the extent to which a person is relaxed, not easily upset, and able to withstand unexpected occurrences with equanimity; and Intellect …– the extent to which a person has imagination, curiosity, and creativity." McLeod 2014, 61}*

Flow. The *Immersion* into a virtual world allows the feeling of *Autonomy* to be complemented by a sense of *Competence.* If the *Virtual Representation* is then also building virtual relationships, it brings a strong foundation for *Connectedness.* This explains the strong forces that MMORPG with a high focus on *Customisation* and *Autonomy* bring.

If these principles were now to be inserted in an interface where real world and virtual world merge, it can be assumed, that, given the immersive and narrative excellence, that a similar sense of *Intrinsic Motivation* can be created. Where *Autonomy* and *Competence* are not highlighted in the virtual world, but rather underscore real success, because virtual success is dependent on real-world struggle, immense persuasive capacity can be assumed.

5.2 An Online Society
– Finding Research to Scrutinise *Meekas & Meecats in Online Clans* as *Motivational Affordance*

Two categories of *Online Community* and *Social Network Sites* (SNSs) are considered as one chapter, because *Mindful Meerkats* will find itself somewhere in the middle. While it is not a full-fledged *Social Network Site* designed to bring users into interaction and communication, it is neither an *Online Community*, which revolves around one topic only. Yet, both constructs share a great number of characteristics with *Mindful Meerkats* that allow the collection and processing of related literature. In a sense, these two types of specific research are used as proxy data to assume, anticipate and deduct results with *Mindful Meerkats.*

Considering this equidistance, it is relevant to note that it is equally related to *Persuasive* and *Pervasive Games* (Bang, Gustafsson, and Katzeff 2007; Jegers 2007; Caon, Mugellini, and Abou Khaled 2013). The scope of this work will not allow further exploration of this thought.

5.2.1 Analysis: Online Communities

The first network that comes to mind, when thinking about an online platform for user communication is *Facebook*, being the first online social network site with a great success since its advent in 2004. It facilitates interaction between friends, acquaintances, but also strangers. Through online profiles with data and photographs, new friendship networks and groups can be built. Other social networks and relevant social media sites

are *Google Plus, Twitter, LinkedIn, Reddit, 9gag* and *Ello* with different purposes and audiences.

A *social network site* (SNSs) allows individuals to *"present themselves, articulate their social networks, and establish or maintain relationships with others. … Participants may use the sites to interact with people they already know offline or to meet new people. [It] enables its users to present themselves in an online profile, accumulate "friends" who can post comments on each other's pages, and view each other's profiles."* (Ellison, Steinfield, and Lampe 2007, 1143–1144)

When trying to put a finger on affordance and consequent behavioural impacts of SNSs such as Facebook, one phenomenon increases the difficulty: Facebook can serve a multitude of purposes with a multitude of features. Smock (2011) points out that we thereby should rather talk about a *toolkit* as opposed to a tool. The same is true for other SNSs. The different behavioural impacts cannot be clearly attributed to a SNS as an entire service, because different outcomes emerge from different needs, motivational and else. The character of a *toolbox* exemplifies the heterogeneity of uses.

Smock tries to combat this by measuring different types of uses and respective gratifications. The results perpetrate the assumption that different motivations and objectives, which relate back to Hamari's *Motivational Needs,* lead to different uses from the tools within the box. "Feature" is defined as a technical tool on the site that enables interaction from the user. In that regard, it relates to *Affordance* in the sense that one feature can provide a range of *Affordances.* They identify and research six features: *status updates, comments, Wall posts, private messages, chat* and *Groups.* Consequently, statements about motivations connected to network use are matched with stated motivations for feature use. The established range of motives amounts to the following: *habitual pass time, relaxing entertainment, expressive information sharing, escapism, cool and new trend, companionship, professional advancement, social interaction* and *meeting new people.*

Subsumed, a wide range of *Motivational Needs* and *Psychological Outcomes* can be covered by one SNS. Before juxtaposing the insights from *Motivational Psychology* and *Gamification* with these findings and correlating them, behavioural change as an effect of SNSs and online communities shall be investigated in the next section.

5.2.2 EFFECTIVENESS FOR BEHAVIOURAL CHANGE

STUDIES OF CASES OF ONLINE SOCIAL NETWORKS & ONLINE COMMUNITIES

The range of SNSs and online communities is very wide, so a small fraction of well-researched online networks is chosen to explore the persuasive and behavioural capacity. These are the game *Ingress,* the community network *Geocaching* and the online community *Nerdfighteria.*

INGRESS: STRUGGLING FOR OTHERWORLDLY MATERIALS

Ingress is a mobile game where geospatial logging is used as a playing board. Two factions compete over the domination of portals that are made visible on the screen and can be attacked and conquered with virtual weapons. Google (Niantic Labs respectively) had initially developed *Ingress* to incentivise users to utilise their maps application while walking. The rare use of Google Maps on foot limited the virtual grid to paths fit for motor vehicles. Since there is an ambition from the part of google to cover all modes of transport, it was vital to have a feature covering mobility on foot. Consequently, *Ingress* was developed with a gameplay that necessitates users to walk in their physical environment to collect points to charge their energy bar (*Exotic matter* or *XM*). The in-game factions (*The Enlightened & The Resistance*) compete over the domination of portals that are located at real-life landmarks. (Sheng 2013; Kabernik 2013; Li et al. 2015)

In a multi-methodological research, Li et al. (2015) identify 6 characteristics unique to *Ingress:* 1) *Sense of Place*: The Player-community creates spatial awareness through location-based features. 2) *Collaboration*: Communication and cooperation is inherent to gameplay and brings benefits. 3) *Emergent, unwritten rules*: Norms spring to existence organically in the game that are not part of the rule-set and are created through *Player-to-Player (P2P)* communication. 4) *Ambiguous gameplay creates excitement:* Certain settings are ambiguous in the sense that they create incentives and disappointment simultaneously. 5) *Offline Impacts:* Offline Strategies emerge as by-products of *Ingress'*. 6) *Range of Age:* The highest age stretches further than assumed prior to the study. These insights allow a deduction of elements of social interaction that shall be condensed later-on, showing the *Persuasive Affordances* that *Ingress* offers.

The study is embedded in research in the category of *Location-based Mobile Games*. An outstanding characteristic of *Location-based Mobile Games* is the capacity to create so-called *Ludic Play*, which means that players *"frequently …navigate the city in unusual and unexpected ways as a consequence of the game narrative/players"*. (de Souza e Silva and Hjorth 2009, 617) This is a unique quality of *Augmented Reality* and connects mobile games to pervasive games. Where *pervasive games* transgress the boundaries of reality with imagination, *Location-based Mobile Games* and *Augmented Reality* facilitate *Immersion* with a *Virtual world*. A projective surface allows to dive into a different experience.

The Social Interaction which is created in the Game is significantly based on the geologging features:

> *"The GPS-based nature enables richer social interaction between players especially in local regions. Therefore, Players not only discuss the game with different online communication channels, but also hangout outside the virtual world with their real-life identities." (Li et al. n.d., 7)*

A side-effect of this hybrid world, where virtual and real identity are perceived congruently ("My avatar is me"), is the willingness to build relationships to shift from in-game online companionship to offline friendship. The inherent geographic proximity facilitates and encourages this process. In an anecdotal account, Li et al. report of a woman, whose husband, also a player, died in a car accident. His portals, in an attempt to *"memorialise"* his name, were protected by the community. A strong evidence of the two worlds merging through *Ingress*, it also backs up the claim that online communities can create real-world behavioural change. Powerful impacts from "just a game" as exemplified here in solace and consolation for not *only* a fellow "player", but rather a mourning friend.

In his article "Modelling Learning from Ingress", Sheng (2013) raises the claim that *Ingress* in a unique way manages to teach its players a) the internal rules, but also, through the gameplay, b) real-world facts, occurrences and Utilities. Integrating specific data about the locations where portals are the situated and their mere geographic location within the urban environment and consequently enhancing spatial sense and visual linking are examples of the latter. He speaks of *seamless learning*, pointing out that a unique environment is created, where *"new forms of pedagogies can be embedded in games … and if the integration is successful through technological usage and gameplay, the game itself may provide a model for educators to reflect and rethink*

on how learning can be designed according to the new paradigm of learning as an experience." (Sheng 2013, 8) In other words, an approach where *Information* not only manifests in *passive Knowledge* through theoretical reflection, but additionally gets internalised through experiential learning to be integrated in a practical routine, can create *Wisdom.*

GEOCACHING: A TREASURE IS A TREASURE IN THE EYE OF THE BEHOLDER

Geocaching is a *Location-based Mobile Service* with Game Elements, and can thus be understood as a *Gamified Systems.* Essentially a modern version of a *Scavenger's hunt,* the objective is to discover little treasures and objects that have been hidden by other users with more or less whim and respective difficulty of discovery. Each success will be monitored in the user profile and points are allocated for the respective accomplishments. The difficulty ranges from hideaways under a stone to on a mountain top and even under-water caves. The treasure is called a *Cache* and the accomplishment of discovery is a *Find.*

O'Hara (2008) uses insights from empirical research with Geocaching Users to correlate motivations from using the service for pastime with potential further use of location-based experience and its broader implications. Through a diary study, augmented with in-depth interviews with 14 players, the following conclusions were drawn:

> *"For many people, geocaching was an opportunity for social occasion, a walk with family or friends. There are several features of geocaching that facilitated this. First, it provided purpose and motivation to a walk that was important in getting people involved in the social activity – in particular younger children. Second, the technology aspect of the location-based experience was actually backgrounded for large parts of the social occasion being brought out intermittently when necessary." (O'Hara 2008, 1185)*

This shows that a service like *Geocaching* has the capacity to positively intervene into daily routines of individuals and create experiences that go far beyond the mere digital and virtual pastime.

The motivations that were identified are the following: 1) *Social Walking:* walking with a purpose. 2) *Discovering and Exploring Places:* Caches are oftentimes hidden at meaningful places that create surplus value if encountered (Note the parallel with *Ingress).* 3) *Collecting:* the amount of *Finds,* both for individuals and *caching teams,* are monitored and bring satisfaction. 4) *Profiles & statistics:* The data stored in profiles and the potential to

interact increases a feeling of immersion. 5) *Competition and Urgency:* the online community created temporal pressure and a willingness to be the first. *6) Challenge,* the different levels of difficulty create progression and ambition.

One extremely important insight, that can be stated for *Ingress* likewise, is the willingness of players to exploit the ubiquitous character of these *Location-based Experiences.* Even in instances where the service (the game respectively) were not the main objective of an activity, players opportunistically used the chance to gain *caches* (or *points/portals* respectively). Lunch breaks, events or assemblies with friends at unusual locations gave evidence for that behaviour.

Other findings from the study regarding service-specific aspects like *travel-bugs* and *geo-coins* will not be considered here, because they cannot easily be extrapolated for the design challenge at hand.

The integration of non-playing environment and people into the endeavour is another unintended consequence where the service transgresses its boundaries due to committed players. Asking other people to help with puzzle *Caches*, hiding *Caches* oneself, not stopping until a *Cache* is found, using it as an incentive to get children to go outside and creating missions for each other, are all great signifiers for the *pervasive* nature of the service.

THE VLOGBROTHERS' NERDFIGHTERIA: "DON'T FORGET TO BE AWESOME, FIGHTERS OF WORLD SUCK!"

The *Nerdfighters Online Community* started off as an experiment of the then distant siblings John and Hank Green, who started to utilise the newly created platform *Youtube* to attempt to reconnect. They decided to have no textual communication anymore for a year and started to communicate via video blogs, what came to be knows as *vlogs* or *vlogging,* which led to them calling themselves *Vlogbrothers.* Their project, called *Brotherhood 2.0* gained so much traction that they soon became one of the iconic channels on the video streaming platform. With the growing popularity of the channel, a name for the viewers emerged, that also coined the title of the community: *Nerdfighters & Nerdfighteria.* (Castellini 2013)

Mainly focusing on educational content and *Edutainment,* the community seems to be rather secondary. Yet, through several other means of communication, such as the continuation of frequent vlogging and addressing of the audience therein, the community got strengthened. A vital element for the emergence of a sense of community and belonging, was

the invention of the *Project for Awesome*. Castellini quotes Green and Green:

> *"Project for Awesome was organised in 2007, and has been held annually on December 17-18 every year since. During PfA [Project for Awesome], thousands of people post videos about and advocating for charities that decrease the overall level of world suck. As a community, we promote these videos and raise money for the charities."'* (Castellini 2013, 219

As an example, PfA raised $800,000 in 2013 going to the top-voted charities. The willingness to step into action and acknowledge an individual responsibility from the mere fact of being human is a remarkable achievement, especially for a community that is this dispersed and heterogeneous. The last *Nerdfighteria* Census resulted in more than a hundred countries being the home to at least one *Nerdfighter*, the most unusual one, probably being Afghanistan. Mustonen (2015) refers to several studies though that community members relative sense of community does not suffer from lack of geographical proximity, which leads over to a closer look into her research.

In her study of discourse theory, applying *multimodal discourse analysis* and *computer-mediated discourse analysis*, Mustonen (2015) explores the capacity of *Nerdfighteria* to establish a *sense of community*, relying on McMillan and Chavis. They claim in 1986 (See Mustonen 2015, 7) that there are four elements to a *sense of community*: 1) *Membership*, 2) *Influence*, 3) *Integration*, 4) *Shared emotional connection*.

She identifies the relevant aspects of the *Vlogging*-Experience that create the four elements of a *sense of community* in two subcategories: *a) linguistic* and *b) visual means*.

In the category of *linguistic means*, a prominent technique – whether intentional or inadvertent cannot be said at this point – was addressing their audience with the personal pronoun *You*. With an average of 7 times (within the selected data) the amount of *You* for a video of 3 minutes 45 on average is high. A similar effect is caused by expressing great gratitude. Through verbal *inclusion* and the illusion of *interaction*, coupled with a fulfilment of *shared emotional connection*, three elements of McMillan's and Chavis' framework are at hand. This verbalised connection gets additionally enforced by a so-called register of Youth, or terminology of the age group in question.

Using insider language, such as the recurring theme of *Nerdfighters* and *Nerdfighteria,* thereby creating an identificatory surface additionally shapes the community. The embracing policy of membership creates further sense of belonging: "Interested in becoming a nerdfighter? Then you are one." (Castellini 2013, 226), which corresponds to statements in which the Brothers Green say that everyone who watches their videos is a *Nerdfighter*. This also gets incorporated in the frequent reinforcement of their motto *"Don't forget to be awesome!",* which usually gets abbreviated into the initialism *DFTBA*. However, the insider-expression also form an *out-group* of Non-*Nerdfighters* which is not (yet) loyal and acquainted with the rules, mannerisms and behaviour inherent to the community. *Identity* is always based on segregation from the non-identifier.

Attempting to defy the notion that they are the sole center of attention, John and Hank actively endorse *Nerdfighteria*-meetings without their presence, and thereby increase the influence and the feeling of relevance of all other members of the community. Mustonen (2013) comments: *"This is important, because as identifying as peers and not leaders, they are refusing hierarchy and signalling that every member of the community, vlogger or viewer alike, is equally valuable".* (Mustonen 2013, 13) Similar to the use of the term *You*, the personal pronoun *We* to indicate Togetherness increases that feeling of being on eye-level. *"We are Nerdfighters!"* in contrast to *"We are the creators and leaders of Nerdfighteria!".*

With regard to the *visual means*, the same experience of the *illusion of interaction* – as opposed to a monologue which it is, *de facto* – gets created through holding eye contact with the camera. The impression of having a conversation get reinforced by a lack of focus on the camera. Usually, there is no constant eye-contact, but fluctuation. Panning away recurringly mimics a real-life conversation. This gets additionally supported by the fact that *Vlogging* mostly takes place within the *Vloggers*, metaphorically inviting the community in. Similarly, the common sign language with the symbol of *Nerdfighteria* being crossed arms with hands forming Star Trek's Vulcan greeting, creates a feeling of *inclusion*.

The fact that all the components of McGill & Chavis' framework can be identified in Mustonen's analysis allows the conclusion that a great *sense of community* is indeed present. Connecting this to the willingness of commitment between community and *Vloggers*, the further assumption can be made that this sense of belonging is a strong motivator for behavioural change.

Compiling *Behavioural Insights* from
SNSs/Online Communities

Looking at the three cases of *SNS/Online Community*, the following observations that apply to all cases are prevalent: 1) *Sense of community*: Feeling included, equal and embraced is a vital ingredient. 2) *Endemic terminology*: There is language and expressions that are proprietary to the community. 3) *Organic Laws:* Unintended regulations and sets of appropriate behaviours emerge from bottom-up community interaction. 4) *Collaborative Competition:* Forming factions and *in-* and *out-groups* shapes identities. 5) *Phenomenon Microcosm:* Identifying with a subgroup in a subsystem increases the feeling of belonging for the entire system. 6) *Ludic Reality*: Playfulness is not only inherent to, but also actively created within the game and reality. 7) *Offline Impact:* All create real-life consequences and willingness to commit.

This list of insights is obviously inspired by Li et al's (2015) observations about the unique characteristics of *Ingress* and expands on it.

Before these observations shall be interpreted and put into context of the concepts introduced in 3, each of these deserves illustration, justifying the claim that they are relevant and present in all three cases.

1) Sense of Community

All three cases showed great presence of a *sense of community*. Prominently so, in the case of the *Vlogbrothers* example, in which the principal research (Mustonen 2015) focused on the illumination of exactly that concept. Through various *linguistic* and *visual* cues and the *illusion of interaction*, the four factors of *sense of community*, which are 1) *Membership*, 2) *Influence*, 3) *Integration*, and 4) *Shared emotional connection,* can be identified. The most dubitable one is the factor of *interaction*, as recurring pledges for participation from the part of the *Nerdfighters* in the form of comments, videos, tweets or other means of Social Media usage as well as Q&A-session, form the major element of *influence*.

Quite visibly so, this is the factor that is most clearly fulfilled by the other examples, *Ingress* and *Geocaching*, where the players (users or gamers respectively) form the main part of the *gameness*. Even more so in *Geocaching* where the app-environment is merely the communication surface for the *Caches* and the organisers rely on users to create a wider network of *Caches*. *Ingress*, as an *Augmented Reality Game,* clearly creates considerable *influence* and *interaction*.

Looking at *Encounter*, a game similar to *Ingress,* Shklovski and de Souza e Silva (2013) distil that the most significant outcome of a *Location-based Game* was not, as expected, the greater spatial awareness and identification with the physical environment, or the collaboration with unknown individuals in the flow of the game, but rather the resulting offline relationships and the consequent *social capital* (Cf. Ellison, Steinfield, and Lampe 2007). As Shklovski and de Souza e Silva put it:

> *"Our study illustrates how membership in something larger than the immediate local space could change personal visions of possibilities. The local, physical experience of the everyday and the game was, of course, important, but the connections to the distributed community resulted in expanded horizons and changed the nature of the local experience as players felt they could belong to something larger than the locales they physically inhabited." (Shklovski and de Souza e Silva 2013, 357)*

2) ENDEMIC TERMINOLOGY

The term 'endemic' stems from ecology, where it describes the characteristic of a plant or animal to be native to a particular system and initially only existing in that particular area.[9] In this context, with reference to 'terminology', the phenomenon shall be made visible that oftentimes immersive experiences, like the ones outlined, create an *in-group* through a common language that is non-conceivable to the *out-group*. Through the creation of a "secret language", which can only be decoded by actors that are part of the community, identification with that group increases.

In *Ingress* examples of codified expressions *Enlightened* (or *Toads* according to green team colour), *Resistance* (or *Smurfs*, according to blue team colour), *Portal, Resonator, Mind Field, Exotic Matter, Pineapple, Scud* or *Portal Key*.
In *Geocaching* examples are *Cache, Find, DNF (Did not Find), first-to-find, Caching Team, Travel Bugs* or *Geo-Coins.*
In *Vlogbrothers* examples are *DFTBA, TFioS, Nerdfighteria, Happy Dance, World Suck* and *the Hanklerfish.*

Expressions that are only used in a subculture or community create a feeling of independence, loyalty, secrecy and membership. It is clearly identifiable who belongs to the community only based on whether the

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[9] One unrelated example is the *Fynbos* plant kingdom which is endemic to South Africa. The smallest, but richest plant kingdom, it only occurs in South Africa.

conversation cues can be deciphered. This phenomenon can be compared to the emergence of slang, dialects, words in sub-groups or localisms. The jargon allows to feel as part of a selected circle. The purposeful framing of a group as aside from the mainstream, and thereby strengthening identification, is visible here as well. What is usually related to a physical space is here only relatively related to the local area, because all groups identify with the wider entity likewise. More on that aspect under *Phenomenon Microcosm*. This observation resonates with a recurring way of the *Vlogbrothers* of saying goodbye, that is *"Or as they like to say where we come from: 'Don't forget to be awesome!'"*. By referring to the digital-virtual[10] space and the community as if it was a country, further identification and the association of a *homeland, safe-place* and *cradle* is created.

Or as Li et al. (n.d.) put it:

> *"The unique vocabulary functions as convenient communication codes for insiders. Players could feel engaged in the community and identify themselves as part of the community as they are talking with each other with their unique inner language."* (Li et al, n.d., 27)

3) ORGANIC LAWS

Brought into focus, mainly by Li et al.'s (n.d.) research on *Ingress*, the phenomenon that the communities create norms and organically evolving rules is a commonality. Finding #3 says *"There are unwritten norms in Ingress"* *[p. 24]*, such as advanced players helping new players or enemy teams even helping each other out to reach high-level rewards. These unwritten norms can be identified as well in *Geocaching*, such as *First-to-Finds* being especially highly appraised, and *Vlogbrothers*, where any kind of discrimination is greatly penalised by the community.

The assumption is that the emergence of user-administered unwritten rules, certainly dependent on a high level of identification, will, in the fashion of a positive *feedback loop*, increase the likelihood of a sustainability of relevance and identification. Similar to inheriting behavioural patterns from parents, a player that was shown courtesy by a more advanced player, will be likely to perceive it as an obligation to recreate the favour eventually.

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[10] It is important to note that there is a difference between 'virtual' and 'digital'. While the opposite of 'digital' is 'analogue', the opposite of 'virtual' is 'real'.

4) Collaborative Competition

As touched upon in former sections of this chapter, the competitive elements in the three communities are always coupled with collaborative elements. This is less of an issue in context of the *Vlogbrothers* as there is no real competitive elements, except maybe writing comments. However, be it the allocation and domination of *Portals* or the capturing of *Caches*, users compete most of the times cordially and fair.

5) Phenomenon Microcosm

All three services endorse and allow local communities to emerge. *Ingress* catalogues these on their webpage, *Geocachers* can write messages to each other and *Vlogbrothers'* websites connect people to have physical meetups. These local communities create a stronger integration of virtual and real world.

Tausczik (2014) discovers that loyalty to a community depends on the type of attachment, but that in all cases a strong identification with a subset of a system, such as presented by a geographically local community, leads to a strong identification with the greater system. The effect on identity-emergence regarding the wider system is based on *bond-based attachment* (based on interpersonal attraction) and *identity-based attachment* (based on group identification); both lead to loyalty for the service. *Communication* increases the impact on loyalty a lot more than mere *Social Awareness*, i.e. whether users were aware of other individuals being virtually present. Tausczik et al. (2014) conclude:

> *"We were able to extend previous work by showing that the effect of group communication on community loyalty was completely mediated by attachment to the assigned work group. This experiment provides compelling evidence that loyalty is mediated by attachment to the social entities present." (Tausczik et al. 2014, 156)*

It was also shown that the loyalty to the service impacted the frequency of visits and likelihood of making friends that are also users of the system. It can be concluded that loyalty and identification with a smaller subgroup, which leads to respective identification with the main system, can have a significant effect on willingness for offline changes, given that identification shows to be a strong motivator for adaption of new behavioural patterns.

6) Ludic Reality

The term 'ludic' was coined by Huitzinga et al.'s (1949) exploration of the playful human, *homo ludens*. Accordingly, this section attempts to make a case that the three quasi-SNSs-sites are powerful tools to create enjoyable experiences for individuals through playful elements in everyday life. The aspect of everyday life, and the consequent integration in patterns that usually do not provide satisfaction, is vital. Other pastimes such as sports, TV or video games are known to bring satisfaction and relaxation. However, the services at hand, enable users to maintain their lifestyle and routine while taking more pleasure out of it. Adding additional playful elements to such as encounters with other players spices up everyday life. Positive spill-over from these non-habitual experiences cannot be overstated. Showing the wide range of emotions, reported for the three services, the capacity to improve life-quality through these services, via the power of play, can be assumed with relatively high likelihood.

TABLE 4: EMOTIONS & MOTIVATIONS REPORTED BY RESEARCH ON SELECTED CASES

Service	Emotions, Associations & Motivations	Author
Ingress	get to know neighbourhood, new friendships, fun, community feeling, art (drawing shapes on earth), hospitality options, respect, prestige	Li et al. (n.d)
	learning, excitement, teaching, cooperation, teamwork	Sheng et al. (2013)
Geocaching	Adventure, Search, Scavenger hunt, collaboration, competition, exploration	O'Hara (2008)
	Challenge, competition, cooperation, communication, disappointment, excitement, fun/play, learning, searching, secret , sharing, theatre	Hooper et al. (2011)
Vlogbrothers	Community, Nerds, Home, Self-Love, Respect, Quirkiness	Castellini (2013)
	Embracing the different, tolerance, hope, science, knowledge, creativity	Mustonen (2015)

7) OFFLINE IMPACT

This aspect should be understood in two ways. It concerns the capacity of the respective service to have an a) *individual impact:* to have a strong impact on the life of the player oneself, and b) *communal/societal impact:* to inspire and create an offline impact for others and/or the community. These two constructs relate back to *pervasive* and *persuasive games*.

a) individual/personal impact

Geocaching and *Ingress* both create strong motivations for their players to adapt their lives and daily routines to integrate gameplay. The research referred to above in Table 4 mention a wide range of activities that were influenced and adjusted to incorporate game routines: Walking the dog, being on the way to a friend, going on a trip with the family, going out for a quick run on lunch break, on vacation or from the car.

Ingress has more pull than *Geocaching* because after a *Cache* has been found, there is no real reason to go to a location a second time. In *Ingress*, even only 15 minutes are enough to return to a portal to get a different item or form a new field. This phenomenon of returning to a repetitive task, called *Replayability Value* by Ludologists certainly increases the likelihood for users to keep playing (e.g. Montola 2012). For the case of Ingress, it is important to note that much of this greater pull-effect is created by digital and real-life Social Interaction within the game narrative. Li (n.d.) comments: *"It's fair to say if people keep playing alone, they will lose interest due to mechanically repeating hacking portals routine to collect AP." (Li et al. n.d., 20)*

And this excludes spending time on solely playing these games, where players would spend entire afternoons trying to combine *mindfields*, find *Caches* and solve *Puzzles*, prepare their own *Caches*, or drive through the countryside to embark to conquer remote *Portal* in the hope to procure over a long time-span, and gain the long-aspired black badge. This level of time-related commitment is not paralleled with the same frequency for the case of *Vlogbrothers*, but the devotion and identification to be a *Nerdfighter* is noteworthy nonetheless.

As Castellini says it:

> *"But even I, so comfortable on the Internet from such a young age, couldn't have predicted the importance of a particular online community in my personal life. (…) Myself and thirteen other people started talking and decided to embark on a pair of sister collab channels, 'TheseFolk' and 'ThoseFolk.' (…) Though I may not have initially sought out this group for self-knowledge as many do, I almost accidentally learned the type of person I wanted to and could be." (Castellini 2013, 217, 221, 222)*

She did not only state great identification and personal growth resulting from following the Greens, but also was devoted enough to start a channel with other *Nerdfighters* on her own.

From a *descriptive* as opposed to an *analytical* or *prescriptive* standpoint – more on those later-on in this work – it can be concluded that all three cases have been found to be very successful in having a personal impact on the players. Users and consumers were willing to go great length in their personal lives to support the game and/or the cause that the services represent. But there is also evidence that these service had a spill-over into other spheres beyond the individual-level effect. Ultimately, the assumption of *Mindful Meerkats* is the personal empowerment and individual behavioural change will bring societal change, which has to be reflected in the flow of this work.

b) communal/societal impact

Several examples in the literature show that users of these three examples were willing to transgress the safety of the virtual world and create real-life impact. For the *Vlogbrothers* case, the foundation of *"Nerdfighters against World Suck"* to decrease the detrimental effects of a variety of issues such as poverty, hunger and diseases in the world, is the most remarkable. In a working paper applying the concept of *mechanisms of translation* Kligler-Vilenchik (2013) looks at how a common culture can a) be created and b) have positive impacts for the real-world. She states:

> *"Using the concept of mechanisms of translation, this report identifies practices through which … participatory culture groups … build on young people's passions around popular culture and their sense of shared cultural identity as an entry point into cultivating civic identities, encouraging political expression and supporting political action." (Kligler-Vilenchik 2013, 7)*

The mechanism capable of doing so are: 1) tapping content worlds and communities, 2) creative production, and 3) forming opinions and discussion. These mechanisms managed to support repeated efforts of the Green-brothers and the community to collect money for charities have established a wide network of change. Most countries of local chapters, where *Nerdfighters* connect in their passion for social change.

But also *Ingress* and *Geocaching* have shown to capacitate create real-world impact in the form of e.g. communities and friendship.

With *Geocaching* being the one that allows most to be enjoyed in isolation and solitude, the evidences for societal impacts are less pronounced, but reputation, competition and social challenge among the members of the

community, united in a niche passion, can be found in the literature, suggesting to look *"beyond the simple in situ consumption of a "treasure hunt". Rather it is important to consider it as an ongoing practice that acquires social significance through its positioning within an on-line community."* (O'Hara 2008, 1186)

In *Ingress*, the increased feeling of *locality,* i.e. to feel a connection to the geographical location of the player, and a consequent *sense of place* can be seen as most remarkable features. The added layer of game narrative on the real world creates a high extent of *Immersion.* Ironically, this immersion ultimately is an immersion into reality as the fictional – so it can be assumed – narrative seamlessly interacts with reality. A fully conceivable scenario, the game creates additional fascination and the feeling ensues that our city has to be protected from the forces of *Enlightened* harnessing *Xm* against humanity's will or protected against the *Resistance,* which hampers the opportunity for humanity to advance with *XM*'s help.

> *"[A] Portal functions as a static in-game location which is accurately connected with the real physical world with … descriptions of the site [and] the player has to be physically … [around] a portal in order to complete most of the interactions… [T]he feature makes the border between virtuality and reality ambiguous as the game is expanding its magic circle, i.e., playground to the real world. (Montola, 2005). This expanded circle facilitates players' social interaction by increasing players' physical proximity, which naturally grouping [sic] players according to the area where they usually play the game."* (Li et al. n.d, 45)

The emergence of local communities is a natural consequence of the game's capacity to draw in real-world locations. The creators did not expect the co-benefit of strategic planning within community that is local network development. Buy-in is the most important aspect, which is greatly accelerated by social factors.

Sheng (2013) also notices "geo-learning" to take place, but fails to extrapolate the insight from *Ingress* for other more relevant content than purely gameplay. This is a gap that this work tries to fill. A noteworthy example of a concept for that type of a *Pervasive, Location-based Game* is presented in Caon's "A pervasive Game to Promote Social Offline Interaction" (2013), where a geospatially integrated Roleplaying Game tries to infuse fantastic elements into the real world. Aliens that attack the earth

have to be fought-off. In comparison with *Ingress* the difference of narrative comes to mind. While *Ingress* could be reality, Caon's narrative is hard to imagine becoming real. A lack of *Immersion* can be assumed.

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TABLE 5: BEHAVIOURAL INSIGHTS IN CASE STUDIES

#		Ingress	Geocaching	Vlogbrothers
1)	Sense of Community	Social Interaction (Real and Virtual), Sense of Place, Collaboration-heavy, players become friends, Social Capital, memorialisation	Reliance on physical, non-organiser contributors to form community	Stars for Us foundation, Nerdfighters against World Suck foundation
2)	Endemic Terminology	*Portal, Resonator, Mind Field, Exotic Matter, Pineapple, Scud, Portal Key*	*Cache, Find, DNF (Did not Find), first-to-find, Caching Team, Travel Bugs, Geo-Coins*	*DFTBA, TFioS, Nerdfighteria, Happy Dance, World Suck, the Hanklerfish*
3)	Organic Laws	Teaching each other, Behavioural code	Leave little objects in Caches, comment section courtesies and politeness.	Standards of conduct, helpfulness, respect, embracing the awkward
4)	Collaborative Competition	Helping other inexperienced players, cross-factional support, paintings	First-to-Find, Prestige, Reputation, support	-
5)	Phenomenon Microcosm	The factions (Enlightened & Resistance), which are vital for identification, appear on all levels of the game and have high significance.	Global set of rules	Local Nerdfighter groups that uphold same standards.
6)	Ludic Reality	Ludic Play, Augmented Reality, Narrative, Virtual world	Hide and Seek and Scavenger Hunt. Everything can become a treasure.	Worldsuck is the ultimate enemy that Nerdfighteria has to combat.
7)	Offline Impact	Memorial service, take different routes, make portal runs as pastime, weekend events	Change routine for Caching, plan vacations accordingly, go for a walk, weekend events	Collecting money, creating professions, advising young people

The next two sections will connect the seven observations made here to the insights from 3. To clarify, *Motivational Affordances* and *the Fogg-Behavioural Model* as well as the *Self-Determination-Theory, Flow, Fun* and *Immersion* will be cross-related with *Online Social Networks* and *Online Communities*, exploring the cases *Ingress, Geocaching* and *Vlogbrothers*.

5.2.3 APPLYING LESSONS FROM PSYCHOLOGY AND HUMAN-COMPUTER-INTERACTION TO DECIPHER ONLINE NETWORKS & COMMUNITIES

Looking at the seven identified insights of the three cases, with regard to the capacities they have at hand to induce behavioural change, it is

visible that these connect well to Zhang's (2013) framework of *Motivational Needs & Affordances* that is based on Deci & Ryan's *Self-Determination Theory.*

Ingress is extremely capable of creating *Autonomy & Self*; players can decide when to engage to what extent. There is full control over how to engage in the game. The importance of seeing the impacts of autonomous choices immediately is present. The congruence of in-game virtual representation and real Self, additionally supports the feeling of full integration.

With regard to *Competence & Achievement,* the *Social* and *Technical Difficulty curve* (Extra Credits 2015) are evened out. That means that there is not a high entry difficulty neither with regard to technical nor to social hurdles.

Li et al. (n.d.) say on the matter:

> *"Its player-friendly nature for newbies [beginners] is partially because of … well-rounded instruction and immediate reward after finishing the first few required tutorial sessions, which build enough confidence for new players to survive in this highly competitive game culture at the beginning." (Li et al. n.d., 33)*

This creates a feeling of ability and induces a sense of capacity to meet goals. The quick progression to a higher level inspires to keep playing. The *Badges* emphasise these feelings of *Achievement.*

Obviously, the smooth integration of *social interaction* satisfies the need for *Relatedness*. Not having to play with other people first, but being introduced to the benefits slowly, allows for a smooth progression. More on the end of *Social Relatedness*, given the amount of online interaction and virtual interaction, the *Psychological Relatedness* surfaces when the virtual friendships become real-life friendships. Looking at the compiled insights, the following commonalities in the *Behavioural Insights* among the three cases that drive change, can be correlated with *Relatedness*: (1) *Sense of Community,* (3) *Competitive Collaboration* and (5) *Phenomenon Microcosm.*

The *Motivational Need* of *Leadership & Followership* gets covered by the fact that the community is open to have real meetings and strategic planning sessions to conquer and conquest the other faction's *mindfields* and high-level *portals.* Any person with enough time available can develop a plan to head a party for a coordinated stakeout. And regular dates in the calendar of the local groups increase integration and social texture. (2) *Endemic Terminology* creating a sentiment of being part of specialised task

force, as well as (3) *Organic Laws* which are not intended, but emergent design, increase the satisfaction of *Leadership & Followership.*

The last *Motivational Need* that Zhang assigns, *Affect & Emotion*, is change clearly induced by (6) *Ludic Reality* and (7) *Offline Impact.* The playfulness that the *Ludic Reality* infuses into the real world exceeds the hedonistic experience that other games can create, because the *Augmented Reality* creates an immersive experience. This gets accelerated by the *Offline Impact* that the game facilitates, which, in turn, creates deep experiences, adventure and distraction from routine.
Zhang only briefly outlines it in his respective piece, which demands a more substantiated conceptual fundament. Research into *Immersion, Flow, Fun, Happiness* and *Joy* in more in detail in 3.2.3 as Hamari's *Psychological Outcomes* helps to fill this gap.

With increasing difficulty, caches at times incorporate physical riddles that increase satisfaction when being solved. The interior satisfaction they provide is based on the *Motivational Need* of *Competence.* Similarly, the making of a Cache provides feelings of *Autonomy.* O'Hara's (2008) six unique features of Geocaching can be directly linked to *Motivational Needs,* which explains why it can create such a satisfying pervasive experience. *1)* Social Walking provides *Relatedness* and *Autonomy.* The element of exploration inherent to the social walking also brings feelings of *Autonomy* to 2) Discovering and Exploring places. The third aspect 3) Collecting similarly like 5) Competition and Urgency combines *Leadership* and *Competence.* The same can be said for 6) Challenge. 4) Profiles & Statistics as a pastime is mostly connected to Fellowship and Relatedness.

5.3 *DIARY ELEMENTS* AND PERSONAL TRACKING – FINDING RESEARCH TO SCRUTINISE FEEDBACK AS MOTIVATIONAL AFFORDANCE

5.3.1 ANALYSIS: QUANTIFIED SELF & BIG DATA

The quantification of entities and elements in our physical environment is certainly a common practice. This phenomenon of collecting data and numbers from everything around us, referred to as 'everyday metering' (Whitson 2013) as seen in water counter, electricity, bathroom scales, pulse rates, but also money, has been prominent throughout the entire modernity. However, its progress and impact was accelerated by newest technological advances, such as wearable technologies like the *iWatch* and other sensor-devices.

Usually, the dimensions measured and quantified have been the rate of consumption of goods or Utilities and consequent monetary flows, so measurements on household or neighbourhood level. The trend now more and more shifts towards the quantification of personal parameters, starting with financial flows and consumption preferences. Payback cards and customers bonuses exemplify this trend. The *Payback Card* and *Miles & More* are the most prominent of these measurement, known as *Loyalty Systems*.

It is visible that the more tangible the asset and the unit in question, the more likely is that it is measured. Fitness trackers like *Fitocracy, Jawbone, Runtastic* and *Nike+* emerged. Next in line were health insurances that incentivised their customers with consumer premiums to be healthier and fulfil tasks in exchange for points that are in a catalogue. A prominent example is South Africa's *Discovery Vitality* program (Armstrong, Lambert, and Lambert 2011). This trend was recently continued by the integration of the Apple *Health* app integrated into *iOS 8* by default. Certainly also an incentive to gear up and get the *iWatch*, it shows a greater awareness for *Quantified Self*.

With the advent of the *Internet of Things*, a technological movement that connects real-world objects to the intern via microchips, microprocessors, sensors and inter-device communication, this trend has received another boost. A result to this enormous amount of collection interfaces is known as *Big Data*, the accumulation of vast data sets that can be interpreted (Nafus and Sherman 2014).

The ethical concerns that come with it regarding the protection of privacy rights and malpractice with the collected data are apparent. Allocating it in the field of tension between mythology, technology and analysis lead Boyd & Crawford (2012) to conclude that there are six important complications to take into consideration, which will be enumerated for the sake of context, but will not be explored to a deeper extent:

1. *Big Data changes the definition of Knowledge*
2. *Claims to objectivity and accuracy are misleading*
3. *Bigger Data are not always better data*
4. *Taken out of context, Big Data loses its meaning*
5. *Just because it is accessible, does not make it ethical*
6. *Limited access to Big data creates new digital divides*

These six observations illuminate the great ambiguity that – like most technologies do – surrounds the ethical purity of *Quantified Self* & *Big Data*. It is indeed the case, that these issues, which Boyd & Crawford nonchalantly call *provocations*, can also be projected to the trend of *Quantified Self*. This is understandable when sensors on mobile phones seem to become one of the more impactful technical revolutions in the next decade (Shilton 2010).

The literature provides two answers to the dilemma of ethical concerns with massive, mobile-supported data collection through surveillance. One option is through a) *Gamification*, being subversive and extrinsically motivating, with the other being via b) transparency of intentions, consensual, inviting and intrinsically motivating.

GAMIFICATION TO OVERCOME RELUCTANCE OF DATA COLLECTION

Whitson (2013) points out that *"through self-observation and quantification, both digital and non-digital, [individuals] control [their] bodies through reason via the care of the self". (Whitson 2013, 167)* That shows an important difference between surveillance via *Quantified Self* and via authority. The latter is disconnected from the individual and is issued and monitored by authorities such as governing bodies and security institutions. The autonomous decision and the illusion of control via access to the interface is comforting enough to be more willing to share. Still, there are worries. These, according to Whitson disappear once there is an element of *fun* or *function*. This get emphasised if the function is the care of the self, which is not unlikely in the realm of *Quantified Self*. The additional layer of gamification allows the shift from the pure quantification to the embedded narrative, where the potentiality of options and choices creates tension and excitement. The self gets visible through representation and actionable. The instant feedback allows the interpolation of rules and ideal pathways, which is appealing in the complexity of choices. Examples she mentions are task trackers like *Epic Win* and *Nike+*, where the data is willingly fed into the servers. Another remarkable example is the shift from facial recognition embedded in airport surveillance or leisure services:

> *"Ellerbrok (2011) argues that facial recognition technologies in their new 'benign' form as user-friendly computer applications speak to pleasure, convenience, and personal entertainment, thus shifting facial recognition from a controversial policing apparatus*

> *to a playful consumer gadget, and moving it from 'hard' to 'soft' technology."(Whitson 2013, 164)*

A similar process can be witnessed with *Foursquare* or *Gowalla* (Hooper and Rettberg 2011), where an individuals' movement patterns are *willingly* exposed. In sum, the integration of game elements into surveillance patterns and especially into *Quantified Self* promises willingness. Especially if the *Quantified Self* provides helpful *feedback* for the *Care of the Self*.

TRANSPARENT INTENTIONS TO OVERCOME RELUCTANCE OF DATA COLLECTION

The second way to circumvent the – in the eyes of the author fully legitimate – reluctance to be subjected to authority-administered surveillance is transparency of intention. In a large experiment with $n = 1987$, Oulasvirta et al (2014) discovered that respondents are considerably more willing to expose personal data and details if provided with the respective intended use. It is important to note that they modelled *asymmetric data collection*, which means an external data collector. In their experiment, they *inter alia* compared a scenario with a private and a public data collector. For apparent reasons, this context cannot be fully equated with *Quantified Self*.

While *Quantified Self* is by definition the deliberate provision of data to collect feedback, there is no feedback featured in this scenario. But as *Mindful Meerkats*, as all so often, meanders on the edge between *asymmetric* and *symmetric data collection*, this is an insightful discovery. The collected data is intended to be simultaneously used to function as a) feedback mechanism; b) extrapolated for research purposes; c) monetised for revenue generation; and d) serve to inform governmental decision-making, depending on the choice of the player. Therefore the player has a choice between or a mixture of a) *private,* b) *scientific* c) *commercial* d) *public* use of his data.

For that purpose it is valuable to know, that the full transparency of these different domains can increase willingness of players to share, and, so it can be assumed, increase affection and trust in the company. This result has to be treated with caution as the *attitude-behaviour-gap* often occurs in Likert-scale items[11], where people assume that they would do something, given an event, but in actuality they behave differently.

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[11] Most common survey-based research method for proxy quantifications. Questions are posed over a scale of 5 steps from "Fully Agree" to "Fully Disagree".

But even only the stated tendency that layers are more willing to give up personal data if they know what for, reinforces the setup.

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For the particular case of *Quantified Self* as integrated in a *Location-Based System* such as *Mindful Meerkats,* two other constructs are significant and potentially relevant for *Behavioural Design*: *Citizen Computation* and *Empowering Surveillance.*

CITIZEN COMPUTATION

The undertaking, that was mentioned earlier in this chapter, namely to use *challenges* via the *gameplay interaction* of Users to collect data willingly and offer it to help them make lifestyle decisions, links into *citizen computation.* As this is just a young field, we are hoping to be able to make a considerable contribution to the field. The initiator Celino (2013, 315-316) outlines that embedded in interdisciplinarity, *Citizen Computation* can be allocated

> *"At the crossroads of several research fields. It relies on Human Computation … to provide a human-based solution to unresolved tasks; it understands from Crowdsourcing … the ability to involve a crowd of workers and learns from Citizen Science … how to recruit volunteers on the territory; finally it builds on Social Computing … to understand and leverage social ties and interactions. With specific reference to location-based GWAPs [Games With A Purpose] , we believe that Citizen Computation games represent a valuable development choice to achieve the objective to 'change the world' (McGonigal 2011) in a playful and entertaining way."* (Celino 2013, 315–316)

As this coincides with the general trajectory of this research, this work can be seen as mutual reinforcing with regard to Celino's assessment. The author wants to propose to combine the increasing "*SensorMania"* (Swan 2012) with *Citizen Computation* and *Quantified Self* to arrive at a *Quantified Environment* and inspire *bottom-up* Change prompting individuals to be more connected to their local environment as research into *Location-based Mobile Games* such as *Ingress* showed.

EMPOWERING SURVEILLANCE

Shilton (2010) argues that *"Mobile phones could become the largest surveillance system on the planet" [p. 131]* and Fogg seconds that notion in "Mobile Persuasion" (2007). However, Shilton provides a novel perspective saying that the instruments of what is conceptually Celino's *Citizen Computation* could allow us to combine the playful and the useful, giving that Oulasvirta's research showed that the explicit declaration of intentions would prime people to a) willingly place data at disposal and b) would use it for their own sake to *Care for the Self*. Shilton posits *Empowering Surveillance* as following:

> *"Local control architectures allow for three key differences from traditional surveillance. First, individuals gain a private store of information that would otherwise be unavailable (e.g. collections of mood, sleep habits, and so forth). […] Second, local control through a vault provides an alternative vision to current data flow architectures. […] Third, and perhaps most importantly, local control of data can provide the capacity to "answer back" to ongoing forms of corporate and government surveillance." (Shilton 2010, 135-136)*

These insights inform further *Design Lessons* drawn from this research (See 6).

5.3.2   EFFECTIVENESS FOR BEHAVIOURAL CHANGE: QUANTIFIED SELF CASE STUDIES

To examine the effectiveness of *Quantified Self* services, four cases from three studies will be looked at in closer detail:

a)   *oPower*, a UK company working on household energy consumption (Ayres, Raseman, and Shih 2012; Allcott 2011)

The following studies could also have been looked at for the virtual representation but they rather use a virtual canvas to design behavioural change specifically and are thus *prescriptive* and *ex-ante observations*. In that sense, they rather fit under the frame of *Quantified Self*. This makes them valuable *addenda* to the *descriptive ex-post* studies above.

b)   *UbiFit*, a garden as a virtual canvas for Fitness behavioural change (Consolvo, Paulos, and Smith 2007) & in the same study

c) *Environmental Awareness* feeds environmental measurements back to mobile phone users (ibd.)

d) The effects of a virtual polar bear on behaviour (Dillahunt et al. 2008)

Other potential studies for the purpose of exploring or extrapolating the *Behavioural Impacts* of the *Motivational Affordance* of *Quantified Self* is Kappen et al.'s (2013) exploration of the effectiveness of gamified task-managing systems, Jung et al.'s (2010) insights into how feedback affects individual and group performance, Kass et al.'s (2007) speech participation tracker and Lin's Health Tracker (2011).

OPOWER & PRIVATELY DELIVERED PEER COMPARISON FEEDBACK

oPower is a company that feeds the energy consumption data back to their users via mail postage, whilst also providing a direct spending comparison with other households in area and neighbourhood. Electricity and natural gas usage alike are accounted for. Ayres et al. (2012) conducted large-scale field experiments with a small number utility companies. All customer sets, independent of the energy supplier, that were exposed to *oPower's* mailed feedback, the energy consumption decreased, including a sustained decrease over time. Different envelope sizes and content of the letters varied in success. The conductors report: *"As we have shown in our simple calculations above, peer comparison reports can create significant net cost and carbon savings, benefiting both individual households and the environment."* (Ayres 2012, 16) They also suggest that other forms of *privately-delivered peer comparison feedback* could be a worthwhile way of eliciting behavioural changes.

Allcott (2009) applies a different approach and directly looks social norms. He makes three assumptions for which consumers might be willing to reduce energy consumption after receiving an overview of direct comparison: a) *Competition:* The feeling of being superior creates competition and pride. b) *Conscience:* As there is no internalisation of external environmental costs in the prices consumers are not aware of the environmental effects. The visualisation of consumption and data coupled with the direct confrontation with neighbours' contribution to energy savings and linked conservation, seems to create an environmental awareness. c) *Social Learning:* Seeing how their own behavioural tweaks actually have a significant impact on their spending, induces awareness within the household.

The flipside of exposing the *social norm* to consumers to make them aware of how they diverge from the norm and therefore induce behavioural also functions negatively, in, what is known as, the "Boomerang Effect", where below-average consumers increase their consumption, knowing that there is more leeway for some. In conclusion of the paper Allcott (2009, 17) states that *"The program is a remarkable departure from traditional energy efficiency programs in that it is designed with direct insight from behavioural science and is implemented using randomized controlled trials … This analysis adds to recently-growing appreciation of how non-price interventions can affect consumer behaviour"*.

This conclusion in itself, especially disconnected from the field of energy conservation, and rather focusing on consumer influencing in general, is a valuable point of departure for the thesis at hand.

UbiFit Garden – A Fitness Garden

In *UbiFit Garden* you get a different visual response depending on your fitness routine. The visual response is projected on the image of a garden on your mobile phone screen saver. The more flowers one sees, the more fitness tasks are fulfilled. The more diverse the set of flowers is, the more diverse is the set of fulfilled exercises. Butterflies represent week's goals. If the participant in question is not exercising the garden merely stays barren. There is no punishment.

As the garden is presented on the background screen, there is a permanent reminder in form of a *Trigger*. Yet, this *Trigger* is merely #T3, a *Signal* creating an omnipresent, passive reminder. It is neither timely enough to be considered a *Spark* designed to create *Motivation*, nor is it a *Facilitator*, designed to create *Ability*.

The fact that we have a garden, that is in itself a passive canvas, does not elicit the association of movement. Therefore it is not an *Immersive Experience*, which would increase the functionality and the capacity of being a *Motivational Affordance*. Even though the *Motivational Need* of *Autonomy* can be assumed to be attached as it lies in the hands of the user to act upon the Trigger, with one out of five Motivational Need Satisfaction, the *Affordance* is fairly low.

The data is not specific enough to increase the insights for the user. There are no statistics of progression that would allow an emergence of feelings of the *Motivational Need Competence*. There is no social interaction

for *Relatedness* and *Leader- and Fellowship* and a Garden alone does not create many emotions, so there is no *Affect & Emotion* either. Unfortunately the article does not give way to piloting data and how it was perceived, but the author would assume that no long-term convergence will take place. Initial excitement and extrinsic rewards in the form of butterflies and flowers will create short-term buy-in due to Novelty, but the lack of bridging the gap between intrinsic and extrinsic motivation will end up in dissipating support. And this is despite the fact that they specifically address both, *Novelty-Effect* and "Motivating Continued Use".

ENVIRONMENTAL AWARENESS FEEDS ENVIRONMENTAL MEASUREMENTS BACK TO MOBILE PHONE USERS (IBD.)

Developed by the same research team, Consolvo et al, *Environmental Awareness* suffers from the same premises. Being intended to reward individuals intrinsically with the data that is fed back to them, the visualisation and playful element is missing. Even though intrinsic motivation does not necessarily require playful experiences, it is certain that at least an element of joy, happiness or flow have to be by-products of the service's use.

Given that the service provides user with immediate feedback on levels of environmental measurement such as Air pollution, this is valuable from a scientific and data collection perspective, but the customer buy-in falls short again. In stark opposition to the positive feelings requires for *Psychological outcomes* to inform behavioural choices, the puritanical and dry relaying of numbers will only excite experts that can interpret the data. What *UbiFit Garden* succeeds in, is the visualisation component. At least partially, given that there is a mismatch between image and reality level, but at least there is an attempt to present the data to the individual in an appealing fashion. In a noteworthy attempt to bring *Citizen Computation* into fruition, *Environmental Awareness* also neglects the *Attitude-Behaviour-Gap*. Only because one is aware and knowledgeable about the CO_2 level in the neighbourhood, the implication for the individual is hidden.

The potential for *Environmental Awareness* to address *Motivational Needs* is certainly given, but at the current stage, the design neglects necessities for those *Motivational Needs* as much as *Psychological Outcomes* are not addressed. And this is despite the fact that sentences like *"she receives meaningful, personal benefits of being able to monitor her current environment and receive alerts when she ventures into harmful atmospheric conditions"*, could easily be expanded for elements like collecting air types, finding specific gases, comparing

amounts of *Greenhouse Gases* that were found with other people to create *Competence* or *Relatedness*.

Behavioural change is a shift of behavioural patterns over time and behaviour is an amalgamation of *Actions. Actions* require *Motivation, Ability* and *Trigger.* But if there is no target behaviour or *Action* that a *Behavioural Change System* attempts to create, the knowledge alone is in vain.

THE EFFECTS OF A VIRTUAL POLAR BEAR ON BEHAVIOUR (DILLAHUNT ET AL. 2008)

In this study participants were tested on their – so the study says – behavioural change. In fact, the study only looks at attitudes. Two groups were exposed to a digital polar bear. While one group only read about the facts, the other group was exposed to an emotionally loaded paragraph. Checking their emotions for sadness, later-on, this group was checked for greater willingness to a) voice to do little changes and b) invest in an environmental protection campaign. With each expressed willingness of change, the floe that the virtual polar bear was standing on was getting bigger. A week later, all participants were asked whether they want to donate money to a campaign. The one belonging to the attachment group were more willing to donate.

It can be deducted that a virtual, appealing creature has an effect on our Empathy. Yet, the setup of the study does not provide much more content than that. There was no difference in presented stages of the polar bear, which would have helped make deductions about real-life impact. The appeal to implement any of the *Actions* promised was not really checked up on. Admittedly not an easy task, this honesty-bias was not addressed. Therefore it can be noted that there was mainly an attitude-driven test setup, which withdraws legitimacy of the findings. The valuable insight whether behavioural non-compliance would be a consequence of empathy with a creature was therefore not an outcome of the study.

5.4 VISUALISED RANKING – FINDING RESEARCH TO SCRUTINISE *LOOKOUT MASTER BOARD* & *BEST BURROW BOARD* AS MOTIVATIONAL AFFORDANCE

5.4.1 ANALYSIS: LEADERBOARDS

What is a leaderboard? A leaderboard is a tool to show the performance of different actors that stand in competition with each other. Teams in a sports league, be it football or basketball *etc.*, have a table that summarises

their performances that would be considered a leaderboard. Another word could be 'hierarchy' or 'ranking'. Costa et al. (2013, 1) define it as follows:

> *"Leaderboards are nothing more than a list of participants in a competition that are according to a variable, such as highest or lowest score. They are known to stimulate and promote competitiveness and are also recognized as an effective way of gauging who is better what the competition stands for."* (Costa et al., 1)

This type of *Motivational Affordance* visualised a random number of participants with regard to one particular factor Therefore, the tool itself is neutral. Depending on the parameters that is being looked at, the *Leaderboard* gains a connotation. One old way of *Leaderboards* is the definition of success in the modern world. Countries are being ranked with regard to their monetary flows, or GDP, and that is the common denominator. Bhutan as one of the examples measure its success in happiness. The point being that as much as you can use a *Leaderboards* to drive competition or negative usages, the intention in itself is neutral.

It certainly connects to *Competence* and competition. Much of pride emerges from knowing that you have a better performance than other peers. There is a difference between *pointification* and *Gamification* with help of *Leaderboards* with regard to whether joy and emergence is the intended outcome or pure fun. Where points are introduced only for the sake to infuse fun into an otherwise desperate environment, this is not *Gamification* (Robertson 2010; Santonen and Faber 2015).

As Deterding expresses, you cannot integrate two inherently opposite systems in each other. In a workplace where playfulness is usually strongly forbidden, a *Leaderboard* would shrivel. A *situation* cannot stand in fundamental contrast to what the integration of prices or points tries to achieve. If *Situational* and *Artifactual Motivational Affordance* contradict each other, the project is bound to fail.

Leaderboards are in that sense subjected to *Cognitive-Evaluation-Theory* as well, in that they are a form of extrinsic rewards to a particular target pattern or target behaviour. If they are not capable of creating intrinsic rewards over time, the *Motivation* will vanish and resentment will follow. As Surugui (2014) puts it: *"Leaderboards enables a context of progression relative to peers. Leaderboards can motivate or demotivate, considering that users differ in their motivation to engage." (Surugui 2014, 23)*

5.4.2 Effectiveness for Behavioural Change: An exemplary Leaderboard Case Study

In an experiment, Costa et al. (2013) examined how the punctuality of office workers changed being exposed to arrival times. Logging in on an iPad located at the office space, each worker arriving at a meeting would receive points depending on arrival time.

It was notable that all participants' behaviours changed due to the office space leaderboard. However, it was also visible that putting the leaderboard in place had negative effects for some workers. Given that points or the *Leaderboards* create extrinsic *Motivations*, Deci & Ryan's observations about correlation between *Extrinsic* and *Intrinsic Motivation* apply. The risk that the *Intrinsic Motivations* disappear when *Extrinsic* ones get too strong, is a real one. Some participants comment that their *Intrinsic Motivation* to be punctual got fractured by the fact that now everyone was doing it anyway for the sake of the *Leaderboard* placement.

The *Motivational Needs* of *Autonomy, Competence* and *Relatedness* that are satisfied when a worker deliberately makes an effort to being on time, get macerated by *extrinsic motivations*. In contrast to making the workplace a more rewarding experience by integrating elements of *joy* and *flow* into the working routine, the mere integration of a *points system* is a *"fun"*-driven and *hedonistic*. Being seen as an easy-fix to worker dissatisfaction, it misses the integral point that even the playful comparison requires a willingness to collaborate on the basis of mutually agreed sets of rules. As Costa (2013) puts it:

> *"what influences an individual's motivation to do something 'as work' rather than 'at work' is the existence or absence of consent to the gamified task, which can be seen as a 'mandatory fun' activity."* (Costa 2013, 2)

This puts the *tool-system-fit* at an ironic disconnect and takes the *Leaderboards* for this case at hand *ad absurdum*. Deterding makes a similar remark:

> *"Playing a competitive video game is voluntarily chosen and free of consequence. Yet a public performance comparison at work, introduced by management and tied to cash incentives ..., is neither voluntary, nor free of consequence. Thus, it could easily be experienced as controlling, thwarting experienced autonomy and hence, intrinsic motivation."* (Deterding 2011, 3)

The moment where a system that is put in place to increase worker satisfaction, destroys *Motivational Needs* such as *Autonomy* by prescribing certain task and thus limiting choice, the intention is skewed entirely. The intended *behavioural change* might indeed occur, admittedly, but only for as long as E*xtrinsic Rewards* keep flowing in. The moment where these rewards get aborted, the expectation has been constituted that it is something worth rewarding, and the unmet expectation creates more dissatisfaction. So, if a *Leaderboards* does not build on already existing *Intrinsic Motivations*, it creates a *feedback loop* with a negative outcome in the moment where the Reward-system gets cancelled. The expression "builds on" is vital as the ignorant set-up of a system would just replace the *Motivation* over time.

The phenomenon described here is also known as the *Overjustification Effect*, where an extrinsic rewards cancelled out an intrinsic reward (Lewis 2014, 15).

5.4.3   LEADERBOARDS AS PERSUASIVE AFFORDANCE

The risk stated above is true for all *gamification system elements.* From within the set of *Affordances* that is looked at in this study*, Leaderboards* are the most commonly used ones. There is a risk of an unnaturally imposing "fun" elements into a system that suppresses joy from its core. However, if the system provides satisfaction of *Motivational Needs*, but has not *Situational Motivational Affordance,* then a system integrating a *Leaderboard* can be exactly the right tool to bank on the existing inherently existing satisfiers of *Motivational Needs.*

In other words, when aiming to provide a way to visualise a parameter which is already part of a process that provides *Intrinsic Motivations*, a *Leaderboard* can be a useful tool to bind and channel *Motivations.* By making *Motivation* visible in form of a ranking, the spectator can be made aware of these *Motivations* and engage with them in greater vigour. In that moment it serves the purpose of a *Trigger* and *Motivation* to equal account. Taking into account the *Situational Affordance* that is provided by the fact that the system allows for joy to emerge from within, all conditions are met for a *Leaderboard* to be *Persuasive Affordance.*

5.5 PERSUASIVE AFFORDANCES AS CULMINATION OF BEHAVIOURAL INSIGHTS

Deterding only speaks about *Situational Motivational Affordances* within *Gamification* systems. However, with regard to the shortfall that the examples of *Quantified Self* showed, an important insight that makes use of his vocabulary is the fact that *Situational Affordances* can also occur without the element of *Motivational Needs* being involved. *Quantified Self* can never be an *Artifactual Motivational Affordance.* There a two options to embed *Quantified Self* into a *Behaviour-Change-Inducing System.*

a) It can take place as a *Situational Affordance*, where the interpretation of the environment and situation through the information received via *Quantified Self* allows a new usage of that environment. Or

b) the statistical data will be interpreted as part of the system in a way that embraces the behavioural chain, and consequently *Quantified Self* only becomes a component of a *Persuasive Affordance*, where the other elements are put in relation with it. Only a juxtaposition of that nature allows the capacity of *Quantified Self* to emerge.

When wrapping up the section on *Motivational Affordances,* which was intended to extrapolate insights for *behaviour change,* it has to be noted that the *Affordances* were rarely specifically designed to induce particular behavioural changes. When looking at *Vlogbrothers* or *Geocaching*, the purpose is entertainment, the same is true for *World of Warcraft* or *Second Life,* other were rather purely science driven, e.g. Yee's research. And the ones that indeed tried to design for behaviour change do it in a reductionist and not thought-through fashion; *Punctuality-gamification* through *Leaderboards, UbiFit* and *Environmental Awareness.*

Therefore, this work wants to suggest the development of a *Theory of Persuasive Affordance* (cf. 3.2.2). It integrates *Motivational Needs* with *Motivational Affordances*, being aware and consciously managing *Situational* and *Artifactual Affordances* (Deterding 2011), leveraging them towards both, *Psychological* and *Behavioural Outcomes* and setting them up to serve an intended *Target Action.* Later-on, potentially, *Persuasive Affordances* could then be expanded to provide a framework for societal change weaving macro-societal theories into it.
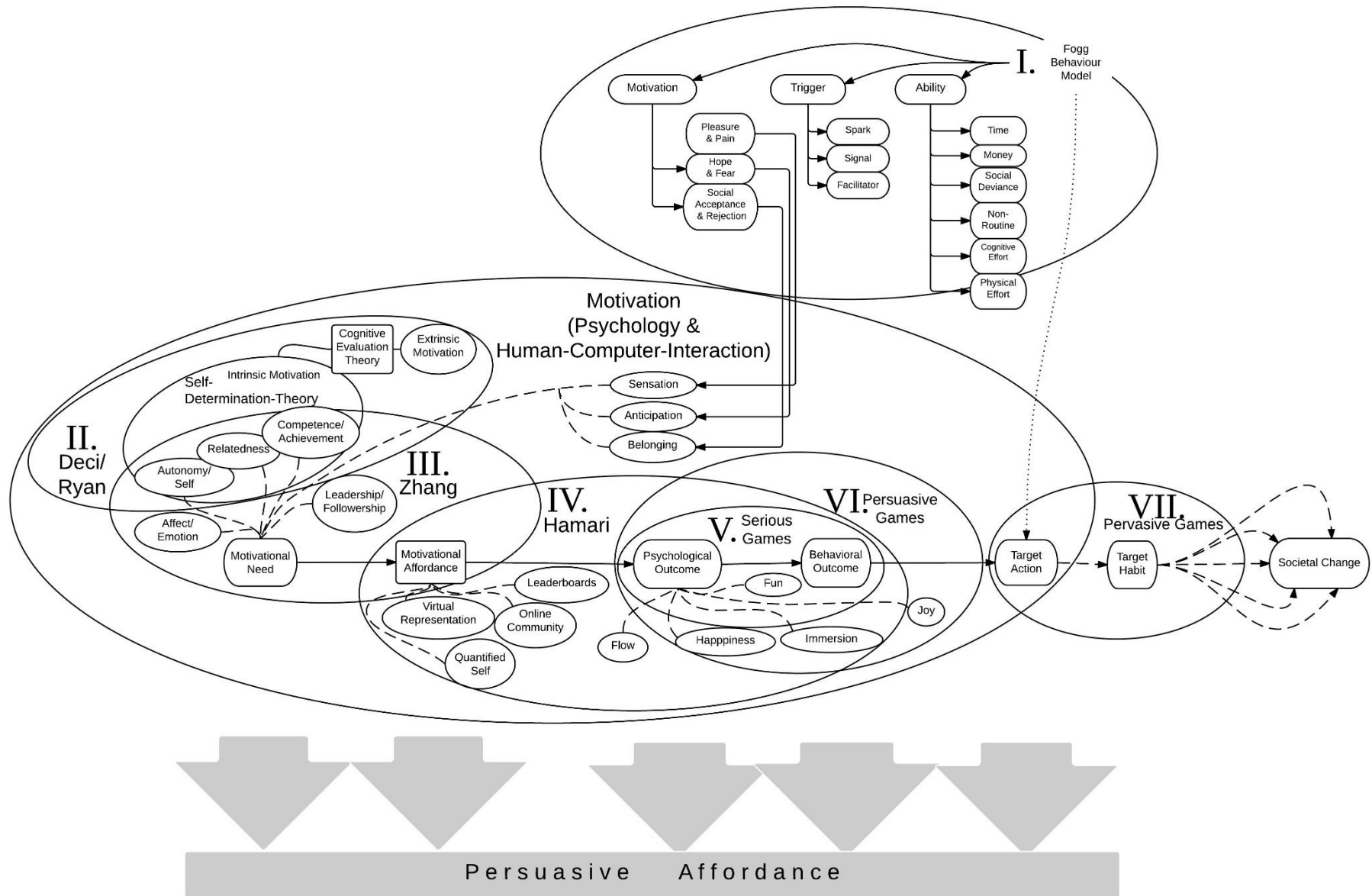
The examples that have been looked at have not sufficiently fulfilled the requirements to be called *Persuasive Affordances.* The only exception that comes close to being a or providing *Persuasive Affordance*s is *Ingress.* It is

certainly a game full of surprises, where its holistic integration of real-world element brings individuals and users to divert from their usual routines greatly to be able to progress in the game. The *Target Action* is *TA1: "Using a data collection device while walking"*, which is pushed for greatly as many of the Game objectives can only be fulfilled while walking. The data that is collected like this then feeds the Google's map application to also provide orientation and assistance for customers on their feet. The *Behavioural Outcome* of *TA1* is incentivised by in-game *Motivational Affordances* that satisfy the *Motivational Needs* of *Autonomy, Competence, Leadership, Affect, Leadership* (Zhang 2008) via *Psychological Outcomes* such as e.g. *Flow* or *Immersion.*

Remembering how *Features* relate to *Affordances* in such a way that they are integrated elements of them, we can make further comparisons. In the same way that *Affordances* are a conceptually underestimated subset of *Features, Persuasive Affordances* can be considered a subset of *Motivational Affordances.* Even though more holistic and encompassing in nature, only a fraction of *Motivational Affordances* are *Persuasive Affordances.*

On a side-note, the same correlation can be identified with regard to *Design.* Even though omnipresent and highly salient in contemporary life, the most potent specimen of it, *System Design* is underestimated and little acknowledged. With a focus on *Product Design* and *Communications Design* most designers in the present day limit the items of their reach and modulation to this reductionist scope, where an object is perceived to be isolated from the systems it is embedded in. Given that *Affordances* are by definition created by interaction between objects, systems and subjects, consequently these design approaches and methods neglect their relevance and existence.

Again, what *Affordances* are to *Features, Persuasive Affordances* are to *Motivational Affordances* and *System Design* is to *Product Design.* Little acknowledged, being an extremely more potent specimen compared to the popular and extravert, but also simple and dumb. Therefore, Science, Design and Entrepreneurship have to fraternise and collaborate to bring all their disciplines out of the darkness and integrate insights into transdisciplinary system design.

I. Fogg Behaviour Model

Motivation
Trigger
Ability

Pleasure & Pain
Hope & Fear
Social Acceptance & Rejection

Spark
Signal
Facilitator

Time
Money
Social Deviance
Non-Routine
Cognitive Effort
Physical Effort

Motivation
(Psychology & Human-Computer-Interaction)

Sensation
Anticipation
Belonging

II. Deci/ Ryan

Self-Determination-Theory

Cognitive Evaluation Theory
Extrinsic Motivation
Intrinsic Motivation

Competence/ Achievement
Relatedness
Autonomy/ Self
Affect/ Emotion
Leadership/ Followership

III. Zhang

Motivational Need

IV. Hamari

Motivational Affordance

Leaderboards
Virtual Representation
Online Community
Quantified Self
Flow

V. Serious Games

VI. Persuasive Games

Psychological Outcome
Behavioral Outcome

Fun
Joy
Happpiness
Immersion

VII. Pervasive Games

Target Action
Target Habit
Societal Change

Persuasive   Affordance

6   DESIGN & APPLICATION – APPLYING LESSONS

What are scientific recommendations for the gameful persuasive design of 'Mindful Meerkats'?

To recap, in 2 and 3, the methodology and theoretical background were outlined. A coherent line of argument was then compiled from the diverse theories of 2 in 3.2. Being a core element of the elaboration in this chapter, this aspect will get repeated again. In 4, the case at hand, the *Persuasive System* of *Mindful Meerkats*, was outlined with regard to the *Motivational Affordances* it offers. To get a grasp on how successful these specimen of *Motivational Affordances* can be in general, each of them was illuminated from a scientific perspective in 5. The insights that were generated with regard to *Persuasion* (See *Persuasive Technology* or *Captology*) allowed the application of the concept of *Persuasive Affordances* to the cases at hand. This chapter 6, will now look at how 3 and 4 can be juxtaposed. What insights from other cases, where *Motivational Affordances* were applied, can inform the development of *Mindful Meerkats*? What can the insights from the applied theories bring to the table for the Design of *Mindful Meerkats*? What assumptions can be generated regarding the *Persuasive Affordances* in *Mindful Meerkats*, and what can be assumed about the consequent effectiveness of the app?

6.1   INSIGHTS FOR MINDFUL MEERKATS FROM MOTIVATIONAL AFFORDANCES

For the sake of theoretical clarity, scientific conduct and the sake of the argument, the *Motivational Affordances* in *Mindful Meerkats* are being treated as if they were independent. However, this separation of theoretical constructs is fairly artificial. The values of the *Leaderboards* are fed by *Quantified Self*. The *Leaderboard* creates a *Community* through *competition*. And the *Meeka* only gets his depth via fulfilled challenges, which in turn provide insights via *Quantified Self* again,. This confluence of In-App Elements or *Affordances* in practice will be addressed in 6.2.

6.1.1   *MEEKA* AS VIRTUAL AGENT

WHAT KIND OF AN *ANIMAL* IS *MEEKA*? – *VIRTUAL AGENT* PARAMETERS

IN-GAME PERSONALITY

A *Meeka* does not have a storyline on its own, there is no virtual narrative. Therefore the *In-game Personality* is low or limited. The only purpose

of the *Agent* is being a canvas for the projections of the player. What is consider *personality* here, lies outside of a personality that an image receives merely through a graphic style of design, choice of colours or spatial arrangement. As much as it is possible to interpret personality into the cute awake eyes of a Meerkat, as little has this to do with the actual personality of the *Agent*. And this is the one which *In-game personality* is concerned with.

IMMERSION IN VIRTUALITY

A *Meeka* only provides little room for *Immersion in Virtuality*, because the gameplay has not much virtual components. In that sense *Mindful Meer-kats* shares more with a *Pervasive* or *Ubiquitous game*, because the main gameplay takes in the real-world. Yet, the immediate responses to completed or failed challenges, can create a feeling of immersion, and seeing the happiness of the *Meeka* correspond to personal inputs. Little animations which are envisioned for the Beta onwards can also have a significant impact on *Immersion in Virtuality*. This component might be additionally increased, when, given the *Attribute* for *Social Sustainability*, that is *Community*, rises, more *Meeka*s appear in the background. At the beginning this would only be possible as static *Meeka*s; later-on it should be possible to reach out to the corresponding *Meecat*s, i.e. the users whose representation the *Meeka* is.

INCORPORATION OF REALITY

For the success of *Mindful Meerkats*, it is vital that individuals feel the value of incorporation or expressing their life through the eyes of a Meerkat, or more specifically, of a *Meeka*. Given that fact and the importance, it can be assumed that *Mindful Meerkats* is creating a strong *Incorporation of Reality*. The fact that the gameplay resembles a *Ubiquitous Game*, taking place in the real world, being monitored by Sensors and *Quantified Self*, further allows for this assumption. If we look at the relationship between virtual and real environment, it is remarkable to note, that in contrast to other *Location-Based Mobile Games* with *Mixed-Reality-Aspects*, that although much of the game takes place in reality, the main playing board is virtual in the form of the *Meeka*. As opposed to looking through the lens of virtual world onto reality, one looks onto a virtual world through the lens of reality[12].

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[12] This observation could will be explored to a greater extent with a notion *Augmented Virtuality* to be a conceptual counterpart to *Augmented Reality*.

One possible impediment to this claim is the fact that one can proceed in the game with pretense and cheating. As it is mostly honesty-based, the verification is rather an optional bonus, as opposed to be an intentional barrier to compliance. Essential cheating to gain points is a greater loss for the individual anyway since he or she basically cheats herself. The added value of cheating is intended to be that marginal that the incentive is low. However, this would indeed be a way to escape the relevance of *Incorporation of Reality.*

Customisation

With regard to *Customisation*, it is important to distinguish between initial and early development features and eventually intended game features. At the beginning, the only options for Users to customise their representation are fur colours and the *Meeka*'s size. The next step would be types of body parts, such as eyes or ears, and their size. So you could be a blue Meerkat with huge ears and tiny eyes. This provides high *Customisation*, but has not effect on *Incorporation of Reality*, which is an important modulator for *Immersion,* which in turn creates *Joy*. Therefore, to affect these altogether, it is intended to allow individuals to use their *Scorpions* to buy additional *Customisation* elements, which make their *Agent* more unique, but also increase the potential *Incorporation of Reality*, given that they could attempt to replicate a most similar version of themselves in the Meerkat narrative.

Mindful Meerkats - A Smartphone Game as an instrument for behavioural change towards sustainable life-styles

TABLE 6: VIRTUAL AGENT TYPOLOGY - EXTENDED (BY AUTHOR)

Virtual Agent Typology				
(+ = *strong* o = *medium* - = *weak*)				
	a) *In-Game Personality*	b) *Immersion in Virtuality*	c) *Incorporation of Reality*	d) *Customisation*
1) *Sprite* (e.g. *Androidify/ Wii Mii*)	-	-	+	+
2) *Avatar* (e.g. *WoW*)	o	+	o	o
3) *Character* (e.g. *Metal Gear Solid*)	+	o	-	-
4) *Persona* (e.g. *GTA/ Assassins' Creed*)	o	++	o	-
5) **Meeka** (**Mindful Meer-kats**)	**-**	**o**	**+**	**+**

BUT WHAT KIND OF *VIRTUAL AGENT* IS *MEEKA*?

If these strings of parameters are now pulled together, and inserted into Table 3 (which is based on Table 6), we can see that a *Meeka* is a mixture of the other types of *Virtual Agents*. It has the passive, static and container-like nature of a *Sprite* with weak *In-Game Personality*.

Its score for *Immersion in Virtuality* is similar to a *Character*, being medium. While the *Character* has low immersion, because of a lack of *Customisation*, a *Meeka* only provides little *Immersion*, because the virtual playing field is limited. For the time being, there is not much more than the canvas with changing backgrounds.

Looking at *Incorporation of Reality* and *Customisation* with strong values the *Meeka* shows greatest resemblance with a *Sprite*. And indeed in the basic variant, a *Meeka* has a passive function similar to the one of a *Sprite*. Again, the mental image of a canvas is helpful. It is a dynamic canvas like a mirror image that expresses your performance and scores visually. In that regards, there are many parallels to Seppelt et al.'s (2014) *LandYOUs*.

The closeness to *Sprite* can be an impediment to *Immersion* and conse-quently to *identification* and *attachment*, which are important factors of *Be-havioural Outcomes (See 3.3)*. Therefore, it is valuable to think about poten-tial design changes to make the emergence of these factors more likely. Consequently, the team of *Mindful Meerkats* discusses options that would change the proximity to *Sprite*.

It is conceivable to control your *Meeka* in a narrated game, where the fate of the endangered Clan in a human world has to be overcome. There would still be the same amount of *Incorporation of Reality*, but the *Immersion in Virtuality* would increase greatly. The *Meeka* would gain characteristics of a *Character*. Similar to *Farmville* or *Hayday*, one would have to take care of an area, with the difference that there is actual choice and one can lose in the game because of systemic feedbacks. Games that border into the realm of *Serious Games* and try to teach through simulation of the real world in a similar fashion are *Eco*, *Fate of the world: Tipping Point* and Seppelt et al.'s (2014) *LandYous* from the Helmholtz-Institute Leipzig.

Another option would be to have an open world on the phone, where each step in the real world would correspond to a step in the virtual world. This would move the game into the direction of a *Ubiquitous* and *Mixed-Reality Games*. A prominent representative of these types is Swiss game developer company *Gbanga*. A direct overlap of real-world and virtual world objects and locations with respective benefits for both worlds would be especially interesting. Standing in an organic marketplace to be able to get fresh ingredients in the game as well, as well as in reality for instance. Points in the game, and discounts in reality. The research on *Location-Based Mobile Games* will inform developments in that direction. In that case, the *Agent* would gain *characteristics* of an *Avatar,* given that it would be an open world with little *In-Game character*, but high *Immersion in Virtuality*, while preserving the high *Incorporation of Reality*. This type of *Augmented Reality Games* is not only little researched, but also little repre-sented in the market. The closest ones to what the team envisions are *Ingress* and *Botfighters*.

INSIGHTS FROM CASE STUDIES

A particularly interesting insight from Yee's exploration of the *Proteus Effect* is the substantiated assumption that changes in virtual representa-tion reflect on the *player*. Being taller or more attractive in the *Virtual world* creates real-life behavioural changes. It can be assumed that this is stronger the more identified a player feels with his representation. Yet,

also just the short period of time in the trial had considerable effects on participants' confidence. That is essential for the case of *Mindful Meerkats* for several reasons.

1) *Negative virtual experiences elicit an emotional and behavioural response.*

Therefore, a deteriorating natural environment including the respective background will bring compassion and motivation to improve *Pawprint*. The same can be expected to be true for all other negative visualisations, stemming from Attribute values, in which the *Meeka* is visibly affected and impoverished.

2) *Positive depiction of the Meeka will create a feeling of fulfilment and satisfaction for the player.*

Even if there are conditions in the life of the player, that might go beyond the limited scope of three little changes per day, such as personal losses, professional difficulties or financial problems, only the small rewards from visual responses and improvements, might infuse a feeling of happiness. A form of *Happiness-Placebo* or *Self-Fulfilling Prophecy* ensues, that fulfils the Self.

3) *The virtual behaviours as well as the real-life behaviours will have an impact on the attitude of the player. Potential Cognitive Dissonance reinforces that sentiment.*

These assumptions get supported by the fact that the behavioural chain presented in 3.2 aligns with Yee's research set-up. In the same way that he manipulates what the player perceives, in *Mindful Meerkats* certain images and impressions are fed back to the player. The perception of the virtual Self alone will change the perception of the real Self. That in turn will have an effect on the willingness to fulfil certain challenges. For the same reason it is important to be weary that non-compliance with challenges might decrease willingness to comply at all. "I am not the kind of person who does environmental stuff".

In McLeod's research there are two important insights for the *Mindful Meerkats' Persuasive Design*:

4) *Self-perception regarding the social domain, i.e. personality and overlap between player and avatar sociality has a great impact on perceived similarity, but not such a great impact on identification. Yet, identification with the avatar was*

affected by both of these. Real-life impacts, though were more likely to occur as consequences of identification.

The take-home lesson from this fact is that it is important to create a feeling of identification. It is modulated by both social and visual similarity. This is important, because the *personality overlap*, which is inherent to the game, as there is no *in-game personality* of *Meeka,* compensates the potential shortage for design templates to create visual similarity between avatar and player. The process for new more customisable *Meekas* cannot wait too long, though, because it plays into *identification* as well.

This lesson gets corroborated by the fact McLeod (2014) finds that:

5) *Real-life effects were more likely to occur as a response to emotional attachment as opposed to absorption.*

FIGURE 12: MOST RECENT AVATAR DESIGNS ((C) MINDFUL MEERKATS)

Absorption was defined as closely related to Immersion, showing the extent to which a player was engaged during the game as opposed to being distant, which was grasped by the factors attachment and emotional involvement. *"Our findings suggested that emotional attachment was a more important determinant of the likelihood of experiencing changes to real life than was the extent of absorption while physically online."* *(McLeod 2014,* 66) This is an additional encouragement to make sure that the person feels represented emotionally and socially rather than visually. Narrative *Immersion* and consequent *emotional attachment* weigh heavier than visual *Absorption*. Embedding the player into the game development process could be an additional way to create attachment to the product and the Meerkat narrative.

Nevertheless, these insights get set in a different light when looking at Trepte et al.'s (2010) observation about the correlation between *Life-Satisfaction* and *Avatar-choice.*

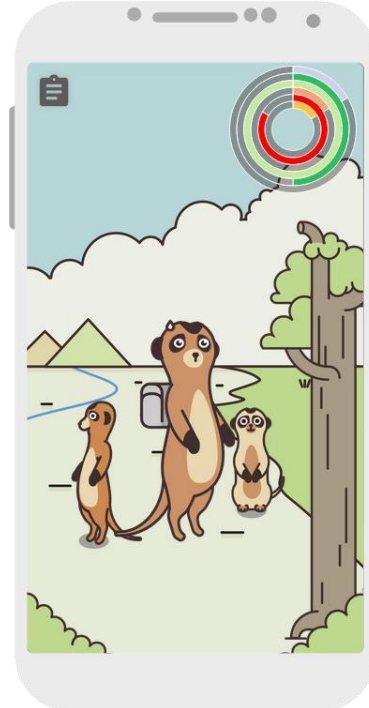6) *Happier people tend to pick avatars that resemble them to a greater extent.*

People that have a higher life-satisfaction, are more likely to pick an avatar that is more similar to themselves. Conversely – *q.e.d; further research needed* – it can be assumed that the happier a player gets, the greater the likelihood that he modifies his avatar to look like him. In that way, there would be the wonderful opportunity to look into the correlation between stated happiness levels via the optional Likert scale day by day, player-avatar-similarity and in-game happiness levels. In that way our assumption can be verified from the bottom up.

This increases the importance of *Customisation* for *identification* again. That puts the ranking of priorities into a difficult dilemma. Research that shows that visual customisation is important, and research that shows that narrative immersion is more important. For now, it can only be noted and taken into consideration.

Beyond this consideration, it is advisable to create stronger and more distinct differences between different stages per attribute to create strong perceptions and consequent responses. The research also backs up the decision to present *Meeka* not as a pet, but as an Avatar-like mirror image. Otherwise, *immersion* would get hindered by independence of specimen. Even if one is not really the *Avatar* in reality (not a *Meeka*, but a *Meecat*), just the fact that one feels connected to the *Avatar*, because there is full control over the course of its "life" or "existence", increases *identification* to the extent that one adopts behaviours that are associated with the avatar's visuals. This control brings further feelings of *Autonomy* which creates a positive feedback loop for identification due to the satisfaction of a *Motivational Need.* That brings us to the next question.

Is *Meeka* a successful *motivational Affordance*? Does it create *intrinsic Motivation*?

A good *Motivational Affordance* would be defined by the successful satisfaction of one or ideally more than one *Motivational Needs.*

Looking at the list of *Motivational* Needs again, it is clear that a *Meeka* especially addresses *Autonomy & Self.* With regard to values, a *Meeka* is unique for every player, i.e. *Meecat* world-wide. That endorses the Self-aspect. For the Alpha-version it cannot be realised yet to grasp all numeric nuances of the *Attribute* values visually. However, the Beta will incorporate a greater number of graphical assets and therefore provide a greater visual response to *Attribute* change, which in turn increases a feeling of *Autonomy & Self.*

The second *Motivational Need* in question is *Competence & Achievement*, which can be considered fulfilled when seeing the *Meeka* progress and change for the better as a representation of one's own personal growth. Letting aside the possibility that a player is cheating, every *Meeka* progress automatically also means a *Meecat progress*.

In an obscure sense, the *Meeka* could indeed be seen as a mobile Mirror Image as there is the chance to form a relationship with the *Meeka* that is oneself. Telling people about the idea, they often return at random points in time and ask "How is your *Meeka* doing?" or "My *Meeka* has gained some points the other day, because I cooked a Vegetarian meal!", as if they were already playing the game. This alludes to the fact that the narrative itself has some drawing force and people can easily remember it. To have an external figure that nudges oneself without being strict or paternalistic, is a valuable feature that provides *Relatedness*.

With regard to *Leadership & Fellowship* and *Affect & Emotion*, the author believes that these are fully satisfied by the *Clan structure* and the fact that a playful layer is shown over anything that you encounter in your life. In these moments the association is not far-fetched to pause for a moment, turn inwards and ask "What would *Meeka* do?". In that way *Immersion* in real-life is created and awareness gets programmed into everyday life.

6.1.2 *Mindful Meerkats* as Online Community & Network

Are we getting close to creating an Online Community?

The compiled *Behavioural Insights* from the case studies can serve as a yardstick to estimate how successful a full implementation of the *Mindful Meerkats* will be in exuding a feeling of togetherness and emerge as an *Online Society* as opposed to not even an *Online Community*.

Sense of Community

As much as it seems tautological to speak of success factor of emerging as a *community* to then name a sense of community as a prerequisite, this is a valuable insight, given that one study specifically addressed components of *sense of community* to be *Membership, Influence, Integration* and S*hared emotional connection*. Additionally, visual and linguistic cues are creating more of such a sense of community. The linguistic aspect will return as *Endemic Terminology*, but the other factors can be determined for the design of *Mindful Meerkats* in its current state.

Membership is going to be exclusive in the sense that one has to be invited to get access to the Alpha and Beta or have participated in Crowdfunding Campaign. With *Membership* however comes access to a forum where next steps are discussed and decisions can be witnessed, so there is *Influence*. *Members* will be fully invited to *Integration* in these discussions. A feedback and participation culture is intended where everyone can give new suggestions for challenges, themes and events. The shared emotional connection comes with recurring vocabulary referring to "ourselves", the members of *Mindful Meerkats* as *Meecats*.

ENDEMIC TERMINOLOGY

Mimicking the *Vlogbrother's DFTBA*, a goodbye shall be institutionalised. With "Stay Marvelous!" and other linguistic cues, a vocabulary is going to be established that is unique to this community. Other examples are the following:

1. *Meeka* as name for the *Virtual Representation*
2. *Meecat* as term for real-life players
3. *Humanimals* as non-player citizens
4. *Habit.at* as the background and later the entire *Virtual world*, a word-play on 'habit' and 'habitat'
5. *Clan,* which is a group of players
6. *Sentry*, which is the rotating leader of a clan
7. *Scorpions*, which is the in-game currency and
8. *Best Burrow Board*, which is the name for the Local Clans Leaderboard

Certainly, the names for the attributes also make up for a new set of vocabulary, with the concepts hidden within them.

ORGANIC LAWS

It cannot be anticipated yet if or which organic laws emerge, but it will stay present during the design that it is a helpful component to embrace bottom-up inspiration to allow for this type of *Autonomy*. The online community interface will facilitate the emergence of such laws.

COLLABORATIVE COMPETITION

This is hopefully a self-explanatory one. The entire app-idea involves a mixture of competitive and collaborative elements. It is not possible to proceed greatly, when playing exclusively alone. The integration of a shallow *Social Difficulty curve* will ease players into social interaction.

PHENOMENON MICROCOSM

The small communities function the same way as the world-wide community and the different levels can communicate with each other as well. The identity of the microcosm Clan and the slogan of "Creating a Happier You" is embraced all around the world.

LUDIC REALITY

A second layer of playfulness is appearing on top of the real world. The perceived environment is suddenly not grey and uninviting and triste, but instead full of *Affordances, choices* to be to remembered, memories to be collected, *Meekas* to be trained. A staircase becomes a *Fitness Affordance*, a coffeeplace or bar becomes a *Pawprint Affordance* ('Deny disposable cup' or 'Deny straw')

OFFLINE IMPACT

This is probably the strongest factor fulfilled by *Mindful Meerkats*. Since the digital world is only the monitoring interface, and yet, is critical for the play experience, the two worlds merge. Having to take care of a mixed-reality clan, where in-game elements as well as offline elements coincide is very rarely embraced to that extent.

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As these factors really just work well together, the only lesson from research and cases can be the following:

7) *To create an* Online Community*, make sure that you make sure to integrate* Sense of Community*,* Endemic Terminology*,* Organic Laws, Collaborative Competition*,* Phenomenon Microcosm*,* Ludic Reality *and* Offline Impact simultaneously.

IS THE ENVISIONED *MEERKATS SOCIETY* A GOOD *MOTIVATIONAL AFFORDANCE*?

With continuous offline competitions for your clan, daily challenges and tasks and expanding your comfort zone, *Competence & Achievement* should be sorted. Similarly, *Autonomy & Self* are given as the *Meeka* is your unique representation and you can choose how to go about it. Another factor which is important to procure the feeling of *Autonomy* is the absolute *choice* about whether to take a challenge or not. There is no punishment on the basis of *guilt* or *penalty.* Reduction of points only occurs on the basis of

Accountability as a matter of *consequence.* We believe that we can recreate the *Relatedness* that the Vlogbrothers create in a similar fashion in the community with the common objective of creating more happiness for ourselves and others. With the message that there is no need for leaders, but that each one of the community is a leader, the emergence of a sense of *Leadership & Fellowship,* and being part of something, can be considered a given. The *emotions* that the sharing of experiences via *Photographic Expression* can bring and the community that embraces individuals as part of a bigger something creates a motivational home.

6.1.3   Quantified Self for Mindfulness

What can we learn from Research and the Case Studies?

Quantified Self and especially *Citizen Computation* and *Empowering Surveillance* have great potential to combine data science and social theory. With the help of self-administered data, individuals could start restructuring and deciphering patterns themselves and understand the behaviour of systems and themselves as part of these systems. Especially the main insight from *oPower's* work, that is the fact that *Privately Delivered Peer Comparison Feedback* is the strongest motivator for behavioural change in Household (*How Behavioral Science Can Lower Your Energy Bill* 2013) resonates greatly with the *Mindful Meerkats* Design.

8) *Creating Social norms via competition, internal rules and positive peer pressures have a strong impact on behavioural adjustments.*

However, the other three *information systems* that were looked at that outspokenly utilised *Quantified Self* or *Feedback mechanisms* were rather unsuccessful in creating highly persuasive systems. That has less to do with *Quantified Self* and more with the underestimation of difficulty of behavioural *interventions, hacks* and *patches*. Feedback alone will not change behaviour. The attitude-behaviour-gap is wider than meets the eye.

9) *Quantified Self has to be embedded in several behavioural responses. Fogg-Behaviour-Model has to inform Design, otherwise it falls short of attempted reaction.*
10) *Information has to be tailored and contextualised to be able to reach individuals at the right point in time. Situational Affordances matter.*

Is *Quantified Self* in *Mindful Meerkats* a successful *motivational Affordance*?

As argued before *Quantified Self* can never be fully persuasive on its own. The mere collecting and relaying of data creates no behavioural response. However, in the way how *Mindful Meerkats* employs them, it is always a combination. The feedback via *Avatar adjustments* creates a feeling of *Competence* & *Achievement*, because it is a reward when a challenge is completed. *Relatedness* and *Affect* is created, because the identification with the *Meeka* and other *Meecats* creates *Empathy*. The diary elements allow to have an overview over the progress and elicit the *Motivational Need* of *Self*.

6.1.4 *Lookout Master* and *Best Burrow* as Leaderboards

What can we learn from Science and the Case Studies?

Leaderboards can be a very useful tool to create behavioural change. Yet, similar to *Quantified Self/feedback*, they are perceived to be *One-Size-fits-All-solutions*, that automatically infuse any system with fun and happiness. However, this equation is, as expected, too simplified. Deterding elaborates that *Leaderboards* require the right environment to be successful and not counterproductive. Where a *Leaderboard* creates an extrinsic reward even though an intrinsic motivation was present, the risk appears that the intrinsic motivation dissipates as the Cognitive-Evaluation-Theory explores. They are thus most useful when they are part of a system that endorses intrinsic motivations as opposed to replacing them.

11) *Leaderboards require careful planning to support Motivation as opposed to replacing it.*

In this case, the *Leaderboards* "*Lookout Master*" (for *Meekas/Meecats*) and "*Best Burrow*" (for *clans*) serve as a mixture between *Quantified Self* and *Leaderboard*. The existence of competitive segments, similar to leagues in other sports, guarantees that there is a challenge embedded in the ranking and not a frustration. In that way there is not frustration of only seeing oneself e.g. as Number 180 of 300 players, but rather as the 10th of Level 4-players in your physical environment.

Are *Leaderboards* successful *motivational Affordances*?

Leaderboards are great affordances to satisfy the *Motivational Needs* of *Competence, Leadership* and *Relatedness*. Seeing your own performance – ideally

high - in comparison with your peers, gives you simultaneously a feeling of having mastered something, while literally leading the board, which affords *Leadership,* and as collaborative competition in Ingress showed, also provides you with feeling of being connected. This last aspect gets additionally increased by the possibility to visit a *Meeka* at their location eventually.

6.2   PERSUASIVE AFFORDANCES IN MINDFUL MEERKATS

Given that through the unique set-up and combination of the services, there are capacities to intervene at any given time, because it is a mobile phone, knowing about the activity of the holder of the phone, as he wilfully shares that information, *Mindful Meerkats* is especially equipped to implement *Persuasive Affordances.* An *Affordance* that can be considered *Persuasive* needs to acknowledge the entire behavioural chain and internalise the potential biases and noise. It has to be acknowledged that there is a difference between a *Situational Motivational Affordance* and an *Artifactual Motivational Affordance* and that the current theory of *Motivational Affordance* requires a renovation that integrates the Fogg Behavioural Model. Thinking about the satisfaction of *Motivational Needs* solely is not sufficient to bring long-lasting change that potentially spirals upwards to shape new social norms.

The complexity especially for a Designer of a *Persuasive System* is extremely high. For the case of *Mindful Meerkats*, it gets multiplied, because each of the *Target Actions* that shall be called for with a *Persuasive Affordance* needs to integrate the components mentioned before. If one of them is not integrated, the attempt to create a *Persuasive Affordance* fails. A system might persuade, but not be persuasive, but only persuading short-term. This is so important, because an extrinsically motivated action does not adhere to the *Self-Determination Theory* and therefore creates dependencies as opposed to free choice.

Through *tailoring* at the start of the service engagement, the system knows about basic living and lifestyle conditions of the player to make sure that *Ability* is never compromised. Similarly, via the conscious deployment of a *Social Difficulty Curve,* other hindrances to *Ability* are prevented. As the first challenges in all *Attributes* are going to be so-called *low-hanging fruits,* feelings of *flow* and *Competence* can be expected to create satisfaction to an extent that invites loyalty.

7 CONCLUSION

7.1 DESIGN INSIGHTS

The insights for future design and development that have been found in the literature review, identified within the text, are the following:

1) *Negative virtual experiences elicit an emotional and behavioural response.*
2) *Positive depiction of the Meeka will create a feeling of fulfilment and satisfaction for the player.*
3) *The virtual behaviours as well as the real-life behaviours will have an impact on the attitude of the player. Potential Cognitive Dissonance reinforces that sentiment.*
4) *Self-perception regarding the social domain, i.e. personality and overlap between player and avatar sociality has a great impact on perceived similarity, but not such a great impact on identification. Yet, identification with the avatar was affected by both of these. Real-life impacts, though were more likely to occur as consequences of identification.*
5) *Real-life effects were more likely to occur as a response to emotional attachment as opposed to absorption.*
6) *Happier people tend to pick avatars that resemble them to a greater extent.*
7) *To create an* Online Community*, make sure that you make sure to integrate* Sense of Community*,* Endemic Terminology*,* Organic Laws, Collaborative Competition*,* Phenomenon Microcosm*,* Ludic Reality *and* Offline Impact
8) *Quantified Self has to be embedded in several behavioural responses. Fogg-Behaviour-Model has to inform Design, otherwise it falls short of attempted reaction.*
9) *Information has to be tailored and contextualised to be able to reach individuals at the right point in time. Situational Affordances matter.*
10) *Leaderboards require careful planning to support Motivation as opposed to replacing it.*

Given that these are merely the directly visible *Design Lessons*, i.e. *Deductions* from the literature, these shall be complemented with a set of *Justifications* and *Falsifications*. These relate to the assumptions inherent in the initial *Mental Model* in 2.3 and corroborate the adjusted Model shown in the *Research Framework* under 3.5 with respect to *Mindful Meerkats*.

7.2 JUSTIFICATION, FALSIFICATION, DEDUCTION – ASSUMPTIONS MEET RESEARCH

First of all, if we have a look at the *Mental Model* once again, we can see that the Hamari's threefold chain can be aligned with it. The components in the system of *Information Technology* that were assumed to have effects, are *Motivational Affordances*. The induced psychological sensations, are understood as *Psychological Outcomes*. And lastly, the intended behavioural changes align to Hamari's *Behavioural Outcomes*. So at least from that, the conceptual angle, the assumptive model gains a certain degree of validity. (See Figure 13).
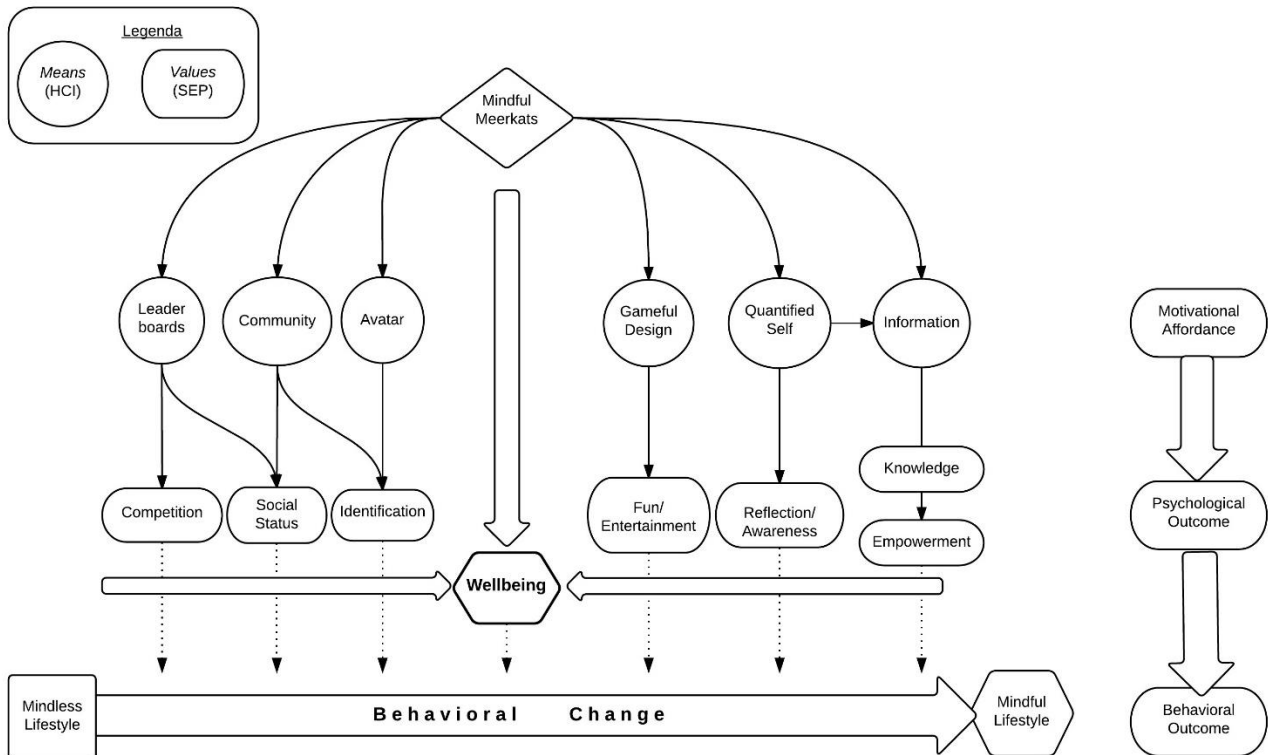
FIGURE 13: MENTAL MODEL + BEHAVIOURAL CHAIN

If we now separately look at the assumptions that are inherent in the model, we can find further insights to either corroborate or discard the assumptions.

One important remark is that what is described here in the *Model* as *Wellbeing* and *Behavioural Change*, has been adjusted over time to be understood as *Intrinsic Motivation*. All individuals strive towards more happiness or *Wellbeing*. Consequently, it is a driver of *Behavioural Change*. Who acknowledges a lack of fulfilment is more likely to change aspects of one's

life. *Intrinsic Motivation* thus is a by-product. This intentional, epistemological limitation of reducing *Wellbeing* to *Intrinsic Motivation* to conceptualise *Behavioural Change* allows to approach the issue with less ontological complexity. The ontological complexity of happiness research and individual behaviour is prominent enough to legitimise this pragmatic, conscious choice (Linley and Joseph 2004; Layard 2003). To evaluate the validity of the initial assumptions, the *Self-Determination-Theory* and the *Fogg Behaviour Model* will be the guiding lights.

Table 7 will simplify orientation.

Looking at the *Mental Model* again, the first inherent assumptions are: (1) *Leaderboards lead to competition* and *(2) Competition leads to Behavioural Change.*

(1) has shown to be accurate. *Leaderboards* create direct social comparisons and therefore induce feelings of performance. If put in place skilfully, they can create a playful sense of competition that enhances *Motivation* and productivity. However, Deterding's commentary on *Situational Affordances* has to be taken seriously, where the situation can hamper and jeopardise the intention of a *Leaderboard* intervention. The mere introduction of a competitive element can also bring mistrust, suspicion and risk the emergence of *Intrinsic Motivation.* As much as *Leaderboards* can guarantee the sensation of *Competence,* they are a hindrance to *Autonomy,* because an additional complication for the fulfilment of Actions is introduced. It can thus reduce the *Ability* of individuals to complete *Target Behaviours.* Furthermore, the potential exposure that comes with a public comparison can bring internal unrest. Individual might feel alienated even though there non-compliance has other factors aside from *Motivation,* and can rather be attributed to a lack of *Ability* or *Trigger.*
Therefore, collaboration and fairness are important components to be stressed within such an *Affordance.* In a similar fashion, creating a point system will not always immediately lead to better working conditions. Playful elements can only complement a work environment; they cannot gloss over or improve bad conditions. This is true for points as well as *Leaderboards* built upon these points. Therefore, (2) cannot be fully backed up. *Competition* is not the component that creates *Intrinsic Motivation* (and *Wellbeing*), but rather the *Psychological Outcomes* attached to *Competition* that bring feelings like *Competence* via dominance, *Relatedness* via amicable and fair rivalry and *Leadership* via social comparison. *Situational Affordances* have

to be taken into account to create an environment prone for the satisfaction of *Motivational Needs.*

The next initial assumptions in the *Mental Model* concern *Social Status.* These are *(3) Leaderboards affect Social Status* and *(4) Social Status modulates Behavioural Change.* Aligning with the observations protocoled with respect to the capacity for *Leaderboard's* capacity to create competition, it can be stated here as well, that they have conditional capacity. Being the most effective tool to facilitate social comparison, they can greatly enhance the *Dual Core Motivator "Belonging",* which deciphers a *Social Acceptance* and *Rejection.* Where a point-system and ranking introduces a new measure of performance, new social norms and parsing mechanism can emerge. These can, under the condition that *Ability* and *Trigger* are given, lead to *Behavioural Change* indeed. However, yet again, the distinction between *Intrinsic Motivation* and *Extrinsic Motivation* through external pressure of new patterns and norms is of utmost relevance. Where individuals comply with a new "regime" that was introduced by a point-system, only to fit the mould and adapt to new rules, no real change is embraced. In other words, there is no real surplus of wellbeing and only a reproduction of an unhealthy environment via the illusion of playfulness. The effects on *Social Status* and the perception of the new social norms has to emerge organically and at a pace that allows individuals to maintain their *Autonomy.* Otherwise, it can be assumed that the extrinsically motivated *Behavioural Change* will only lead to internal resentment and pressures, and the *Motivation* will disappear and dissolve quickly. This stands in line with the findings of the *Cognitive Evaluation Theory* and explains why unhealthy work (or living) environment require new *External Rewards* at an increasing rate over time to compensate for the internal void.

Initial assumption number five reads as follows: *(5) Community creates Identification.* This assumption was born from the fallacy that an *Online Network* and *Social Network Site* automatically creates a *sense of community.* Especially the research on the *Vlogbrother's Nerdfighteria* showed the great number of factors that feeds into a group of people feeling as a community. Accordingly, adjusting the assumption to that insight, it should rather read *Identification creates Community.* However we are then confronted with Chicken-and-Egg-like dilemma. How is *Community* created? Is *Identification* more important for *Communities* or do *Communities* create feelings of *Identification*? Looking at Mustonen once again, the catalogue of factors contributing to *sense of community* comes back to mind, where *Membership, Influence, Integration* and *Shared Emotional Connection* are seen to be the main

aspects. Additionally, this work identified seven other factors that facilitated behavioural impacts of *Online Network* and their evolution to be communities, which went far beyond simple *Identification.* This directly connects to initial assumption *(7) Identification leads to Behavioural Change.* The *Behavioural Insights* grounded on the comparison of the three communities show a wide array of aspects beneficial for the creation of behavioural impacts from *Communities.* Aside from *1) Sense of Community*, these were the following six: 2) *Endemic terminology,* 3) *Organic Laws,* 4) *Collaborative Competition,* 5) *Phenomenon Microcosm,* 6) *Ludic Reality* and 7) *Offline Impact.* The great number of aspects shows that the capacity for *Behavioural Change* stemming from *Online Communities* was both underestimated in terms of potency and overestimated in terms of linearity. It is more complex than meets the eye.

A similar conclusion can be drawn for initial assumption number *(6) Avatar* [now: Virtual Representation] *leads to Identification* and number *(7) Identification leads to Behavioural Change*, which has already been mentioned. Even though a *Virtual Representation* can bring a sense of identification to the player, it is less so the *Identification* and rather other factors that determine the capacity for real-world impact. The Proteus-Effect is a major insight. It states that in-game conditions have real-world behavioural impact. Even though it is not explained in its functioning and emergence, merely showing evidence of its existence and modulates people's behaviour without their knowledge is significant. In-game confidence-inducing factors like height translate into real-world confident behaviour. This shows that *Virtual Representations* – similar to Online Communities – if deliberately designed for that purpose, qua *Persuasive Affordances* for instance, have great prospects to address *Intrinsic Motivation.* Customisation can bring *Autonomy*, Challenges bring *Competence* and a Representation-User-Similarity brings *Relatedness.* Additionally, research into the correlation of choice of *Virtual Representation* and *Wellbeing* allows further insights attached to *Virtual Representations* that reach far beyond the limited impact of and from *Identification.*

Initial assumption *(8) Gameful Design leads to Fun/Entertainment* can be unpacked with reference to the remarks for the assumptions (1) and (3). *Leaderboards* and a point-system are often consider the cornerstones of *Gamification* as the most effective tool to bring fun into a non-game environment (See Deterding et al. 2011). However, as mentioned before, they cannot be seen as a silver bullet that will create a pleasant experience of

something that is inherently unpleasant. In the same way that not all information systems, that are considered games, are satisfying the requirements of immersion and joy, that are part of a fulfilling experiences, and are *bad* games, there are environments that cannot be improved because their nature is inherently contradicting the intention of joy. The environment has to be initially joyful – that decreases over time – or neutral in nature, for gameful elements to succeed in maintaining, creating or infusing joy.

This in itself allow the reflection of initial assumption number *(9) Fun/Entertainment leads to Behavioural Change*. Looking at Zhang's fifth *Motivational Need* of *Affect & Emotion,* it seems that the *Behavioural Outcome* should from Gameful Design should be automatic. However, this is only true under two conditions. Firstly, the Gameful Design has to respect the environmental constraints posed by what Deterding dubs *Situational Affordances.* Secondly, there has to be a clear *Target Action* which is attached to the creation or provision of fun. Plus, a designer of a gameful environment should not only aim for the provision of fun. Entertainment and likewise the joy of Games is not only found via fun (Extra Credits 2012).

Leaving the concrete game elements of *Leaderboards* and *Virtual Representation*, we face a more abstract concept of feedback and *Quantified Self.* Initial assumption number ten reads *(10) Quantified Self leads to Awareness.* Looking at the next three initial assumptions *(11) Awareness leads to Behavioural Change, (12) Information leads to Knowledge* and *(13) Knowledge leads to Behavioural Change*, it becomes apparent that their abstract nature and the difficulty to measure whether they are part of a *Behavioural Change* justify the decision to not include them to the same extent as the other information technology elements. *Information, Knowledge* as well as *Awareness* are concepts that require an exploration from a philosophical standpoint which would have exceeded the scope of this work.

Nevertheless, the insights from the other elements allow reflections on these constructs. This is especially true when the assumption on the creation of *Awareness* via *Quantified Self* can be expanded (or reduced) onto direct capacity of it for *Behavioural Change. Quantified Self* provides the greatest potential for timely *Triggers,* which according to Fogg are one third of any *Action.* Therefore, the power of *Quantified Self* cannot be underestimated. This gets highlighted when taking *Competence* as one of the core aspects of *Intrinsic Motivation* into account. Often individuals are not even aware of their performance, let alone their excellence unless it is communicated or told to them. This latter certainly can only be stated if the *Intrinsic Motivation* is already present. Otherwise they would not have

pursue an *Action* about which a performance could be fed back. In other words, *Quantified Self* is more suited to enforce a behavioural pattern and increase the likelihood of an *Action* being maintained as opposed to creating a new Behaviour.

TABLE 7: ASSUMPTIONS, VERIFICATIONS, FALSIFICATION, DEDUCTIONS - AN OVERVIEW

Number	Initial Assumption	(V) Verification/ (F) Falsification	Correction/ Deduction
(1)	Leaderboards lead to Competition	(V) Leaderboards can instill a feeling of competition, but not always the type of competition that is intended by gamification designers.	Leaderboards cannot provide a full-fledged experience on their own. They need to go hand in hand with other affordances to be successfully persuasive.
(2)	Competition leads to Behavioural Change	(F) Competition alone does not lead to Behavioural Change. Negative effects of competition have to be taken into consideration. Competition is most effective as multiplier of e.g. Competence.	Situational Affordances are necessary that satisfy and counterbalance loss of Autonomy via Competence, Relatedness and Leadership.
(3)	Leaderboards affect Social Status.	(F) Even though Leaderboards certainly affect Social Status, they do not have an unconditional impact. Only where the measured and ranked component is of relevance and importance for the particular human group, Leaderboards have the assumed effect.	Social Status has more factors than only competition. Leaderboards can be responsible for changing norms and thereby creating a new ethical regime, but this is a very important component for the success of Leaderboards to tap into Social Status.
(4)	Social Status modulates Behavioural Change.	(V) Belonging with Social Acceptance and Rejection is one of the most vital components of the Fogg Behavioural Model. It is therefore a very strong modulator for Behavioural Change. The pressure from being an isolated part of an organisational structure such as a community or society cannot be stressed enough.	When the norms and attitudes are heavily contradictory to the Target Actions and Intended Outcomes of an information system or behavioural Design, it is very complicated to have a great impact. Therefore, a smooth transition and lean social difficulty curve is important. Where deep core beliefs are endangered, or social standing at risk, individuals are hesitant to proceed.
(5)	Community creates Identification.	(F) Not a clear correlation. Community and Identification are interdependent.	Sense of community is dependent on a multitude of factors that go beyond only identification.
(6)	Avatar leads to Identification	(V): Virtual Representations can induce Identification. And so much more…	Proteus-Effect and correlation to wellbeing demand greater relevance and attention of and to Representation research.

(7)	*Identification leads to Behavioural Change*	*(V), but only if considering the vast amount of elements that are necessary in a community to have behavioural impacts.*	*Identification alone is only a small fraction of behavioural capacities of communities. (1) Sense of Community, 2) Endemic terminology, 3) Organic Laws, 4) Collaborative Competition, 5) Phenomenon Microcosm, 6) Ludic Reality, 7) Offline Impact)*
(8)	*Gameful Design leads to Fun/Entertainment*	*(F) Not all Gameful Design will automatically lead to Fun. It has to be designed while respecting the system and the environment in which it is placed. Also, Gameful Design is not limited to Fun.*	*Good Gameful Design can lead to Fun and Entertainment, but a wider range of emotions such as joy, tension and adventure should be considered as outcomes of a gameful system.*
(9)	*Fun/Entertainment leads to Behavioural Change*	*(V): Fun & Joy as Psychological Outcomes and Motivational Need of Affect/Emotion bring Intrinsic Motivation.*	*We can assume that if a lack of Fun/Entertainment is present in a life, the promise of these, can be a convincing argument for Behavioural Change.*
(10)	*Quantified Self leads to Awareness.*	*(V) With a narrow definition of Awareness, where it is passive knowledge, it is safe to say, that the mere provision of new personalised information leads to greater knowledge and awareness about oneself.*	*Even though the Attitude-Behaviour-Gap is strong, information should not be entirely discarded as a low-hanging fruit and way to reach willing specimen.*
(11)	*Awareness leads to Behavioural Change.*	*(F): Research too limited, concept too abstract.*	*Further, more specific philosophical, sociological and sociolinguistic research necessary.*
(12)	*Information leads to Knowledge.*	*(F): Research too limited, concept too abstract.*	*Further, more specific philosophical, sociological and sociolinguistic research necessary.*
(13)	*Knowledge leads to Behavioural Change.*	*(F): Research too limited, concept too abstract.*	*Further, more specific philosophical, sociological and sociolinguistic research necessary.*

7.3   LINEARITY VS. COMPLEXITY

Looking at the compiled insights, deductions and corrections of initial assumption, it becomes strongly visible and apparent, that the linear approach was oversimplified. *Behavioural Change* and the factors determining human decision-making are manifold, interdependent and adaptive. A change in one of the *Affordances* has impacts on all other elements and a *Psychological Outcome* can or cannot lead to a *Behavioural Outcome*. It is extremely difficult to make separated and laboratory-like assumptions or predictions. The laws of human behaviour cannot be estimated to follow similar rules of clarity as physical laws. Therefore, the first *Mental Model* fails to provide a complete overview. The inherent complex-adaptive nature of all, individuals, human systems and 90% of all systems in general, poses a great impediment for the predictive capacities of analytical research (Poli 2013).

This is by no means a way of giving in to the task in or asking for scientific-cognitive resignation and blessing, but rather a call for caution and a plea for embracing complexity. Scientific analysis is not capable of addressing issues of interdisciplinary and ontological complexity to a satisfactory degree anymore. Where all systems increase in interdependence continuously and an individual is exposed to a plethora of systemic impacts as an effect, the notion of clarity and truth are outdated.

8 DISCUSSION

The following chapter shall give way to aspects and considerations that are valid and remain to be said, but do not form part of the analytical contribution. They are conscious thoughts and reflections.

8.1 NOVELTY AND INNOVATION

The discipline of *Sustainable Development* or more accurately, the practitioners and scientists within it, recurringly refer to it as being inherently interdisciplinary (Schoolman et al. 2012; Kajikawa et al. 2007). However, looking at the disciplines that are mostly considered to be vital components of *Sustainable Development*, *inter alia* Geoscience, Climate Science, Agriculture and Policy Change, have in common a) that they mostly rely on big-scale models, b) rarely look for implementation and c) overlook the importance of individuals. Disciplines like Psychology, Design and Human-Computer-Interaction are brushed upon in subsets like Environmental Psychology and Ecological Design, but not juxtaposed with the ulterior purpose of *Sustainable Development* of putting theory into action.

But how is it possible that a discipline always denotes that the human factor is the biggest impediment for a transition and yet most propositions neglect the individual? International climate conferences are perceived as failures where common purpose cannot compete with national interests. Scientific research is subjected to funding schemes. Climate communication does not leave the elites. Emission trading schemes, technological advance i.e. Geoengineering or Genetically modified Organisms, new emission targets and more growth are declared the salvation, whilst the individuals are blamed for not caring enough. Where top-down schemes dominate the debate, and individual behavioural patterns and value networks are not part of it, no resilience can be expected in the sustainability debate. There is an inactive 80% of global society that cannot partake because the ontological complexity of the global meta-system of systems is additionally brought out of reach with ever-more epistemologically complex approaches and panels and expert councils that isolate the "everyday man". Climate Action is abstract, far away and not rewarding. Guilt and accusations create an environment of toxicity for observers. Instead of communicating that everyone should do as much as they can, they general notion is that one has to do it all at once or not at all.

With a focus on changing attitudes with conscience and appealing to responsibility the patronisation is not libertarian, but fully imposed. *Autonomy* and *Competence* equal zero. Policy-makers are divided between "The market will solve the issue" and "Let us handle this; we know better". But

both not only demotivate individuals but also deliberately exempt them from any responsibility. Another factor which cannot be underestimated is the fact that *Mindful Meerkats* does not "sell" environmentally conscious behaviour as an altruistic service to community, but rather as an intrinsically beneficial and fully utilitarian goal. Where the health of the environment is a component of wellbeing, the relevance for single individuals is more concrete than the prospect of having to drive less to get to a shore or have longer summers. It is not only possible to be part of the change, it is also easy. There is no necessity to go all the way at once. As an example, if every individual would reduce their meat consumption by 50%, we would get a long way already. It is about *Radical Incrementalism* (Swilling and Annecke 2012), not Shock Therapy. It does not have to be difficult. And it does not have to be prescriptive. Making individuals aware of the wide range of potential changes will bring change already.

The disciplines that were alluded to, namely Design, Psychology and Human-Computer-Interaction, have to become a constant companion in the scientific endeavour that is *Sustainable Development*. A discipline that, in my personal adjusted interpretation, and with a conscious reference to the origin story of Brundtland, strives to maintain the planet's capacity to provide an environment that can provide happiness to future generations, they can provide valuable insights that can tackle the gap and difficulty that complexity brings. Rockström et al. (2009) and the *Stockholm Resilience Center* are bringing research towards this trajectory, collating valuable insights for the complexity of the 21st century.

Persuasive Affordances provide a unique framework to address most issues of *Sustainable Development*. A policy as much as a state campaign, a product or even scientific research can be scrutinised in their capacity to bring happiness and/or behavioural change to the audience. And ultimately, most of the issues in *Sustainable Development* try to mediate the outcomes of human behaviour – *inter alia* emissions and Climate Change, financial collapses, breached carrying capacity, infrastructural collapses – with *ex post* treatments of symptoms. With a fully system-aware and complexity-embracing approach that goes to the human and behavioural root, I am convinced that many sources for collapse can be equilibrated and ameliorated.

Admittedly, the transformative ambition that lies behind a system that is aiming to revolutionise most social-ecological systems from the bottom-up is not to be underestimated and requires a certain degree of idealism and healthy megalomania. However, if the author cannot strive towards such a project that fundamentally trusts in humanity, humility and

the self-healing power of communities, the alternative would be devastating. Therefore, the convicted dreaming with a tiny chance of success is preferred over the cynic defeat before the fight has even been fought.

The potential that lies within *Mindful Meerkats* both as a subject and as a tool shall be outlined in the penultimate section of this thesis.

8.2 FURTHER POSSIBLE RESEARCH WITH AND ABOUT MINDFUL MEERKATS

Social Innovation is seen as an intervention via a particular tool that fundamentally revolutionises and radically changes the way a certain process in society takes place. Looking at the extent to which most systems in the contemporary world are taken for granted, such as for instance the legal, the financial, the economic or the democratic system, all of which could be considered partially failing under their own premises and promises, it is safe to say that there is a necessity for *Social Innovation*. However, path dependency and a consequent constant recital of "But we have done it like that since always hinder the emergence of new ideas or rather the transition of these ideas from niche to mainstream. If, for the sake of the argument, we then assume that *Mindful Meerkats* manages to build a stable followership, it can function as a mouthpiece for all possible social innovations. Any social innovation begins with a behavioural change on a small, communitarian level. Being inspired by the postulate of the game, that is either with the prospect of materialistic rewards or of an increase in personal wellbeing, potentially of civil-social agendas can be presented. And it is, in itself, a fundamental departure from a monetary definition of success towards a non-monetary definition via happiness. It thus provides a toolbox for a bottom-up certification and presents an alternative pathway to the failing top-down approaches.

And the programmes that are introduced through the platform can then also be evaluated by the users in exchange for in-game bonuses. It thus becomes a tool for the democratic distribution and collection of opinions, where the selection of candidates is managed through the validity of a voice through a certain number of fulfilled quests or challenges. The location-based elements allow an additional element of verification. A politician gets judged upon by all individuals that follow his activity within a certain geographical area. Context-specific challenges and calls for contribution provide relevance for policymakers and create location awareness. It thus becomes a tool for empirical research.

And this is not the only type of data that can potentially be collated with the help of *Mindful Meerkats*. At least two more applications are clearly conceivable. One being empirical data on personal wellbeing and the other being data on behavioural correlations. With continuous prompts to state subjective wellbeing, individuals have the chance to monitor their own wellbeing over time to be able to verify the functionality of the game as well. Being shown the direct impacts, the likelihood for extrinsically motivated activities to internalise increases greatly. The same which is true for subjective wellbeing, i.e. the correlation between behavioural change and personal happiness can be said about other parameters that are subject to Behavioural Choices. One example being the Urban Metabolism. Correlating the impacts of behavioural change on Climate data, such as emissions to be able to make estimates for the success of integrating individuals into climate schemes is a promising endeavour. And potentially other statistically valid parameters for city planning and public organisation in their response to behaviour could be extracted from *Mindful Meerkats*. Examples are congestion, building prices, health costs, filed complaints or petty crime etc. The burden on public representatives to address these social issues could be heavily lifted. Making local authorities aware that that communities would be able to cater for themselves is a strong incentive for support. And this would even happen willingly, because it instils purpose and connection. After initial interest is created via external rewards and *Scorpion* collection, the intrinsic motivation and wellbeing surplus gets noticeable and individuals might stick to new habits. Therefore then, the mentioned statistical values can be correlated back to subjective wellbeing, and even a ranking of priority for governmental authorities based on the goal of improving general national happiness can be deducted.

Potentially, the scale of *Mindful Meerkats* is unlimited. The versatility that comes with the customisation of challenges for particular groups of individuals allows tailored delivery. Certainly, an underprivileged individual cannot be asked to fulfil a task that they are not suited for in the first place. The more heterogeneous a society, the more difficult a sensible provision of challenges. Hypothetically, though, with enough support from local experts such as ethnologist, linguists and cultural scientist, there is great potential to unite several countries with the goal of creating a happy Meerkat-society.

Just briefly, *Citizen Computation* and *Empowering Surveillance* are other aspects that allude to the potential of *Mindful Meerkats*. As a tool to empower individuals to take part and create their environment, they can open new pathways for human, community-leaning progress.

8.3 BOUNDARIES AND LIMITATIONS

The strengths that have mentioned in the previous chapter of course bring boundaries with them. The power that lies behind Behavioural Science border manipulation and can certainly be used with mischievous intent. Just like any other tool, the application and ethical scrutiny, that comes with it, still lies in the hands of the wielder. With regards to the ethical tenability, it has to be clear that there is awareness of the potential risks. The enormous amounts of data from and for different sources need to be fully secure with the service provider. Transparency is one of the most important ambitions. Transparency can create feelings of common goals and reduce reluctance to offer personal data. It underscores the emerging senses of belonging and partnership that were previously covered in this chapter.

Taking the issue of data safety and transparency a step further, all users shall be provided with a choice upon starting the game, for which purpose their data would be stored and used. The data can then be "donated" or rather made available for three different abstract values: *Industry/Private Sector*, *Science* or *Politics*. These three are the potential recipient of in-game data. The economy would increase their market reach and improve their customers models, science would do research with the data and politics could improve their policies and verify assumptions. Certainly, the benefits for *Mindful Meerkats* would be separate as economic actors can usually pay fees. In exchange for giving the data to a partner of whom we benefit, a user would receive the in-game currency of *Scorpions* to balance the additional gain for *Mindful Meerkats* from the choice in favour of *Industry*.

Further-on, from an ethical standpoint, the question of patronisation is yet to be explored fully. When is inspiration for choices problematic? When does it become a threat for autonomy? Given that the goal is to enlighten individuals for choices that they have that can provide additional quality of life, the resistance and hesitance is limited. Nevertheless, if we only *replace* one system that is – from a perspective of individual choice – oppressive, with another one, there is no gain. Therefore, the ideal is to not make decisions for the individuals, but instead create awareness for potential choices, which then are fully divisible by the individual himself.

A third and last remark regards the potential pitfalls of the project. Conventional business cannot imagine that a project can be lucrative. Conventional policy-makers cannot imagine that a project can be a game and have a purpose. Conventional climate change activist do not see enough directly measurable impact for mitigation and adaptation. If these facts impede the distribution and the spreading of the business concept, it is possible that the time is not there yet. Before the project can get into the next phase, it is important that we generate a following that can then finance our endeavours in advance. The rejection from all conventional realms with innovation on such a wide array of issues complicates the conceptual proximity of what is talked about and what is responded. No further steps can be undertaken if there is no credibility for the feasibility and functionality of the idea. And given the theoretical innovation, the practical innovation is yet to be tested. However, these are issues that have to be taken seriously upon starting a business in general, more so if it is a *Social Enterprise*, and even more so, if a company aims to kickstart a *Social Innovation*. Exciting times lie ahead…

BIBLIOGRAPHY

Acaroglu, Leyla. 2013. *Paper Beats Plastic? How to Rethink Environmental Folklore*. TED. TED 2013. http://www.ted.com/talks/leyla_acaroglu_paper_beats_plastic_how_to_rethink_environmental_folklore.html.

Allcott, Hunt. 2011. "Social Norms and Energy Conservation." *Journal of Public Economics* 95 (9): 1082–95.

Ariely, Dan. 2008. *Predictably Irrational: The Hidden Forces That Shape Our Decisions*. HarperCollins New York, NY:

Armstrong, Miranda EG, Estelle V. Lambert, and Michael I. Lambert. 2011. "Physical Fitness of South African School Children: Discovery Vitality - Health of the Nation Study." *Perceptual and Motor Skills* 113 (3): 999–1016.

Ayres, Ian, Sophie Raseman, and Alice Shih. 2012. "Evidence from Two Large Field Experiments That Peer Comparison Feedback Can Reduce Residential Energy Usage." *Journal of Law, Economics, and Organization*, ews020.

Bang, Magnus, Anton Gustafsson, and Cecilia Katzeff. 2007. "Promoting New Patterns in Household Energy Consumption with Pervasive Learning Games." In *Persuasive Technology*, edited by Yvonne de Kort, Wijnand IJsselsteijn, Cees Midden, Berry Eggen, and B. J. Fogg, 55–63. Lecture Notes in Computer Science 4744. Springer Berlin Heidelberg. http://link.springer.com.proxy.library.uu.nl/chapter/10.1007/978-3-540-77006-0_7.

Bartle, Richard. 2014. "Richard A. Bartle: Avatar, Character, Persona." *Mud.co.uk*. July 8. http://mud.co.uk/richard/acp.htm?utm_content=bufferc85ba&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer.

Bernays, Edward L. 1952. *Public Relations*. 2. print. Norman: Univ. of Oklahoma Press.

Bessière, Katherine, A. Fleming Seay, and Sara Kiesler. 2007. "The Ideal Elf: Identity Exploration in World of Warcraft." *CyberPsychology & Behavior* 10 (4): 530–35.

Boyd, Danah, and Kate Crawford. 2012. "Critical Questions for Big Data." *Information, Communication & Society* 15 (5): 662–79. doi:10.1080/1369118X.2012.678878.

Butler, Charles. 2015. "Applied Behavioral Economics: A Game Designer's Perspective." In *Gamification in Education and Business*, edited by Torsten Reiners and Lincoln C. Wood, 81–104. Springer International Publishing. http://link.springer.com.proxy.library.uu.nl/chapter/10.1007/978-3-319-10208-5_5.

Caon, Maurizio, Elena Mugellini, and Omar Abou Khaled. 2013. "A Pervasive Game to Promote Social Offline Interaction." In *Proceedings of the 2013 ACM Conference on Pervasive and Ubiquitous Computing Adjunct Publication*, 1381–84. ACM. http://dl.acm.org/citation.cfm?id=2497359.

Castellini, Brianna. 2013. "Don't Forget To Be Awesome: An In-Depth Exploration of Nerdfighteria." *Interface: The Journal of Education, Community and Values* 13 (inter13). http://commons.pacificu.edu/cgi/viewcontent.cgi?article=1025&context=inter13.

Celino, Irene. 2013. "Location-Based Games for Citizen Computation." In *Handbook of Human Computation*, edited by Pietro Michelucci, 297–316. Springer New York. http://link.springer.com.proxy.library.uu.nl/chapter/10.1007/978-1-4614-8806-4_25.

Chemero, Anthony. 2003. "An Outline of a Theory of Affordances." *Ecological Psychology* 15 (2): 181–95.

Consolvo, Sunny, Eric Paulos, and Ian Smith. 2007. "Mobile Persuasion for Everyday Behavior Change." *Mobile Persuasion* 20: 77–86.

Costa, João P., Rina R. Wehbe, James Robb, and Lennart E. Nacke. 2013. "Time's up: Studying Leaderboards for Engaging Punctual Behaviour." In *Proceedings of the First International Conference on Gameful Design, Research, and Applications*, 26–33. ACM. http://dl.acm.org/citation.cfm?id=2583012.

Csikszentmihalyi, Mihaly. 1990. *Flow: The Psychology of Optimal Experience*. Harper & Row.

de Souza e Silva, Adriana, and Larissa Hjorth. 2009. "Playful Urban Spaces A Historical Approach to Mobile Games." *Simulation & Gaming* 40 (5): 602–25.

Deterding, Sebastian. 2011. "Situated Motivational Affordances of Game Elements: A Conceptual Model." In *Gamification: Using Game Design Elements in Non-Gaming Contexts, a Workshop at CHI*. http://nespap.sakura.ne.jp/test/wp-content/uploads/2014/06/Deterding-Situated-motivational-affordances-of-game-elements-A-conceptual-model.pdf.

Deterding, Sebastian, Dan Dixon, Rilla Khaled, and Lennart Nacke. 2011. "From Game Design Elements to Gamefulness: Defining Gamification." In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 9–15. ACM. http://dl.acm.org/citation.cfm?id=2181040.

Deterding, Sebastian, Miguel Sicart, Lennart Nacke, Kenton O'Hara, and Dan Dixon. 2011. "Gamification. Using Game-Design Elements in Non-Gaming Contexts." In *CHI'11 Extended Abstracts on Human Factors in Computing Systems*, 2425–28. ACM. http://dl.acm.org/citation.cfm?id=1979575.

Dietz, Thomas, Amy Fitzgerald, and Rachael Shwom. 2005. "Environmental Values." *Annu. Rev. Environ. Resour.* 30: 335–72.

Dillahunt, Tawanna, Geof Becker, Jennifer Mankoff, and Robert Kraut. 2008. "Motivating Environmentally Sustainable Behavior Changes with a Virtual Polar Bear." In *Pervasive 2008 Workshop Proceedings*, 8:58–62. http://www.cs.cmu.edu/afs/cs.cmu.edu/Web/People/tdillahu/Site/Research_files/Polar%20Bear.pdf.

Duhigg, Charles. 2012. *The Power of Habit: Why We Do What We Do in Life and Business.* 1 edition. New York: Random House.

Dunn, Robert Andrew, and Rosanna E. Guadagno. 2012. "My Avatar and me–Gender and Personality Predictors of Avatar-Self Discrepancy." *Computers in Human Behavior* 28 (1): 97–106.

Ellison, Nicole B., Charles Steinfield, and Cliff Lampe. 2007. "The Benefits of Facebook 'Friends:' Social Capital and College Students' Use of Online Social Network Sites." *Journal of Computer-Mediated Communication* 12 (4): 1143–68. doi:10.1111/j.1083-6101.2007.00367.x.

Extra Credits. 2012. *Beyond Fun - Why Games Need to Be More than Fun.* https://www.youtube.com/watch?v=HgzpgOJ2ubI.

———. 2015. *Social Difficulty Curve - Easing Players into Communication - Extra Credits.* https://www.youtube.com/watch?v=QuG7mIpVFc0.

Flavin, Christopher, and Robert Engelman. 2009. "The Perfect Storm." *State of the World 2009–Into a Warming World,* 5–29.

Fogg, BJ. 2009. "A Behavior Model for Persuasive Design." In *Proceedings of the 4th International Conference on Persuasive Technology,* 40. ACM. http://dl.acm.org/citation.cfm?id=1541999.

———. 2011. "BJ Fogg's Behavior Model." *Behaviormodel.org.* http://www.behaviormodel.org/.

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.

"Four of Nine Planetary Boundaries Now Crossed – University of Copenhagen." 2015. Accessed July 15. http://snm.ku.dk/english/news/all_news/2015/01_four_of_nine_planetary_boundaries_crossed/.

Gibson, James J. 1977. "The Theory of Affordances." *Hilldale, USA.* https://books.google.de/books?hl=de&lr=&id=b9WWAwAAQBAJ&oi=fnd&pg=PA56&dq=the+theory+of+af-fordances&ots=KUZuBDpnD7&sig=U332i1erzOJecfIfDyWFcQjJeDc.

Glasser, Harold. 2004. "Learning Our Way to a Sustainable and Desirable World: Ideas Inspired by Arne Naess and Deep Ecology." In *Higher Education and the Challenge of Sustainability,* 131–48. Springer. http://link.springer.com/content/pdf/10.1007/0-306-48515-X_11.pdf.

———. 2007. "Minding the Gap: The Role of Social Learning in Linking Our Stated Desire for a More Sustainable World to Our Everyday Actions and Policies." In *Social Learning towards a Sustainable World.* Wageningen: Wageningen Academic Publishers.

Hamari, Juho. 2015. "Gamification-Motivations & Effects." https://aaltodoc.aalto.fi/handle/123456789/15037.

Hamari, Juho, Jonna Koivisto, and Harri Sarsa. 2014. "Does Gamification Work?–a Literature Review of Empirical Studies on Gamification." In *System Sciences (HICSS), 2014 47th Hawaii International Conference on,* 3025–34. IEEE. http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6758978.

Hamari, Juho, and Janne Tuunanen. 2014. "Player Types: A Meta-Synthesis." *Transactions of the Digital Games Research Association* 1 (2). http://todigra.org/index.php/todigra/article/view/13.

Harding, Eloise. 2015. "Prefiguration versus the 'Reformist Drift' in the Camp for Climate Action." *Capitalism Nature Socialism,* no. ahead-of-print: 1–17.

Hedlund-de Witt, Annick. 2013. *Worldviews and the Transformation to Sustainable Societies.*

Hemp, Paul. 2006. "Avatar-Based Marketing." *Harvard Business Review* 84 (6): 48–57.

Hobson, Kersty. 2001. "Sustainable Lifestyles: Rethinking Barriers and Behaviour Change." *Exploring Sustainable Consumption: Environmental Policy and the Social Sciences* 1: 191–209.

———. 2002. "Competing Discourses of Sustainable Consumption: Does the 'Rationalisation of Lifestyles' Make Sense?" *Environmental Politics* 11 (2): 95–120. doi:10.1080/714000601.

———. 2003. "Thinking Habits into Action: The Role of Knowledge and Process in Questioning Household Consumption Practices." *Local Environment* 8 (1): 95–112. doi:10.1080/13549830306673.

Hooper, Clare J., and Jill Walker Rettberg. 2011. "Experiences with Geographical Collaborative Systems: Playfulness in Geo-social Networks and Geocaching." Workshop presented at the Please Enjoy workshop at Mobile HCI, August. http://eprints.soton.ac.uk/272471/.

How Behavioral Science Can Lower Your Energy Bill. 2013. https://www.youtube.com/watch?v=4cJ08wOqloc&feature=youtube_gdata_player.

Huizinga, Johan, and Richard Francis Carrington Hull. 1949. *Homo Ludens. A Study of the Play-Element in Culture.* Routledge & Kegan Paul.

Jegers, Kalle. 2007. "Pervasive Game Flow: Understanding Player Enjoyment in Pervasive Gaming." *Computers in Entertainment (CIE)* 5 (1): 9.

Jung, J. H., Christoph Schneider, and Joseph Valacich. 2010. "Enhancing the Motivational Affordance of Information Systems: The Effects of Real-Time Performance Feedback and Goal Setting in Group Collaboration Environments." *Management Science* 56 (4): 724–42.

Kabernik, Vitaly. 2013. "More than Just a Game: Impact of the Ingress Project on the Internet and Security." *Security Index: A Russian Journal on International Security* 19 (4): 89–90.

Kajikawa, Yuya, Junko Ohno, Yoshiyuki Takeda, Katsumori Matsushima, and Hiroshi Komiyama. 2007. "Creating an Academic Landscape of Sustainability Science: An Analysis of the Citation Network." *Sustainability Science* 2 (2): 221–31. doi:10.1007/s11625-007-0027-8.

Kappen, Dennis, Jens Johannsmeier, and Lennart Nacke. 2013. "Deconstructing Gamified Task Management Applications." In . Ontario: ACM. https://hcigames.com/wp-content/uploads/2015/01/Deconstructing-Gamified-Task-Management-Applications.pdf.

Kass, Alex. 2007. "Transforming the Mobile Phone into a Personal Performance Coach." *Mobile Persuasion* 20.

Keizer, Kees, Siegwart Lindenberg, and Linda Steg. 2008. "The Spreading of Disorder." *Science* 322 (5908): 1681–85.

Kligler-Vilenchik, Neta. 2013. "'Decreasing World Suck.'" http://drupal.dmlhub.net/sites/default/files/Decreasing%20World%20Suck%20-%20Working%20Paper%20-%20MAPP%20-%20June%2025%202013.pdf.

Kollmuss, Anja, and Julian Agyeman. 2002. "Mind the Gap: Why Do People Act Environmentally and What Are the Barriers to pro-Environmental Behavior?" *Environmental Education Research* 8 (3): 239–60.

Landers, Richard N., and Rachel C. Callan. 2011. "Casual Social Games as Serious Games: The Psychology of Gamification in Undergraduate Education and Employee Training." In *Serious Games and Edutainment Applications*, edited by Minhua Ma, Andreas Oikonomou, and Lakhmi C. Jain, 399–423. Springer London. http://link.springer.com.proxy.library.uu.nl/chapter/10.1007/978-1-4471-2161-9_20.

Layard, Richard. 2003. "Happiness: Has Social Science a Clue? Lecture 1: What Is Happiness? Are We Getting Happier?" http://eprints.lse.ac.uk/47425/1/__libfile_REPOSITORY_Content_Layard_Has%20social%20science%20a%20clue%20what%20is%20happiness_Has%20social%20science%20a%20clue%20what%20is%20happiness%20(LSE%20RO).pdf.

Lejano, Raul P., and Francisco Fernandez de Castro. 2014. "Norm, Network, and Commons: The Invisible Hand of Community." *Environmental Science & Policy*, Interrogating The Commons, 36 (February): 73–85. doi:10.1016/j.envsci.2013.07.012.

Lewis, Chris. 2014. *Irresistible Apps.* Springer. http://link.springer.com/chapter/10.1007/978-1-4302-6422-4_1.

Lindenberg, Siegwart, and Linda Steg. 2007. "Normative, Gain and Hedonic Goal Frames Guiding Environmental Behavior." *Journal of Social Issues* 63 (1): 117–37.

Linley, P. Alex, and Stephen Joseph, eds. 2004. *Positive Psychology in Practice.* Hoboken, N.J: Wiley.

Lin, Yuzhong, J. Jessurun, B. de Vries, and H. Timmermans. 2011. "Motivate: Towards Context-Aware Recommendation Mobile System for Healthy Living." In *2011 5th International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth)*, 250–53.

Lippmann, Walter. 1922. *Public Opinion.* BN Publishing.

Li, Runze, Simiao Liu, Yang Liu, Hsin-Yen Tu, and Xiaotong Yang. 2015. "A Probe into Ingress and Its Social Interaction: Augmented Reality's Influence on Mobile Game Community Design." Accessed July 1. http://vince-li.com/pdf/ingress/paper.pdf.

Matyas, Sebastian, Christian Matyas, Christoph Schlieder, Peter Kiefer, Hiroko Mitarai, and Maiko Kamata. 2008. "Designing Location-Based Mobile Games with a Purpose: Collecting Geospatial Data with CityExplorer." In *Proceedings of the 2008 International Conference on Advances in Computer Entertainment Technology*, 244–47. ACM. http://dl.acm.org/citation.cfm?id=1501806.

McGonigal, Jane. 2003. "A Real Little Game: The Performance of Belief in Pervasive Play." *Level Up.* http://ww%20w.avantgame.com/MCGONIGAL%20A%20Real%20Little%20Game%20DiGRA%202003.pdf.

McLeod, Poppy Lauretta, Yi-Ching Liu, and Jill Elizabeth Axline. 2014. "When Your Second Life Comes Knocking: Effects of Personality on Changes to Real Life from Virtual World Experiences." *Computers in Human Behavior* 39: 59–70. doi:10.1016/j.chb.2014.06.025.

Meadows, Donella H., Jørgen Randers, and Dennis Meadows. 2005. *The Limits to Growth: The 30-Year Update*. Taylor & Francis.

Mohr, David C, Stephen M Schueller, Enid Montague, Michelle Nicole Burns, and Parisa Rashidi. 2014. "The Behavioral Intervention Technology Model: An Integrated Conceptual and Technological Framework for eHealth and mHealth Interventions." *Journal of Medical Internet Research* 16 (6). doi:10.2196/jmir.3077.

Montola, Markus. 2012. "Social Constructionism and Ludology Implications for the Study of Games." *Simulation & Gaming* 43 (3): 300–320.

Mustonen, Katri. 2015. "' Nerdfighters, We Did It': Means of Building a Sense of Community on the YouTube Channel Vlogbrothers." https://jyx.jyu.fi/dspace/handle/123456789/46061.

Nafus, Dawn, and Jamie Sherman. 2014. "Big Data, Big Questions| This One Does Not Go Up To 11: The Quantified Self Movement as an Alternative Big Data Practice." *International Journal of Communication* 8: 11.

Nolan, J. M., P. W. Schultz, R. B. Cialdini, N. J. Goldstein, and V. Griskevicius. 2008. "Normative Social Influence Is Underdetected." *Personality and Social Psychology Bulletin* 34 (7): 913–23. doi:10.1177/0146167208316691.

Norris, Gregory A. 2013. "An Introduction to Handprints and Handprinting In: The New Requirement for Social Leadership: Healing." In *Uncertainty, Diversity and the Common Good: Changing Norms and New Leadership Paradigms*, edited by S. Groschl. London: Gower Publishing.

O'Hara, Kenton. 2008. "Understanding Geocaching Practices and Motivations." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1177–86. CHI '08. New York, NY, USA: ACM. doi:10.1145/1357054.1357239.

Oreg, S. 2006. "Predicting Proenvironmental Behavior Cross-Nationally: Values, the Theory of Planned Behavior, and Value-Belief-Norm Theory." *Environment and Behavior* 38 (4): 462–83. doi:10.1177/0013916505286012.

Oreskes, Naomi. 2004. "The Scientific Consensus on Climate Change." *Science* 306 (5702): 1686–1686. doi:10.1126/science.1103618.

Oulasvirta, Antti, Tiia Suomalainen, Juho Hamari, Airi Lampinen, and Kristiina Karvonen. 2014. "Transparency of Intentions Decreases Privacy Concerns in Ubiquitous Surveillance." *Cyberpsychology, Behavior, and Social Networking* 17 (10): 633–38. doi:10.1089/cyber.2013.0585.

Poli, Roberto. 2013. "A Note on the Difference between Complicated and Complex Social Systems." *Cadmus* 2 (1): 142–47.

Price, Jennifer C., Iain A. Walker, and Fabio Boschetti. 2014. "Measuring Cultural Values and Beliefs about Environment to Identify Their Role in Climate Change Responses." *Journal of Environmental Psychology* 37: 8–20. doi:10.1016/j.jenvp.2013.10.001.

Przybylski, Andrew K., C. Scott Rigby, and Richard M. Ryan. 2010. "A Motivational Model of Video Game Engagement." *Review of General Psychology* 14 (2): 154–66. doi:10.1037/a0019440.

Raessens, Joost. 2006. "Playful Identities, or the Ludification of Culture." *Games and Culture* 1 (1): 52–57. doi:10.1177/1555412005281779.

Reiss, Steven. 2004. "Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires." *Review of General Psychology* 8 (3): 179.

Robertson, Margaret. 2010. "Can't Play, Won't Play : Blog : Hide&Seek." Inventing New Kinds of Play. *Hide&Seek*. June 10. http://hideandseek.net/2010/10/06/cant-play-wont-play/.

Rockström, Johan, Will Steffen, Kevin Noone, \AAsa Persson, Stuart III Chapin, Eric Lambin, Timothy M. Lenton, Marten Scheffer, Carl Folke, and Hans Joachim Schellnhuber. 2009. "Planetary Boundaries: Exploring the Safe Operating Space for Humanity." *Ecology & Society* 14 (2). http://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=17083087&AN=52253039&h=fz5vuY%2BLo9Pa2OZGg1yGLYWN9uWUn6ghkE8JGJb0fu5cyKw1M14N8I%2FH87v8cR%2Fj2ltnx3AZquy30%2BvklwBfBg%3D%3D&crl=c.

Rosenberg, Robin S., Shawnee L. Baughman, and Jeremy N. Bailenson. 2013. "Virtual Superheroes: Using Superpowers in Virtual Reality to Encourage Prosocial Behavior." Edited by Attila Szolnoki. *PLoS ONE* 8 (1): e55003. doi:10.1371/journal.pone.0055003.

Ryan, Richard M., and Edward L. Deci. 2000. "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being." *American Psychologist* 55 (1): 68.

Sabatier, Paul A., Hank C. Jenkins-Smith, and others. 1993. "Policy Change and Learning: An Advocacy Coalition Approach."

Sakamoto, Mizuki, and Tatsuo Nakajima. 2013. "Micro-Crowdfunding: Achieving a Sustainable Society Through Economic and Social Incentives in Micro-Level Crowdfunding." In *Proceedings of the 12th International Conference on Mobile and Ubiquitous Multimedia*, 29:1–29:10. MUM '13. New York, NY, USA: ACM. doi:10.1145/2541831.2541838.

Santonen, Teemu, and Edward Faber. 2015. "Towards a Comprehensive Framework to Analyse Edutainment Applications." Accessed August 8. http://ispim.org/files/budapest_proceedings/documents/678325815_Paper.pdf.

Schoolman, Ethan D., Jeremy S. Guest, Kathleen F. Bush, and Andrew R. Bell. 2012. "How Interdisciplinary Is Sustainability Research? Analyzing the Structure of an Emerging Scientific Field." *Sustainability Science* 7 (1): 67–80. doi:10.1007/s11625-011-0139-z.

Seppelt, Ralf, Romina Martin, Alexander Finger, Christin Henzen, Martin Lindner, Katrin Pietzsch, Andreas Werntze, Ute Zander, and Jule Schulze. 2014. "Experiences with a Serious Online Game for Exploring Complex Relationships of Sustainable Land Management and Human Well-Being: LandYOUs." http://www.igb-berlin.de/IGB-Publikationen/Martin_2014_p_IEMSS.pdf.

Sheng, Lee Yik. 2013. "Modelling Learning from Ingress (Google's Augmented Reality Social Game)." In *Educational Media (ICEM), 2013 IEEE 63rd Annual Conference International Council for*, 1–8. IEEE. http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6820152.

Shilton, Katie. 2010. "Participatory Sensing: Building Empowering Surveillance." *Surveillance & Society* 8 (2): 131–50.

Shklovski, Irina, and Adriana de Souza e Silva. 2013. "An Urban Encounter." *Information, Communication & Society* 16 (3): 340–61. doi:10.1080/1369118X.2012.756049.

Smahel, David, Lukas Blinka, and Ondrej Ledabyl. 2008. "Playing MMORPGs: Connections between Addiction and Identifying with a Character." *CyberPsychology & Behavior* 11 (6): 715–18. doi:10.1089/cpb.2007.0210.

Smock, Andrew D., Nicole B. Ellison, Cliff Lampe, and Donghee Yvette Wohn. 2011. "Facebook as a Toolkit: A Uses and Gratification Approach to Unbundling Feature Use." *Computers in Human Behavior* 27 (6): 2322–29. doi:10.1016/j.chb.2011.07.011.

Steen, Francis F., Patricia M. Greenfield, Mari Siân Davies, Brendesha Tynes, P. E. Vorderer, and J. E. Bryant. 2006. "What Went Wrong with The Sims Online: Cultural Learning and Barriers to Identification in a Massively Multiplayer Online Role-Playing Game." *Playing Video Games: Motives, Responses, and Consequences*, 307–24.

Steg, Linda, Jan Willem Bolderdijk, Kees Keizer, and Goda Perlaviciute. 2014. "An Integrated Framework for Encouraging Pro-Environmental Behaviour: The Role of Values, Situational Factors and Goals." *Journal of Environmental Psychology* 38 (June): 104–15. doi:10.1016/j.jenvp.2014.01.002.

Stern, Paul C., Thomas Dietz, Troy D. Abel, Gregory A. Guagnano, and Linda Kalof. 1999. "A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism." *Human Ecology Review* 6 (2): 81.

Swan, Melanie. 2012. "Sensor Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0." *Journal of Sensor and Actuator Networks* 1 (3): 217–53. doi:10.3390/jsan1030217.

Swilling, Mark, and Eve Annecke. 2012. "Just Transitions: Explorations of Sustainability in an Unfair World." http://scholar.sun.ac.za/handle/10019.1/83160.

Tausczik, Yla R., Laura A. Dabbish, and Robert E. Kraut. 2014. "Building Loyalty to Online Communities through Bond and Identity-Based Attachment to Sub-Groups." In , 146–57. ACM Press. doi:10.1145/2531602.2531688.

Tol, R. 2003. "Is the Uncertainty about Climate Change Too Large for Expected Cost-Benefit Analysis?" *Climatic Change* 56 (3): 265–89. doi:10.1023/A:1021753906949.

Trepte, Sabine, and Leonard Reinecke. 2010. "Avatar Creation and Video Game Enjoyment: Effects of Life-Satisfaction, Game Competitiveness, and Identification with the Avatar." *Journal of Media Psychology: Theories, Methods, and Applications* 22 (4): 171.

Tuite, Kathleen. 2015. "GWAPs: Games with a Problem." Accessed July 12. http://www.fdg2014.org/papers/fdg2014_wip_22.pdf.

Vallerand, Robert J., and Catherine F. Ratelle. 2002. "Intrinsic and Extrinsic Motivation: A Hierarchical Model." *Handbook of Self-Determination Research* 128: 37–63.

Vandenbergh, Michael P. 2005. "Order without Social Norms: How Personal Norm Activation Can Protect the Environment." SSRN Scholarly Paper ID 732824. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=732824.

van der Werff, Ellen, Linda Steg, and Kees Keizer. 2013a. "It Is a Moral Issue: The Relationship between Environmental Self-Identity, Obligation-Based Intrinsic Motivation and pro-Environmental Behaviour." *Global Environmental Change* 23 (5): 1258–65.

———. 2013b. "The Value of Environmental Self-Identity: The Relationship between Biospheric Values, Environmental Self-Identity and Environmental Preferences, Intentions and Behaviour." *Journal of Environmental Psychology* 34: 55–63.

Vasalou, Asimina, and Adam N. Joinson. 2009. "Me, Myself and I: The Role of Interactional Context on Self-Presentation through Avatars." *Computers in Human Behavior* 25 (2): 510–20.

Wals, Arjen, ed. 2007. *Social Learning towards a Sustainable World: Principles, Perspectives and Practices*. http://books.google.de/books?hl=de&lr=&id=TYVqxsYkgEMC&oi=fnd&pg=PA35&dq=harold+glasser&ots=4Y_5XFt-RT&sig=f5ZTy9D5tyY2NU-Tpfqu3fHAuVs.

WCED. 1987. *Our common future*. Oxford [u.a.]: Univ. Press.

Whitson, Jennifer R. 2013. "Gaming the Quantified Self." *Surveillance & Society* 11 (1/2): 163–76.

Wrzesien, Maja, Alejandro Rodríguez, Beatriz Rey, Mariano Alcañiz, Rosa María Baños, and Mª Dolores Vara. 2015. "How the Physical Similarity of Avatars Can Influence the Learning of Emotion Regulation Strategies in Teenagers." *Computers in Human Behavior* 43: 101–11. doi:10.1016/j.chb.2014.09.024.

Yee, Nick, and Jeremy Bailenson. 2007. "The Proteus Effect: The Effect of Transformed Self-Representation on Behavior." *Human Communication Research* 33 (3): 271–90.

Yee, Nick, Jeremy N. Bailenson, and Nicolas Ducheneaut. 2009. "The Proteus Effect: Implications of Transformed Digital Self-Representation on Online and Offline Behavior." *Communication Research*. http://crx.sagepub.com/content/early/2009/01/22/0093650208330254.short.

Zhang, Ping. 2008. "Technical Opinion Motivational Affordances: Reasons for ICT Design and Use." *Communications of the ACM* 51 (11): 145–47.

ANNEX

ANNEX, ITEM A: MOTIVATIONAL NEEDS (ZHANG 2013)

Motivational Sources and Needs	Design Principles	Some Existing Design Examples
Psychological: Autonomy and the Self	Principle 1. Support autonomy. Principle 2. Promote creation and representation of self-identity.	Desktop skins, cell phone ring tones, online avatars, application toolbar customization.
Cognitive: Competence and Achievement	Principle 3. Design for optimal challenge. Principle 4. Provide timely and positive feedback.	Games and learning systems with various challenge levels and immediate performance feedback.
Social & Psychological: Relatedness	Principle 5. Facilitate human-human interaction. Principle 6. Represent human social bond.	Group based games (e.g. online Bridge) with a chat section, visualizations of email exchanges over a period of time to show both tasks and social related messages.
Social & Psychological: Leadership and Followership	Principle 7. Facilitate one's desire to influence others. Principle 8. Facilitate one's desire to be influenced by others.	Blogs (satisfy one's desire to influence by authoring, and to be influenced by reading), virtual communities where leaders sometimes emerge.
Emotional: Affect and Emotion	Principle 9. Induce intended emotions via initial exposure to ICT. Principle 10. Induce intended emotions via intensive interaction with ICT.	Slick/attractive look of iPod or cell phones, engaging games, ICT that induce optimal flow experience.

ANNEX, ITEM B: CONCEPTUAL DEVELOPMENTS RELATED TO CHANGING BEHAV-IOUR THROUGH TECHNOLOGY (HAMARI 2015)

Concept	Definition	Emphasis
Gamification	'A process of enhancing services with (motivational) affordances for gameful experiences in order to support the user's overall value creation' — Huotari & Hamari (2012).	Invoking intrinsic motivations
Games (see also Table 1)	Free, no material interest, voluntary, uncertain, governed by rules, interesting choices, mastery, flow — Huizinga (1944), Caillois (1961), Avedon & Sutton-Smith (1971)	Invoking intrinsic motivations
Loyalty program	'Marketing efforts which reward, and therefore, encourage loyal customer behaviour in order to increase the profitability of stable customer relationships' — Sharp & Sharp (1997)	To increase customer loyalty (mainly via monetary rewards)
Persuasive technology	Interactive information technology designed to change users' attitudes or behaviour — Fogg (2003), Oinas-Kukkonen & Harjumaa (2009)	Attitude & behaviour change (via communicative persuasion)
Behaviour change support system (Oinas-Kukkonen 2013)	"A behaviour change support system (BCSS) is a socio-technical information system with psychological and behavioural outcomes designed to form, alter or reinforce attitudes, behaviours or an act of complying without using coercion or deception." - Oinas-Kukkonen (2013)	Attitude and behaviour change
Choice architecture	'To nudge people towards the right choices [to make their lives better]' — Thaler & Sunstein (2008)	To help people make better decisions
Decision support systems	'A computer based system to aid decision-making [for running organisations more efficiently]' — Sol et al. (1987)	Support decision making by making it more efficient

ANNEX, ITEM C: GAMIFICATION LITERATURE REVIEW HAMARI (2014), RESEARCHED MOTIVATIONAL AFFORDANCES

Affordance	Included in the study
Points	[4][13][15][16][23][27][34][37][41]
Leaderboards	[4][10][13][15][16][21][23][27][37][41]
Achievements/Badges	[2][8][10][17][20][22][25][27][34]
Levels	[11][15][16][21][27][37]
Story/Theme	[12][18][21][23][33][36]
Clear goals	[11][27][33][32]
Feedback	[4][11][21][27][32][33]
Rewards	[12][18][33][36]
Progress	[14][18][27][33]
Challenge	[4][13][18][21][23][27][33]