

Doing the Self: An Ethnographic Analysis of the 'Quantified Self'



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'Wearables' and 'self-quantifying technologies' are becoming ever more popular and normalised in society as a means of 'knowing' the self. How are these technologies implicated in this endeavour? Using insights from a four year multi-sited ethnography of the 'Quantified Self', I explore how the self is 'done' in the context of using technologies that purport to quantify the self in some way. Drawing on Science and Technology Studies (STS) sensibilities, I conduct a four-pronged investigation into 'self-making' by drawing upon, and expanding, existing theories of agency and performativity, number, data-visualisation, and enactment.

I find that self-quantifying technologies are productive in the doing of the self and are implicated in the process of making boundaries around that which comes to be known as the 'self' in a particular moment. The numbers and visualisations that result from practices of self-quantification enable a new way of 'seeing' the self, and provide a way of communicating this self with others. The self is thus not a pre-existing entity that simply requires these technologies as a means to 'know' it. Rather, the self is constantly being done with these technologies and within the surrounding practices of self-quantification.

In order to highlight the different parts of this process, I proffer the term 'enactment'. This term explains how these different elements come together to culminate in the production of a momentarily constant self in a particular context. It is a way of simultaneously encapsulating the processes of intra-action, extra-action and enactment with/in a community. In sum, it captures the conclusion that, in the context of self-quantification, we must understand the self as a collective enactment, achieved, at least in part, through the use of self-quantifying technologies that produce numerical data which facilitate visualisations that are imperative to the doing of the self.

For Kesha: You left far too soon.

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Chapter 1:

Introduction

The term 'Quantified Self' was brought to the fore in late 2008 when Kevin Kelly, one of the founding editors of *Wired* magazine, hosted the first ever meeting of the 'Quantified Self' group. Held at his home, he invited select members to talk about their practices of tracking themselves, the technologies that they used during that process, and what they had learned from their experiences. It was an idea conceived of alongside fellow founding editor of *Wired*, Gary Wolf. In a TED talk given in 2010 at the TED@Cannes, Wolf argued that "if we want to act more effectively in the world, we have to get to know ourselves better", and moreover, that "the uptake and diffusion of mobile technologies, the exponential improvement in data storage and data processing, and the remarkable improvement in human biometric sensors" are making it ever more possible and much easier to achieve greater self-improvement, self-discovery, self-awareness and self-knowledge (Wolf, 2010a: <00:01:26>).

The proposition that it is worthwhile to 'get to know ourselves better', as Wolf puts it, is not new. Versions of it can be traced as far back as the time of the Stoics. Plato, for example, attributes Socrates with the famous maxim that "the life which is unexamined is not worth living" (Plato, 1961). Similarly, Seneca often wrote about taking account of oneself on a daily basis (1969), as did Epictetus, who advocated, for example, the counting of days on which one has not been angry (2008). This is a theme which seemed to continue long after the Stoics. In more modern times, for example, Benjamin Franklin (1964) was well-known for recording his performance on thirteen different measures of 'virtue', whilst Buckminster Fuller kept a diary of his daily life and ideas, called the *Dymaxion Chronofile*.¹

These examples of 'examined' lives can arguably fit neatly into the idea of *Epimeleia Heautou* ('concern with oneself') – a concept that was propagated in the Greco-Roman period between 300BC – 300AD and later taken up as an object of analysis by Foucault (Foucault, 1983, 1988a, 1988b, 1997). Foucault's version of the concern with oneself is based on Socratic principles of "wisdom, truth and the perfection of the soul" and therefore focuses on the conscience and the mind rather than the body (1997: 226). There are, however, many differences between knowing oneself in the Greco-Roman era that was the focus of Foucault's work, and knowing oneself in the modern day. One of the most significant differences is, as Wolf highlighted, the invention and availability of technologies which make it possible to know, record, and analyse information on a completely different scale.

¹ The full '*Dymaxion Chronofile*' can be found under 'R. Buckminster Fuller papers, M1090. Dept. of Special Collections, Stanford University Libraries, Stanford, California.'

Whilst in theory both forms of self-tracking - manual² and digital³ - are ways of recording, monitoring, measuring, and tracking the self, in practice things are different. As Lupton (2016: 4) argues, “since the advent of computing...self-tracking has been transformed into major interconnected practices that have significant social, cultural and political implications”. Lupton (2016) outlines the three main implications of the addition of computing to self-tracking. First, the practices and technologies of self-tracking have become increasingly automated and digitised - allowing for great detail of tracking and much easier capabilities of storage and retrieval of data. Second, the ability to store this data on the cloud increases the number of people who may potentially have access to this data - amongst these may be the developers of the technology, employers, state agencies, as well as cyber criminals who may ‘steal’ the data. And finally, the commercial ‘value’ of the data is increased as more and more people can use the data for economic gain - insurance companies, advertisers and employers, for example, may want access to the data for financial or other gains.

The idea for this particular research was a result of being in the right place at the right time when I became involved with the Collaboration for Leadership in Applied Health Research and Care (CLAHRC) whilst I was doing my MPhil at the Cambridge Judge Business School. One of the main problems facing the NHS at that time (and this is still the case) was the seemingly impossible situation where demand for NHS services was

² The use of diaries, paper and pen memos, and writing lists, for example.

³ Digital self-tracking technologies (or ‘self-quantifying technologies’ as they will be referred to throughout this thesis) can come in many different forms. Wearable technologies such as the Fitbit, Nike Fuelband, and Jawbone Up (devices that the user wears on the wrist to record steps taken using an in-built accelerometer), blood glucose monitors that measure blood sugar levels, wifi-enabled scales to track weight, mobile applications used to measure and analyse sleep patterns, monitor menstruation cycles, or track calories, runs, and bike rides, are all examples of the types of self-quantifying technologies that are dealt with in this research.

increasing whilst the budgets for NHS institutions were being drastically cut (Appleby et al., 2014). How to meet growing demand when the capacity to supply services was being diminished? The line of inquiry that I pursued at that time was self-management and self-assistive technologies.

At the Cambridge and Peterborough Foundation Trust we discussed the implications of sensors in the toilets of the houses of people suffering with dementia to trigger an alarm if the toilet had not been flushed for an unusually long time (see Alzheimer's Society, 2016), and pills with RFID (radio-frequency identification) tags to track when medicine was not being taken correctly (see Lovoi et al., 2006). The idea being that if we could prevent certain people from entering a 'crisis' stage and needing emergency acute primary care, then that would go some way to alleviate the stress on an already overreaching part of the NHS, freeing up some capacity for other issues which may be unavoidable.

This got me thinking about how we could take this a little further. Rather than using self-assistive or self-management technologies with people already suffering from a condition, was there anything out there that focused on preventing people from getting ill or developing a condition in the first place? This is when I happened across the 'Quantified Self'. At that point, back in 2011, the Quantified Self was relatively in its infancy, but there was something about the idea of 'self-knowledge through numbers' (their motto) that I thought would be interesting to learn more about, both for the potential implications for the NHS and the general model of healthcare, but also as an object of study in and of itself. Here were a group of people, seemingly fit and well, choosing to use technologies to track, monitor, measure, quantify and record certain aspects of themselves for the stated aim of gaining and increasing 'self-

knowledge'. And they met up on a regular basis to talk about what they did, how they did it, and what they learned. How curious!

For my MPhil research (Dudhwala, 2012), I focused on the 'self-management of mental wellness'. The thesis made some interesting conclusions about how self-quantifying technologies used for mental health gave people a sense of control over themselves. It analysed the views of both mental health clinicians as well as the users of the technology. For this DPhil research however, I had the space to significantly expand the scope of the study. I chose here to focus on self-quantification as a whole - regardless of whether it concerned mental health or physical health, or even health at all. The aim being to understand the mechanisms behind self-quantification in general, and how the self is navigated, or done, through these practices of self-quantification. And thus began a four-year ethnographic engagement with the 'Quantified Self'.

That first ever meeting of the 'Quantified Self' comprised 28 people.⁴ Since, over seven years later, the group has branched out across the globe with different cities and countries hosting their own groups. To date, the Quantified Self has over 70,000 members across 235 different 'Meetup' locations across the world, and these numbers are increasing daily (Meetup, 2016).⁵ However, this number does not even begin to reflect the number of people who track themselves in some way: many people who

⁴ Details of the first Quantified Self Meeting can be found on Tim Ferriss' blog where he has posted his notes of what happened in the session. See: <http://fourhourworkweek.com/2013/04/03/the-first-ever-quantified-self-notes-plus-ld-as-cognitive-enhancer/>

⁵ 'Meetup' is the phrase used for the way that Quantified Self meetings are now organised. 'Meetup' is the name of a website that hosts a communal space for like-minded people with similar interests to get together. The Global Quantified Self Meetup page can be found at: <http://www.meetup.com/topics/quantified-self/>. This process is explained in much more detail in Chapter 4.

track themselves may not regard themselves as 'self-trackers', or have ever heard of the 'Quantified Self' as an organised group, and therefore would not be represented in the figures for the group.

It is extremely difficult to know how many people fall under the general description of tracking themselves. Nonetheless, to have some idea of what this number could be, we might turn to sales figures for popular self-tracking devices. The 'Fitbit', for instance, is a pedometer that tracks the number of steps one takes on a daily basis using an in-built accelerometer, and is one of the most popular wearable tracking devices on the market. Sales figures by mid 2015 showed that 20.8 million devices had been sold (Guardian, 2015).⁶ Sales figures, though, do not indicate use. Mobile phone application downloads may also help indicate the number of self-trackers, or even website visits, though the same limitations apply.

Despite not being able to quantify exactly the number of self-trackers, two things are clear. First, the number of people engaging with these technologies is significant enough to warrant serious attention, and, second, not nearly enough is known about the implications of using these 'self-quantifying technologies'. How, for example, do self-quantifying technologies and the self relate? What are the key features of self-quantification? How do practices of self-quantification bear upon the 'doing' of the self? These are the questions that I set about to investigate in the thesis.

'Doing' is just one of many words that could have been chosen. Doing can be unpacked into many different verbs, which can be placed on a continuum depicting differing levels of strength in terms of the idea that I am trying to convey. Woolgar and Neyland

⁶ <https://www.theguardian.com/technology/2015/nov/02/fitbit-quarterly-earnings-increase-revenue>

(2013: 107) argue a similar point in favour of their choice of the word 'constitution'. They argue that they could equally have used terms such as "shaping, aggregating, constructing, apprehending, performing, accomplishing, constituting, and enacting", highlighting that these words represent "a continuum along which each term has a slightly different connotation to the extent that its usage differentially acquiesces with the presumption of a pre-existing external world".

Similarly, there are other words that I could have chosen instead of 'doing' the self: shaping, constructing, rendering, performing, accomplishing, achieving, constituting, performing, making, and enacting the self, are all candidates that could have been used. However, they all have slightly different connotations ranging from the weakest form of 'doing' to the strongest. Shaping the self, for example, implies that the self already exists, and is just moulded a little. Constructing similarly implies the pre-existence of certain building blocks which simply need to be assembled together. Performing is stronger, but also weak because of the dramaturgical connotations implying that once the performance is over, one can go back to being the 'normal', back-stage self (c.f. Goffman, 1959). Enacting is perhaps the strongest candidate here, implying the self is brought into being through the very enactment itself. The choice of 'doing' allows me to engage with the terms on this continuum, whilst of course recognising from the outset that it sits closest to the furthest end of it.

In *Chapter 2*, I discuss the existing literature on technology, the self, self-management and the recent literature that has emerged on self-quantification. From this literature it becomes clear that certain areas have been under-investigated or overlooked. Notably, how the self is 'done' through practices of self-quantification is something that is not examined, and therefore becomes the guiding question for this research.

Next, in *Chapter 3*, I explain the methodological principles underpinning this research. I discuss why an ethnographic engagement with the Quantified Self is the most appropriate method by which to answer the questions that I seek to investigate. I also go into detail about what a typical Meetup in the Quantified Self is like, and the process through which I became a 'member' of the group and was able to collect more data than I initially knew what to do with. Finally, I discuss the data analysis procedure, highlighting my journey through qualitative analysis software and categorical coding. The data analysis procedure resulted in four themes which become the topic of investigation for each of the four empirical chapters that follow.

The first empirical chapter, *Chapter 4: The Agential Self*, deals with issues of agency and performativity. Picking up on both the gap in the literature regarding these issues in practices of self-quantification, as well as the data analysis pointing to this issue being important, the chapter deconstructs the 'relationship' between self-quantifying technologies and the self. It uses insights from Karen Barad's theory of *agential realism*, most notably her concepts of *intra-action* and *agential cutting*, to overcome some of the difficulties involved in even discussing 'self-quantifying technologies' and the 'self' as separate entities.

It becomes clear from Chapter 4 that the intra-action of technologies and the self are just one piece of the puzzle. In almost all instances of self-quantification, there is a numerical output of some sort. In *Chapter 5: The Quantification of Self*, I discuss the role of number in practices of self-quantification. I offer three broad analytical schemes of number and show how, counter to much conventional thinking on the matter, numbers are not always more 'objective' than qualitative descriptions of a phenomenon, that

consistency is much more important than accuracy or truth, and that numbers offer a way of 'seeing' things that may otherwise not be knowable.

The theme of 'seeing' is picked up in *Chapter 6: The Visualisation of Self*, where I discuss how visualisations of the self are a critical part of doing the self. I argue that visualisations do not merely represent some pre-existing aspect of the self, but are a crucial part of 'producing' the self. Like numbers, data visualisation also allows self-quantifiers to 'see' things that they may have otherwise been unaware of, but in addition, visualisations act as a device through which to include others in this doing of the self. Commonly used phrases such as 'as you can see' function to enact an audience that is presumed to be able to see what the self-quantifier is seeing, and allows this audience to partake in the production of that particular quantified-self.

In the final empirical chapter, *Chapter 7: The Constancy of Self*, I address the problems that arise when we consider the multiple and fluid nature of the self. I discuss how, despite the many different technologies used, numbers and visualisations produced, and despite changes over time, constancy of the self is achieved through the practices of self-quantification. I show how 'enactment' is a useful concept for addressing some of these problems, but it falls short in capturing the nuances of the constancy of the self in self-quantification. I instead offer the term 'entractment' as a way of overcoming this shortcoming, a term which describes how the self is held together and 'done' through the practice of self-quantification in the face of multiplicity and fluidity.

In the *Conclusion* I reflect on the journey of the research. I revisit the initial aims and motivations for the research and bring together the key insights into how the self is done in practices of self-quantification. I highlight the implications of this research for

theory, methodology, and for practice, all the while reflecting on what limitations the research contains. Finally, I offer some thoughts on where it might be useful to focus future investigations in this area.

Chapter 2:

Critical Literature Review

Introduction

How are we to understand the 'self' in a world where technologies are increasingly being used to track, measure, record, quantify, visualise, and analyse the self? In this thesis, I use the theoretical and methodological sensibilities offered by Science and Technology Studies (STS) to study the phenomenon of the 'self' at a time when it is becoming increasingly difficult to separate the self from technologies and the practices surrounding the use of these technologies. Specifically, I am interested in 'self-quantifying technologies' which is the general term that I use to denote any technology which is used by someone to track, measure, record, or quantify some aspect of their self.⁷

⁷ More specifically, the 'someone' here refers to people who are part of the Quantified Self group or more generally engage in practices of self-quantification, and the 'self-quantifying technologies' refer to the technologies which they use and discuss.

I use STS as the theoretical and methodological driving force for the research for many reasons, but primarily because of the inherent imperative within it to see how anything and everything 'could be otherwise'. It allows us to question the received view of science and technology from the stance of an academically legitimate 'idiot'. That is, as Isabelle Stengers explains, someone who "resists the consensual way in which the situation is presented...the idiot demands that we slow down, that we don't consider ourselves authorised to believe we possess the meaning of what we know." (2005: 994-995). Therefore, as the rate of use of these technologies on/by the self, as well as the surrounding analyses of what this means, speeds up, I urge us to slow down. And so, in this chapter, I scrutinise that which is taken for granted by critically reviewing the existing literature.

In order to understand the 'self' in the context of a proliferation of the use of technologies that claim to help people to know themselves better, we need first to take a step back. How has the role of technology in society been conceptualised? What are the different ways of conceptualising the self? What do we claim to understand about the use of technologies on/by the self so far? This critical review of the literature is thus broken down into three parts: conceptualisations of technology, theories of the self, and finally, research on the use of technologies on/by the self. In reviewing the current literature I fulfil four aims. First, I avoid repeating in this thesis that which has already been done. Second, I build up a good understanding of the existing theory such that I can build on this to expand it where necessary. Third, I highlight where the current knowledge falls short. And finally, I arrive at certain puzzles and questions which are still unanswered, and which therefore become the guiding questions for my own research.

Conceptualisations of Technology

Determinism

According to the theory of technological determinism, the primary driving force shaping a society's culture and values is the development of technology and its capabilities. It is a theory which has fallen out of academic favour in recent times, however there have been attempts at reviving it as a fruitful way of understanding the world. In fact, there are even some who go so far as to assert that we are all, at some level, technological determinists. Sally Wyatt (2008), for example, argues that rather than dismissing the idea at face value, scholarship on technological determinism needs to be dealt with systematically with no motive other than to assess the strength of its claims. One way to do this is to unpack what technological determinism actually is, and for this we need to acknowledge that 'technological determinism' is not a single entity with a fixed definition that is shared by all. In fact, there are many different variations of both the type of determinism and its strength.

To try and make sense of these different types of determinism, some have sought to create a taxonomy of determinism. Bruce Bimber (1994) talks about the 'three faces' of technological determinism: the 'normative' face, the 'unintended consequences' face, and the 'nomological' face. The normative face is said to be neither fully technological nor deterministic, and causal agency is attributed primarily to human practices rather than to an essential feature of the technology itself. In this sense, the 'normative' face fits the well-known National Rifle Association slogan 'guns don't kill people, people kill people'. In other words, it is not the essential properties of the gun that kill people, they argue, but the actions of the person pulling the trigger.

The 'unintended consequences' face represents the view that social actors cannot possibly be fully aware of the full extent of the ramifications of technology and the consequent changes that may be brought about as a result. This view is reminiscent of Winner's (1986) concept of 'technological somnambulism' where he argues that even though we cannot know the full consequences of using technology, we still "willingly sleepwalk through the process of reconstituting the conditions of human existence". Similarly, Wyatt (2008) also offers a form of determinism that she terms 'normative technological determinism' which is the belief that technology has become so complex that humans and society cannot possibly have any control over it.

The final face, the 'nomological' face, is concerned with a much narrower definition of technology which includes only physical artefacts and machines. Here, systems of doing things or the way in which something is used are not counted as being technologies. Bimber (1944: 88) argues that this can be the only definition of technology, since to include knowledge and forms of social organisation would be to say that social change is determined, in part, by social forces - which negates the point of 'technological' determinism altogether: if society is responsible for social change, what, then, is the role of technology?

Whilst Bimber (1994) outlines a classification system for the different types of determinisms, others see determinism as having more to do with its differing strength rather than it differing in kind. This is the view held by Merritt Roe Smith and Leo Marx (1994) who see technological determinism as being on a scale that ranges from soft to hard determinism. Hard determinists attribute agency to the essential features of the technology itself. They would argue that in the face of the great agential power of technology, society has little choice about the direction it goes in because this is

determined by the path that the technology lays out for it. Those who are unconvinced by the handing over of agency to the technology itself, like Roe Smith and Marx, soften the message a little by arguing that technology is built by humans first, and so any action that arises as a consequence of that technology always *begins* with the preprogrammed actions of humans but may *end* up being determined by the technology in some way. Soft determinists, therefore, locate agential power not in the technology itself, but situate it in a more complex concoction of social, political, economic and cultural factors (Smith and Marx, 1994).

Similarly, Robert Heilbroner, in his provocatively titled essay '*Do Machines Make History?*' (1967), argues for the existence of a form of soft determinism. He argues that there is a set pattern of development for technology and societal change: that the age of the steam-mill could never have come about without first mastering the hand-mill and that the electrical age must be lived through first to be able to progress to the nuclear age. Whilst, on the whole, Heilbroner argues that technology does follow a mostly fixed sequence of development which determines society to a large extent, like Roe Smith and Marx, he gives himself some leeway by stating that there has to be a recognition of certain political, social, and economic factors which may affect such a rigid technological development.

Roe Smith, Marx and Heilbroner are all self-proclaimed 'soft' determinists. In labelling themselves as such, they are able to assert claims which in some sense are unfalsifiable (c.f. Popper, 1959). For instance, they all allow their technological determinism to be explained away by exceptional or foundational economic, social, or political factors. In this sense, soft determinists are not really saying much at all other than a variation of: technology often determines society, but sometimes so too does culture, politics and

economics; furthermore, technology itself is often the product of these very same factors.

There is something deeply unsatisfactory about these sorts of explanations: anything that they explain is caveated by the existence of potential other explanations too. There does not seem to be any pattern as to when technology might be the primary determining factor for society, or when the other factors may be more important. In fact, we could even go so far as to say that these theories are only technologically determinist in theory: in practice, anything goes.

There are, however, at least some useful questions which arise out of this 'soft determinist' view of technology. Roe Smith and Marx's assertion that the consequences of technology can be explained in some way by the human inventors of the technology leaves us with the question of whether the intentionality of the designer/inventor of the technology matters in the face of the resulting consequences. Does it matter that the designer of asbestos insulated houses *intended* for it to result in relatively sound-proof accommodation in the face of the consequence that it actually caused many cases of lung cancer and Mesothelioma (Cancer Research UK, 2015)? What is the importance of the *intention* of the inventor of Avon Skin So Soft Oil Spray to hydrate skin and 'lock in moisture' when most of its users use it as a form of insect repellent (Beever, 2006)? Roe Smith and Marx's attribution of partial agency to the human inventors of technology does not seem to hold: as the examples above show, once a technology has been designed and built, the original creators have little or no control over its ultimate use.

Roe Smith and Marx's and Heilbroner's versions of determinism lead to the more interesting question of who 'makes' the technology – the designers or the users? Are

there *any* essential features of technology which determine action, or is it always an amalgamation of different factors? In the context of self-quantifying technologies, does the intention of the designer of the technologies *matter* in their adoption by self-quantifiers? Is there a relationship between the *intention* of the designer of the technology and in its actual *use*? These questions are important, and there have been many attempts at answering them. These attempts, however, have largely been from those who move away from the 'determinist' label and fall more under the idiom of social constructivism.

Social Constructivism

Rather than explaining change and agency primarily in terms of the technology itself, social constructivists turn to the social interests of the actors involved, invoking political and power explanations too. Mackenzie & Wajcman (1985), for example, argue that technology is shaped by society such that it is moulded and patterned by the way that it is used and adopted by its different users. This 'social shaping of technology' (SST) view holds that technology is not a fixed entity and the meanings and uses attributed to it are a consequence of the negotiations between different actors and groups in society (c.f. Cronberg 1992). Furthermore, whilst technological determinism focusses mainly on the common outcomes of technology, SST takes a deeper look at how social, cultural, political and economic factors shape the direction of the innovation itself, the type of technology that ends up being built, how the outcomes of the technology are themselves negotiated and how they affect different changes for different groups in society (Williams and Edge 1996).

A similar perspective is given by 'social construction of technology' (SCOT). Bijker et al. (1987) and Biker (1997), for example, argue that technology is socially constructed through a number of competing interests and discourses. It is only through a process of active 'closure' and 'stabilisation' that a technology adopts the dominant characteristics that people come to recognise it for. For instance, the modern day bicycle is said to be a result of the convergence of decades of competing interests and rhetoric, not the result of any inherently superior characteristics of the technology itself. Similarly, the mass adoption of the QWERTY keyboard over its DVORAK competitor was not because it was the more efficient (in fact, tests showed that the DVORAK led to faster typing) but because workers had already spent time mastering the QWERTY: the opportunity costs of relearning another keyboard type would have been too high and there were already many vested interests supporting the QWERTY keyboard (Bijker, 1997; Rogers, 1995).

Although SST and SCOT recognise the importance of political factors in their analysis of the development and effects of technology, their main focus, as their names suggest, is on the social factors involved. The distinctions are quite crude: it is patent that the political and social spheres have more in common than not. However, in the STS literature a distinction is made and upheld – even if just by the different language that is used. Winner's (1980) well-known article "*Do Artifacts Have Politics?*" is a clear example of this – '*Politics*' is in the very title. Here, Winner argues that technology is 'politically impregnated': whilst we think we have choices, all we really have are a set number of responses to predetermined outcomes (see also Mol, 1999). He uses the infamous example of Moses's bridges in New York, which are argued to have been purposefully built lower than average so that public transport could not pass through them. In this sense, Winner is arguing that the bridges are inscribed with certain

properties which do not allow the poorer members of the community, who are restricted to travel via public transportation, access to the beaches.

There is, however, a major problem with Winner's political-technological determinism. As Woolgar and Cooper (1999) recognise, Winner's story depends on one definitive account (political) of one outcome (the exclusion of one strata of society) of an artefact (low bridges) to the exclusion of any other explanation or outcome. For Winner, it could not have been otherwise; for others, it most certainly was. Joerges (1999), for example, also criticises Winner's somewhat reductionist and simplistic treatment of the effects of technology. Joerges argues that the power that is seen as being exerted by technology is not found in the essential features or attributes of the technology itself, but rather in its 'authorization' - in the way that it is given legitimate representation by its placement and use in society. In this sense, Joerges places himself in-between what he calls control (c.f. Winner, 1980, 2004) and contingency (Latour, 1988b; Woolgar, 1991) arguments.

In highlighting that there are other possible explanations for the building of low bridges (some economic reasons are cited) as well as other outcomes (there were apparently many other routes towards Jones Beach), Joerges certainly overcomes the unsatisfactorily narrow explanation offered by Winner. However, he still falls into the same trap as SST and SCOT theories – namely, that regardless of how many different stories and interests are cited, it could *always* be otherwise. There could always be other reasons and explanations that have not been cited, thought of, or purposefully negated. The fact that Joerges (and Bijker, Pinch, Wajcman, Mackenzie, etc.) chose *those* explanations over others shows that he is doing exactly what Joerges accuses others of doing when citing Winner's Moses Bridges story. They are all, in a sense, making

‘agential cuts’ (c.f Barad, 2003) to focus on the things they think are relevant to make sense of the phenomenon.

The difference between their accounts and constructivist accounts such as Woolgar’s, however, is that Joerges’ account, and others like it (such as SST and SCOT), are concerned with choosing the right, or most important, explanations, whereas Woolgar and Cooper (1999) highlight that there are an endless number of alternative explanations. It is the process by which some are chosen or made to seem ‘right’ over others that is the very thing that needs to be scrutinised. The discussion started with a question from Winner (1980): do artifacts have politics? The response to this was another question by Joerges (1999) which turned the original on its head: do politics have artefacts? And the reply to this was yet another question posed by Woolgar and Cooper (1999): do artefacts have ambivalence? These three questions encapsulate the debate well: Winner is arguing that there does exist a form of socio-political determinism; Joerges is arguing that it could be otherwise and then tells us what this ‘otherwise’ actually is; and finally Woolgar and Cooper argue that even the otherwise could be otherwise, which itself could also be otherwise, *ad infinitum*.

These are important ways of thinking about technology and the impacts that it has, especially in the context of self-quantifying technologies. Winner’s focus is on the top-down, designer to user aspect of technology. He argues that the designer inscribes certain politics into technology which then has certain outcomes and effects on the users. However, he does not take into account how the user may adopt the technology, or modify it or use it for other means, or the perspectives of those users who are not affected by the technology at all. However, can ‘designers’ and ‘users’ be distinguished so easily? To what extent do the designers of self-quantifying technologies inscribe

certain politics into their technologies? What might these politics be and toward what ends?

Joerges' account of the 'known otherwise' brings up another set of questions, this time methodological. If it could be otherwise, and these otherwise can be known, then how to go about finding what they are? Joerges conducted a form of historical analysis to find out economic causes, other routes into Jones Beach, other reasons why poor people did not want to go to the beaches anyway and so on – but why did he choose to focus on those factors? Why did he neglect to look at the government at the time, the role of transport lobbies, etc.? When studying the phenomenon of the self in the context of self-quantifying technologies, how to decide when the 'otherwise' have been 'found' and when the case can be closed?

The point Woolgar and Cooper are making is that the case can never be fully closed: it can always be otherwise. But certain boundaries are created to stop the analysis from heading into infinite regression. Therefore, how these boundaries are made, by whom and for what purpose may be the more pertinent questions to ask, rather than seeking the (non-existent) definitive answer. And so: how are self-quantifying technologies implicated in the pursuit of 'knowledge' of the self? How is the self 'done'? What counts as self-quantifying technologies? How do people draw a boundary around their own self-quantifying behaviour?

'Middling' Theories

There still remain two sets of issues which are left unexplained or unaccounted for in the theories discussed above. The first issue is that if there is something essential in the

technology or its features that determine outcomes and behaviour (as the technological determinists argue, as well as Winner, to some extent), then how is it that exactly the same technology can be used in vastly *different ways*? For example, a 'Sigg' bottle is used by some to store and drink water, by others to roll out knots in their calf muscles, and by others still to hammer nails into walls (Jacobs, 2010; Stephan R, 2012). No doubt there are many other uses too. Joerges' and Woolgar and Cooper's perspectives could certainly come in use to explain this.

However, and the second issue, if there is nothing essential in the features of the technology and it is a matter of constructivism, or of competing interests and the power of storytelling, then how can we explain those instances where technology is used in *the same way* in two places that are completely removed from each other both geographically and culturally? For example, how can we explain how children in Ethiopia were able to teach themselves to read using a tablet PC without any instruction as to how to use this foreign technology in the first place (c.f. Talbot, 2012)? Was there something fundamental to the technology which resulted in such similar usage in a context where social and cultural factors could not have played a part due to them being so far removed from each other?

One proposed response to these two issues is to argue that neither the social nor the technical are exclusively able to explain any outcome. Proponents of this way of thinking seek to bridge the false dichotomy of the technical and the social by arguing that they are in fact both mutually reinforcing. These 'middling' theories became more and more popular after Giddens proposed his 'theory of structuration' (1984). Giddens argues that no analysis is complete which does not take into account both structural

and agency explanations. Phenomenon only occur through the inseparable interaction of both of these factors simultaneously, which reinforce, shape, and change each other.

It was only a matter of time before Giddens' theory was adapted to form an explanation of *technology*, and this was precisely what Orlikowski did. Orlikowski's (1992) 'duality of technology' model proposed to show that whilst technology is created and changed by human action, the same technology recursively enables and constrains that very human action. In studying a work organisation, Orlikowski showed that although technology only comes into existence through creative human action (a slight nod to the soft technological determinists), technology facilitates and constrains the performance of certain kinds of work. Alongside this, the interaction of technology and human action is shaped by the wider institutional context.

However, although the duality of technology takes into account the mutual relationship between technology and society, it still rests on making a distinction between the different entities involved in the analysis: between technology, human action and the organisational context, for instance. It is precisely this ontological separation of the entities that is seen as problematic by others who argue that one cannot *be* without the other and as such cannot be thought of as separate phenomenon. This is the view proposed by Sociomateriality, whose main proponent, ironically, is Orlikowski herself. In an intellectual U-turn, Orlikowski now argues that making a distinction between the material and the social, as she had done herself in her previous work, needs rethinking (c.f Orlikowski, 2007; Orlikowski & Scott, 2008).

Constitutive Theories

The sociomateriality view does not engage with debate about whether or not technology is socially constructed, or even how society and technology might mutually shape one another: these arguments are seen as irrelevant precisely because, as Latour (2004) argues, the separation of technology and society is itself the artefact that needs to be questioned. In other words, one cannot begin by assuming that the 'social' and the 'technical' are separate entities. In this view, one does not begin by assuming the independent existence of entities with inherent properties: one cannot think of the technical without also thinking of the social and one cannot think of the social without also thinking of the technical (c.f. Barad, 2003; Orlikowski, 2007).

From the sociomaterial perspective, things only exist in practice; hence the title of Orlikowski's (2007) paper: '*sociomaterial practices*'. This makes the sociomaterial view much easier to comprehend – if nothing exists in and of itself, and things are only constituted in their relations with one another, then things can only intelligibly exist when they are actually 'in-being', so to speak, as they are being constituted in practice at those precise moments of time, however lasting or fleeting they may be. Sociomateriality thus offers an explanation of organisational and technological change: it is an ongoing and emergent accomplishment consisting of a number of heterogeneous actors that are both material and social at the same time (c.f. Schatzki, 2001; Tsoukas & Chia, 2002).

Whilst this is an interesting take on the technology / society debate, it still remains to be seen how useful this practice-based theory is. How can a constitutive understanding of technology help to understand how the self is done? How to study self-quantifying

technologies and their implications for the doing of the self if we begin by resisting the assumption that technology and the self are distinct entities?

Intra-action

One way of addressing these questions is offered by Karen Barad in her work on agency and performativity (e.g. Barad, 1996; 2003). Although she is addressing 'material' and 'human' agency, her ideas offer useful insights into the relationship between technology and society. For Barad, *everything* has the potential for agency. It makes no sense to assume that there is a distinction between human and material agency (and a valid extension of this can be that there is no sense in assuming *a priori* a distinction between society and technology) because that would presume that either had certain qualities about them which preceded interaction between them. Barad argues that "there are no such independently existing objects with inherent characteristics" (2003: 816). For this reason, Barad argues that the representationalist account of the world, where, for example, scientists *represent* the reality that is out there, cannot hold. According to representationalism, we can have access to the representations through scientific knowledge, but not to that which is being represented. However, this view rests on the belief that there is actual 'stuff' 'out there' waiting to be represented as knowledge, and this, as discussed above is an account of the world that is refuted by Barad.

Barad maintains that there is no world already 'out there'; rather it is 'made', or only 'becomes', in the moment where *intra-action* occurs: "the world *is* intra-activity in its differential mattering" (Barad 2003: 817, emphasis in original). Intra-action refers to a

simultaneously reciprocal action which cannot be reduced to any component parts (because there aren't any component parts – the action *is* the whole), and it is only in these moments that specific things may become apparent. These constantly ongoing intra-actions are termed 'material discursive practices' and it is through these practices that certain boundaries are enacted and performed. This is done by making 'agential cuts' which momentarily defocus everything else except for the phenomenon that is created. Without these agential cuts, the whole universe (and whatever else there may be) is enmeshed in an intertwined web of relational ontology where nothing can be differentiated from, or conceived of without, anything else. Making agential cuts through material discursive practices allows certain phenomena to be momentarily distinguished and performed. In fact, for Barad, it is only through *intra*-action that the boundary or distinction between material and human agency – a distinction that according to Barad is taken too much for granted – can be performed.

Barad describes her way of looking at the world as an 'agential realist ontology'. Applying an agential realist ontology to studying the use of self-quantifying technologies in the doing of the self would imply that the self is not constructed by self-quantifying technologies; rather the use of self-quantifying technologies *is/becomes* the self. That is, self-quantifying technologies play a crucial role in the constitution of the self as a phenomenon which is only *that* phenomenon with those particular technologies. And conversely, self-quantifying technologies are only that when they are being used as a tool/process for doing the self. In Barad's words, "...apparatuses [self-quantifying technologies] are not mere static arrangements *in* the world, but rather apparatuses are dynamic (re)configurings *of* the world, specific agential practices/ intra-actions/ performances through which specific exclusionary boundaries [the self]

are enacted" (Barad 2003: 816). So, for example, when we claim to espouse certain 'knowledge' about something, we are sharing with others the specific agential cut that we have chosen to make using our chosen apparatus. We are thus performing an intra-action, which is, or becomes, the phenomenon itself.

Finally, Barad's thinking also has an impact on reflexivity and the role of the researcher. If, as Barad asserts, apparatuses *are* the phenomenon they are measuring, then we, as the researchers, must also *be* the phenomenon: we are part of the intra-action too. This is explicitly argued by Barad: "'We" are not outside observers of the world. Nor are we simply located at particular places *in* the world, rather, we are part *of* the world in its ongoing intra-activity.'" (Barad 2003: 828). As such, how can we as the researcher explain someone else's 'agential cut' without changing its very nature through 'intra-acting' with it?

Whilst Barad's work raises some provoking questions for both the content and method of this research in so much as it is to do with material (technological) and human agency, its focus is not specifically on the self. Most of her examples are to do with expert scientific apparatus and the knowledge that results from conducting experiments using them. As suggested earlier, most of the discussion on technology thus far has concentrated on the relationship between technology and society with much less emphasis on the relationship between technology and the self. The next part of this critical literature review will thus deal with theories of the self.

Theories of the Self

The Self as the Mind/Soul

The notion of the self has long been an occupation of philosophers, psychologists and sociologists; they have questioned its very existence (Descartes, 1996), its unconscious engagements (Freud, 1915) and its deliberate performances (Goffman, 1959). Yet, the ongoing 'concern' with the self by the self itself was not addressed until Foucault (1983, 1988a, 1988b, 1997) brought it to the fore in his long history of subjectivity. As indicated in the Introduction, a considerable amount of space in Foucault's work is dedicated to the notion of *Epimeleia Heautou* or the 'concern with oneself'. However, Foucault's (1997: 226) interpretation of the concern with oneself is based on Socratic principles of "wisdom, truth and the perfection of the soul". As a result, his work prioritises the conscience and the mind.

For Foucault, the physical body has very little bearing on the self when it comes to self care: "when you take care of the body, you do not take care of the self. The self is not clothing, tools, or possessions; it is to be found in the principle that uses these tools, a principle not of the body but of the soul" (1997: 230). It is therefore evident that Foucault's treatment of the concern for oneself seems to be based in an implicit belief in Cartesian Dualism, which forecloses the opportunity to explore how the self (or the mind/soul in Dualistic/Foucauldian terms) may be constituted through (and by) the body as well as through self-quantifying technologies.

Foucault (1997: 90) also talks about 'technologies of the self', which, according to him, "permit individuals to effect by their own means, or with the help of others, a certain

number of operations on their own bodies and souls, thoughts, conduct, and way of being, so as to transform themselves in order to attain a certain state of happiness, purity, wisdom, perfection, or immortality". Whilst this might seem applicable to modern-day technologies of the self such as those used by the Quantified Self, Foucault's idea of these technologies is very different to the ones used by them. From my observations, self-quantifying technologies are devices (in the form of either hardware or software) that track, measure, monitor, or record some aspect of the self. Crucially, these devices allow for the mass storage and retrieval of the digital data that are produced through their use, so that they can be analysed in various ways.

Foucault's (1988a) use of the term technology is much closer to a 'technique': more verb than noun. More so, this technique mainly involved spending time thinking about what one had accomplished that day and if there were any lessons to be learned from it – like keeping a mindful journal. In this respect, although the principle of keeping a record is similar, Foucault's technologies of the self are vastly different to the self-quantifying technologies available in the present day.

There is, interestingly, one account of Foucault engaging with the idea of the quantification of the self as it is practiced in the modern day. He talks about measuring and quantifying the frequency of sexual encounters, and places this under the category of 'medical regimens' (1997: 91). Though there is no further mention of the idea of quantification of the self in his work. There is, however, one instance where Foucault questions the type of self he is referring to in his work. When Foucault talks about *epimeleisthai* (taking pains with oneself) rather than *epimeleia heautou*, he asks 'what is this self of which one has to take care?' and 'of what does care consist'? (1997: 230). The

idea of 'taking pains with oneself' is much closer to the idea of self-quantification that I am interested in.

The Self as the Body

Whilst Foucault's engagement with *epimeleia heautou* is an interesting starting point, it is somewhat constrained by ignoring the importance of the body in the concept of the self. Later theories expanded on Foucault's work by giving more emphasis to the material body. Rose (1996: 10), for example, argued that subjectification, or the making of the self, cannot be found by trying to locate it in a "universe of meaning" but in a "complex of apparatuses, practices, machinations, and assemblages within which human being has been fabricated, and which presuppose and enjoin particular relations with ourselves". Here, an analogy is drawn to the image of a cyborg (c.f. Haraway, 2006) which ultimately poses a threat to the uniqueness and primacy of the self.

In a more recent work, however, Rose (2013) criticises attempts to explain the capacities of the body through arguments which, much like his own argument above, claim that it is in part socially constructed or shaped by cultural expectations or practices. This signifies a move back to a version of materialism (Barad, 1996, 2003; Bennett and Joyce, 2010; Pels, Hetherington, and Vandenberghe, 2002; Rose, 2013) which takes the body as the primary site of the self (e.g. Butler, 1993). Leaving behind the soul and the mind, Rose (2013) now sees biology as the primary force of the self: he points to a shift from regarding the mind as the most important determiner of the self, to the view that personhood is embodied in the flesh: to some extent, "our bodies *were* ourselves" (2013:

7, emphasis added). Here we see a complete swing of the pendulum from Foucault's concept of the self that focussed on the soul/mind, to newer conceptions of the self that stem from the turn to materiality which focus on biology and the material body. Both aspects are necessary, but neither are sufficient by themselves. What about the role of external influences on the self? Not just of other people, but also of other materialities and discourse?

The Social Construction of the Self

Hacking (2002) has attempted to conceptualise the self as a social construction, or through a process of classification. He argues that our classification systems and the classes they entail both emerge through their interaction/reinforcement of each other. It is neither the case that the classification system created the class entirely, nor that the class already existed and was just waiting to be classified and labelled as such. This seems to be referring to a kind of intra-action where both the class and the classification only become such in their relationship with each other (c.f. Barad, 2007). However, this view does not question whether there is any influence over the classification process in the first place – whether if by classifying something as one thing by certain people silences other types of classifications that could have come into being if the classification process was in the hands of someone else (Bowker and Star, 2000).

Other perspectives on the self have highlighted how different ideas of the self were more convincing at certain points in history (Taylor, 1989), or how the self is constructed through the actions of the person and yet these are only actionable through the context of who one is (Butler, 1993). Yet others connect the self directly with our

capacity for language: Harre (1985) argued that a self is not a certain kind of being but simply a possession of a theory about the self. Similarly, Hacking argues that new possibilities for description about the self open up new possibilities for becoming oneself (2002). This idea potentially has a direct bearing on practices of self quantification - does this argument extend such that we can query whether new modes of quantification and visualisation, for example, open up new possibilities for becoming oneself?

In his later work, Hacking (2005) added that whilst in the past we would exchange organs, add limbs, or have dental implants, these days it is also possible to change the state of our minds, too. He uses Prozac as an example of a targeted drug that changes the state of the mind, and in turn changes how one may conceive of the self: "but the designer drugs are more or less specific, and they will undoubtedly have a vast effect on how we conceive of ourselves, our minds, our souls. By ingesting or injecting a substance into our bodies, we affect our minds" (Hacking, 2005: 162). This provides an interesting way of thinking about the role of self-quantifying technologies as potentially affecting not only how the self is done, but also how it is conceived of.

Whilst there is a large body of literature that deals with different aspects of the self, it seems as though there are very few which deal with the self as a whole, in its entirety. Foucault's conception focusses largely on the 'soul', the Neo-Foucauldians are preoccupied with the 'body' and its material state, whilst the social constructionists fall short in the absence of political explanations (Cruikshank, 1993) when looking at external factors in constructing the self. The material impact of technologies used in modern day self-quantifying and improvement are not discussed. How are these

technologies implicated in the doing of the self? How does the self navigate through the hundreds of possible technologies that can be used?

The Use of Technologies On/By the Self

Self-Regulation and Self-Management

Although the terms 'self-tracking' and 'self-quantification' may be new, the principles or techniques that they refer to are not. There has been much work done on similar 'projects' on the self, albeit with a slightly different focus. The early notion of 'self-regulation', for example, was rooted in psychological literature and brought to the fore by Bandura in the late eighties and early nineties. Bandura maintained that self-regulation referred to behaviour being motivated and regulated by a constant exercise of self-influence (1991). Successful self-regulation consists of three elements: self-monitoring behaviour of both determinants and effects; evaluation in relation to personal standards (internal goals) as well as to environmental circumstances (external goals); and finally action in terms of actual behaviour change (Bandura, 1991). Many other theories and models of self-regulation have also been advanced: the 'health belief model', the 'theory of reasoned action', and the 'health behavioural goal model', for example, explain how someone might regulate their own actions (Fishbein and Ajzen, 1975; Maes and Gebhardt, 2000; Rosenstock, 1974).

Similarly, the notion of 'self-management' has also been around for some time. It is interesting that the differences between self-regulation and self-management are not entirely clear from the literature. Sometimes the two terms are used interchangeably

and at other times subtle differences between the two are emphasised to highlight certain aspects which may be conducive to the broader point the author is trying to make (for example see Lorig, 2004; Pollack, 1996; Sims, 1980; Thoresen and Mahoney, 1974).

A more contemporary and comprehensive definition is given by Barlow et al. (2005: 273) where self-management is seen as an:

“...individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and life style changes inherent in living with a chronic condition. Efficacious self-management encompasses the ability to monitor one's condition and to affect the cognitive, behavioural and emotional responses necessary to maintain a satisfactory quality of life. A dynamic and continuous process of self-regulation is established, with individuals working in partnership with relevant health professionals”.

Barlow et al.'s definition incorporates self-regulation within the notion of self-management and explicitly highlights the involvement of a 'health professional'. This definition lends itself well to explaining the type of self-management examined by empirical studies that test the effectiveness of self-management on physical indicators of health (e.g. Ross et al., 2010; Kelley et al., 2011).

One particular study by Haskell et al. (1994) investigated the effects of using a self-management programme with patients suffering from coronary heart disease. Patients just seen by a physician showed no change in their condition, or got worse. Patients helped by nurse implementers *and* a self-management programme showed positive change. In another study, DeBusk et al. (1994) looked at the effects of a self-management tool developed for people at risk of heart problems. Participants using a self-management programme achieved a much higher reduction of plasma cholesterol

(needed to reduce the risk of heart problems) than the control group who were not given a self-management programme.

The authors of these empirical studies argue that incorporating self-management into an individual's health programme is much more effective than seeing a physician alone. However, despite calling themselves theories and models of *self*-management and *self*-regulation, most, if not all of the studies describing this, are more concerned with the *collaborative*-regulation of health by both patient and professional. The two empirical studies above, for example, involve nurse implementers and physicians as pivotal actors in the self-management of the patient, rather than exploring the effect of self-management in the absence of any external expert. How does self-management or self-regulation fare when the patient is not guided through it or facilitated by medical professionals? This concern about distinguishing 'pure' self-management from those practices which are professional interventions which may include a self-management component are also acknowledged by Barlow et al. (2005).

It is also difficult to understand from these studies what the effect is of the technology on the individuals' perceptions of their health and self. We know from the studies that there was a measurable change in the individuals' cholesterol or blood sugar level, but the studies do not attempt to understand *how* this phenomenon made the individuals feel, or *why* they were engaging with self-management programmes in the first place. One reason for this may be that the methodology used to understand self-management in these cases has been largely experimental and focussed on a statistical change in measured health metrics such as those discussed above. A more qualitatively-oriented methodology would have perhaps been more useful to uncover the thick descriptions behind the phenomenon of self-management and self-regulation (Geertz, 1973).

The research that has been discussed above is rooted in psychological or medical literature. It is therefore not surprising that the methods employed are largely experimental and quantitative. Further, this literature makes certain assumptions about what counts as the 'self' and as 'technology'. Studies on self-management and self-regulation in the sociological and anthropological literature reveal how a qualitative methodology might give different kinds of insights into the how, what and why of self-management. Law and Moser (2001), for example, have adopted such qualitative methods to tell short stories about self-management through the experience of disabled individuals who are unable to walk or speak, and who use an advanced wheelchair technology ('RollTalk') to move around and communicate. This study finds that there is, in fact, no stable core to the self and that it is always constructed in social relations and technology. The study focusses on the menus and options that RollTalk provides – they are seen as preconceived ideas of what options a person would like to choose from and carry an assumption that the person can and *wants* to make a choice. Here, we start to see the interplay between self-management and technology.

Similarly, Willems' (2000) study of the use of self-management programmes with asthma sufferers revealed that technology altered the relationship of the patients to their asthma. In measuring their lung function, patients came to focus on the measurements taken by the technology more than their bodily feelings, but then the sense of these bodily feelings began to be adjusted by the technological measurement. Willems concludes his study by stating that either the measurements made by the technology could come to engulf subjectivity, or alternatively, the incorporation of the measurements could allow patients increased agency (2000: 37).

Rather than end with such statements, it would perhaps be more useful to start by posing them as the very questions to study. For example, what is the relationship between self-management technologies and agency? Is the relationship unidirectional with one influencing the other, or are there more variables involved? What about the role of, for example, others who are also doing some kind of self-management?

The influence of others doing self-management is largely not discussed in the self-regulation/self-management literature. For discussion of the role of others, it is the 'self-help' literature which is most fruitful; especially that literature which focusses on self-help groups. An early definition in the academic literature comes from Katz and Bender, who described self-help groups as "small voluntary group structures that through mutual support aim to complete specific tasks...they consist of participants that gather in order mutually to satisfy a common need, help with a handicap or a life problem and to create a desired social or personal change" (1976: 141). This definition is important as it accounts for self-help with problems that might be for things beyond those that need medical care, which is something that remains the focus of the self-regulation and self-management literature discussed above. This opens up the discussion around self-regulation/-management/-help to questions about its implications for both social and clinical problems.

Further, the literature on self-help groups focuses much more on the social processes involved in being part of a self-help group, including (but not limited to) the formation of networks within these groups and the way the group is organised (Katz and Bender, 1987; Kickbusch and Hatch, 1983; Trojan, 1989). These social processes and networks feed into what Riessman and Gartner (1987) call a 'self-help ethos': an ethos which incorporates mutual support, information exchange and relatedness based on shared

conditions (Borkman, 1997; Davison, Pennebaker, and Dickerson, 2000; Kurtz, 1990) as well as a rejection of professionalisation and bureaucratisation (Chapman, 1997; Jacobs and Goodman, 1989; Reay-Young, 2001). A common view of self-help groups is thus neatly summarised by Adamsen and Rasmussen in their characterisation of them as incorporating “anti-bureaucratic organization, absence of professionals, spontaneity, personal participation and reciprocity” (2001: 911).

The self-regulation, self-management and self-help literature are perhaps the closest proxy for understanding the dynamics and nuances of self-quantification and self-improvement. However, they do not map onto the latter perfectly. From preliminary investigations in an earlier research project (Dudhwala 2012), the main elements of self-quantification appear to be that a) there is no professional or expert leading or teaching the behaviour; b) they involve using personal technologies of some kind; c) the focus is not (wholly or mostly) on discernible medical illnesses or problems; and d) they involve being part of a wider group and interacting with others engaging in similar behaviour. The self-regulation and self-management literature does not cover those instances where there is no medical professional present, where there are no discernible illnesses or group situations. The self-help literature does look at the dynamics of the social processes involved and also gives insight into groups which don't have experts or professionals leading them. However, it unfortunately does not problematise the role of technology and, like the literature on self-regulation and self-management, it does not give much insight into those situations where people self-help in the absence of any problems.

Self-Quantification

Back in late 2012, when I first searched for existing literature that dealt with all four of the elements which I found to be critical to self-quantification (used without a professional/expert; using personal technologies of some kind; focus not being wholly on treating illness; and done in the context of a larger community of people engaging in similar activities) I found very little - presumably because the phenomena of self-tracking and self-quantification was still relatively new. In fact, the Oxford Libraries' catalogue of journals articles revealed only two relevant search results for articles containing 'self-quantification'. Of these, one was an article in the New Scientist Magazine entitled "*The End of the Average Man*" (Fleming, 2012) and the second was an Editor's Note in the Journal of the American College of Cardiology called "Self Quantification of Health and Fitness" (DeMaria, 2012).

Looking for links to other research in the references section was also fruitless, since there was only one given in the editor's note and this referred to another magazine article in the Economist (2012). The search for literature on 'self-tracking' yielded many more results: 309 articles in total. However, most focused on kinematics, audio-frequency bridges, polymers and other physics-related topics. There were only three that related to the type of self-tracking that is associated with the practices of self-quantification with which I am concerned (Swan, 2009; Mehta, 2011; Morris and Aguilera, 2012).

Swan (2009) focuses on 'patient-driven healthcare' through three new health services: health social networks, consumer personalised medicine, and most importantly to this research, 'quantified self-tracking'. The aim of her paper is to show how new types of

health services can improve traditional health-care systems. Whilst the paper is commendable for being perhaps the first academic article to engage with self-tracking and self-quantification, it focusses heavily on the 'treating illness' model of healthcare rather than on exploring self-quantification in itself. Further, the paper assumes that self-tracking works, that there are no problems with it, and that the results obtained from it are accurate and easily understood. For my purposes, it is these very assumptions which need to be questioned and contested. How is the information gleaned from self-tracking understood by the self-tracker? Does the technology used make a difference to how someone relates to the metric being tracked? How does a metric come to be regarded as 'accurate'? How does one 'understand' the information?

Similarly, Morris and Aguilera (2012) examine 'mobile, social, and wearable computing' in the context of psychological practices and increasing access to psychotherapy. Whilst the article makes one mention of the 'Quantified Self' and 'optimising wellbeing' (2012: 624), it is largely focussed on how such practices can be integrated with clinical practice. Once again, the article does not question, for example, the values that might be inscribed into the technologies by different actants, or how different modes of representation of the collected data might affect how the metrics being tracked are perceived by the self-tracker and their self-tracking community.

One of the earliest articles written on the subject was written by an Advisor to the Quantified Self in 2011. Mehta himself was an attendee of the very first QS Meetup at Kevin Kelly's house in California. Interestingly, Mehta (2011) shares some links to QS blog posts made on the QS website and categorises them as ranging from serious to silly. It is interesting to see here that, for Mehta, the most serious form of self-quantification given in the list is the tracking of heart rate and meditation, whilst the

comparative exercise benefits of 'dodge ball and lindy hop' are classed as being the most 'silly'. What features may make one form of quantification appear more serious than another? Is there an hierarchy of quantification of the self?

Similar assertions about which self-quantification practices are more 'serious' than others have prevailed in more recent research on self-quantification. For instance, in her paper about apps used to track sexual and reproductive behaviour, Lupton (2015: 443) maintained that apps designed for "medical and health education purposes" were more serious than those that "claimed to calculate the calories burnt during sex to those providing sex jokes or outlining sexual positions for enhanced enjoyment". Again, these claims do not signal for whom these apps may be considered to be more 'serious'. What counts as serious or important for one, may not be the case for another.

The paper mentioned above (Lupton, 2015), is just one of the numerous new articles that have been written on the topic of self-quantification in recent years. The same search for literature on self-tracking and self-quantification that I did three years ago, conducted now, highlighted just how quickly this phenomenon has grown and how much academic research interest it has attracted, too. Over 50 articles were returned in the search query. Of these articles, there were certain themes which seemed to emerge around the research surrounding self-quantification. Ruckenstein and Paktzar (2015) conducted a thematic analysis of the discourse surrounding QS articles published in Wired magazine. They found that there were four dominant themes which emerged from the metaphor of the QS: 'Transparency', 'Optimisation', 'Feedback Loop', and 'Biohacking'. These are interesting themes, however, we have to treat them with caution since Wired magazine may well have conflicting motivations for emphasising

some features of the QS whilst downplaying others, since the two co-editors of the magazine were the founders of the group itself.

From my own review of the literature on self-quantification, I found that one of the biggest themes was not one of those mentioned by Ruckenstein and Paktzar (2015), but that of 'surveillance'. In 2014, a whole special issue was devoted to 'critical approaches to digital health technologies' which engaged with topics such as surveillance, control and the disciplinary power of self-tracking devices (Lupton, 2014).

Lupton (2014) focuses on what she calls the 'neoliberal political orientation' in which she argues that self-quantification technologies and the algorithms present within them normalise certain kinds of behaviour as the status quo, whilst at the same time putting the responsibility and labour of taking care of oneself onto the individual rather than on the state. Further, she argues that people are sometimes 'pushed' into using certain technologies that end up being for the benefit of other actors than themselves - insurance companies encouraging their customers to use fitness and lifestyle monitors in exchange for reductions on their premiums, for example. This is an idea that is picked up by Moore and Robinson (2015), who look at how QS technologies have been implemented by workplaces to encourage, or in some cases even oblige, workers to measure their own productivity. Some have even gone so far as to argue that "technologies of measurement have been shaped into tools to produce legitimacy and authority" (Nafus and Sherman, 2014: 1786).

The idea that there is an underlying neoliberal agenda to self-quantification seems to run through much of the thinking and research that has been thus far done on the topic. Crawford et. al. (2015) highlight how the assumptions that underpin the auto-

analysis of data by the machines used to self-quantify remain unknown. In effect, users are being compared to people based on metrics that are deemed important or 'normal' by the technology, yet which they may not hold as important themselves. It would be interesting here to try and understand the extent to which these assumptions are questioned by the users. How do people make sense of the data that these technologies give to them about themselves?

Lupton (2015: 441) makes sense of the relationship between the technologies and the people using them by employing a sociomaterial perspective on digital health technologies where the technologies are "active participants that shape human bodies and selves as part of heterogenous networks, creating new practices and knowledges". What is implied here with the use of the word 'shaping'? This seems reminiscent of the 'Social Shaping of Technology' line of argument discussed in an earlier section of this chapter. However, that type of reasoning suggested that broader societal and political factors impacted upon new technological developments. And Lupton's argument suggests that technology is 'shaping' the self and body of the user. Might it be more useful to examine whether the technology, selves, and bodies are implicated in the constitution of an altogether new phenomenon?

In her most recent book, Lupton (2016: 3) argues that:

"My initial response to self-tracking was that it was an intriguing way of using forms of information to conduct practices of selfhood and embodiment. This, in itself, is an interesting topic to explore. However, over the period in which I have observed and sought to analyse self tracking, it has become clear that the practice has expanded well beyond the domain of the individual, into a variety of social contexts and uses."

Lupton, therefore, focuses her more recent efforts on the broader social context of self-quantification. Though it is interesting and no doubt imperative to explore how self-tracking has moved into these different realms, it is also important to understand the extent to which this move impacts precisely on those 'practices of selfhood and embodiment' that Lupton mentions.

One way in which the move can be seen as impacting them, is by considering the argument that we are now not only more knowable to ourselves, but we are also more knowable to others: to our friends, colleagues, institutions, and to capitalist markets (Crawford et al., 2015). Do these competing interests affect what data is collected and analysed by the technologies, and how this is done? For example, whilst it might be useful for someone to know their body temperature at certain intervals in the day for whatever reason, this may not be profitable to the companies that produce these technologies and therefore it may be much more difficult to extract this specific type of data. Taking this line of argument even further, we may ask to what extent the interests of profit drive what it is possible to easily know about the self. In much the same way as a supermarket can influence the diet of a region by putting certain foods and items on special offer or by heavily discounting them, how can the interests of technology makers and companies shape what does and what does not get counted as important metrics for the 'self'?

This does seem a rather simplified view of the relationship between the technologies and the people that are using them, and it has been suggested that we take into consideration the embodied, complex ontology of the self rather than imagining the human/machine relationship as a simple material/digital duality (Gardner & Jenkins,

2016). In taking this complex ontology of the self in consideration, Gardner & Jenkins (2016: 4) argue that "on balance, there are few technological experiences with more potential for creating a sense of disembodied alienation than seeing one's physical self portrayed two-dimensionally as data via algorithmic code." (2016: 4). This Heideggerian view of technological alienation (see Heidegger, 1977), however, seems to be refuted by others working in this field who have found the opposite to be the case.

Whilst Ruckenstein's (2014: 76) argument is that self-tracking technologies are responsible for "abstracting physical reactions into data flows and visualisations by following certain conventions and assumptions", she maintains that this only serves to create new kinds of affective ties between people and their selves as seen through data visualisations. In other words, rather than being alienating, these visualisations are said to allow people to connect more with the unseen (unseeable) parts of themselves - it brings them to life and makes them more communicable with others and have a greater connection with themselves. It allows people to 'see' themselves and others (e.g. Coopmans, 2014). How might this work in practice?

A study conducted by Lynch and Cohn (2015) highlights the need to dig a little deeper into what is involved in the processes and practices of self-quantification. They suggest that we must unearth the messiness behind the neat model that is often presented in the form of a technology leading to an output of some kind which then leads to a feedback loop resulting in some behaviour change. Their study is based on a trial called 'Get Moving' which analysed three forms of self-monitoring "to promote physical activity" (Lynch and Cohn, 2015: 3). Their aim in the study was to shift from a "theoretical-psychological orientation to a more socio-material one" by trying to

“foreground participants’ own understandings and experiences of using and engaging with intervention technologies.” More specifically, they adopt Mol and Law’s (2004) suggestion that the body is not a stable or fixed identity, but something that is constantly ‘done’ or achieved.

Lynch and Cohn (2015, 12) conclude that the participant of their study engaged with self-monitoring activities in such different ways that it “may be time to consider jettisoning the term ‘self-monitoring’ altogether”. This is an interesting conclusion to come to, especially when earlier in the study the authors referred to the need of understanding the practices in which the body is done. I argue that rather than jettison the term altogether, a more fruitful exercise might be to analyse these very practices that ‘do’ the body, or in this case, the practices that do the self.

This is the task that I have taken up in this thesis. I have brought together the various bodies of literature that have focussed on technology, the self, and self-quantification, and have set out to understand, in practice, the processes by which the self is ‘done’ in the context of self-quantification. There are therefore two questions which guide this research. First, how do self-quantifying technologies and the self relate? And second, what are the processes through which the self is ‘done’ in the context of self-quantification? In the next chapter I will go through in detail how I set about attempting to answer these questions.

Chapter 3:

Methodology

The Suitability of the Ethnographic Method

From the review of the literature in the previous chapter, it appears that in much of the work already done on trying to understand practices of self-quantification, the researchers do not engage for very long or in much depth with the people who practice self-quantification or in their practices of self-quantification. For example, whilst much of Lupton's work is fascinating and highlights many issues which ought to be thought about in this area, as a reader, I am still left wanting. Wanting to see for myself, or at least experience through the writing, what self-quantifying practices may consist of *in practice*. In theory, issues of surveillance and 'neoliberal' agendas may have a bearing on the self, but in practice, is this what dominates in the QS Meetups, or do these narratives lay at the heart of doing the self? Perhaps this is an unfair critique, since these were not the questions that guided their research. However, they are the

questions that have guided my own research. And in light of that, a critical assessment of the top ten downloaded QS apps, or an investigation of the claims of the top most bought QS technologies will not be enough to understand *how* the self is *done*, in *practice* (e.g. Lupton, 2014, 2015; Lupton and Jutel, 2015).

Other studies that I discussed in the previous chapter embarked upon some form of quasi-experimental methodology (Ruckenstein, 2014, and Gardner and Jenkins, 2016 for example). However, for the purposes of gaining a deeper understanding of the practices, I decided that a snapshot analysis, which is what these experiments heralded, would not provide enough depth. I decided that for this research, where I was investigating the practices of 'doing the self' using self-quantifying technologies, I needed to be present in the spaces where these practices occurred and be a part of the process in some way. I decided that surveys, questionnaires or experiments were not suitable since they did not result in rich, thick descriptions of the phenomenon which can allow for a deeper understanding of what is going on (Geertz, 1972). It is for this reason that the methods that I use for this research are ethnographic.

The ethnographic method, though not without faults, is perhaps one of the only ways to immerse oneself in an organisation or culture in a manner which enables you to understand the world of those being studied from their own perspective. Many of the classical anthropologists such as Malinowski (1922), Evans-Pritchard (1937), Becker (1953) and Goffman (1974) used ethnography as their methodology for precisely these reasons, and they were able to appreciate the world of their natives from an involved, yet distanced, perspective. Whilst the ethnographers mentioned above undertook classic ethnographical research in the sense that they sought to participate in one particular culture with one particular group of people – Malinowski (1922) with the

Trobrianders in the Trobriand Islands, and Evans-Pritchard (1937) with the Nuer in the Southern Sudan, for example – the kind of ethnographic method that I undertook for this research is a slightly different version of the traditional method and is rooted in Science and Technology Studies (STS) sensibilities.

The ethnographic method that I used is less about ‘following the people’ as the ethnographers mentioned above did (see Hess, 2001: 106, although I did do a lot of following the people anyway) and more about following the ‘thing’ and the ‘metaphor’ (see Hess, 2001: 106–108) – the ‘thing’ being self-quantifying technologies and the ‘metaphor’ being ‘doing the self’. This means that although the QS, for example, is an important field-site for this research, it is only interesting insofar as it is a group that engages in the practices of using self-quantifying technologies. Emily Martin (1994) employed a similar type of ethnography in her study where she followed the metaphor of ‘immunity’ and this led her to a number of different sites and perspectives ranging from scientists and experts, to the mass media and the word ‘on the street’. Because there were multiple sites which Martin followed, her method has been termed a ‘multi-sited’ ethnography by George Marcus (1995).

My own research spanned several sites too: the QS group in London, San Francisco, Manchester, Oxford, and Amsterdam; a range of post-Meetup pubs in each of these locations, the QS website where the blogs are published; the QS Vimeo site where the Show&Tell videos are uploaded; various ‘borrowed’ office spaces in London that hosted the ‘self-hacking’ working groups; coffee shops; walks along canals and to tube stations; and numerous Skype windows and FaceTime screens.

As for my choice of using the Quantified Self group to comment on much broader issues, I would like to point to the brilliant investigation of a “knowing subject” by Mialet (2012). In her study, Mialet sets out to understand where the ‘genius’ of Stephen Hawking may reside, given that he is unable to move, or speak, or write without the help of others. She argues that her work is an ethnographic study that

“treats Hawking’s unique situation as a privileged case by which to address larger questions having to do with genius, singularity, identity, subjectivity...and the frontiers of humanity. *Hawking Incorporated*, therefore, is not about Stephen Hawking - that is, it is not about a man, and it is not a biography. It is a work of empirical philosophy”. (Mialet, 2012: 6).

In investigating the Quantified Self, my own research can be similarly described as using a ‘privileged case by which to address larger questions’. As a group that explicitly uses technology in the pursuit of self-knowledge, the Quantified Self provides a unique opportunity to understand the how the self and technology relate, and how the self is done. Larger questions to do with agency, performativity, the role of numbers and visualisations, and achieving constancy, are addressed through this study precisely because, rather than despite the fact that, this group offers such a unique insight into these issues, and of the more general issue of doing the self.

Getting In

One frequently cited difficulty with ethnographic fieldwork is the ‘getting in’ phase (Buchanan, Boddy, and McCalman, 1988). My first experience of the QS started, as I imagine it does for most attendees, on the internet on a website called Meetup.com which is the main way to find out about when and where QS Meetups are happening. The site’s mission is to:

“revitalize local community and help people around the world self-organize. Meetup believes that people can change their personal world, or the whole world, by organising themselves into groups that are powerful enough to make a difference” (Meetup, 2016).

Once signed up, the site allows interested people to become members and press ‘Join us’ to ‘RSVP’ to attend the next QS Meetup.⁸ In my case this was in December 2011. After RSVPing, I instantly received an automated email from ‘Belinda’, referred to in the email as ‘your organiser’, confirming my attendance of the Meetup and giving further details:

“We are encouraging those who step up for a talk to share things from their personal perspective...If personal perspective is not possible...it is advisable to attend at least one Meetup before speaking to get a sense of the group dynamic and the community. This is simply to avoid marketing pitches and using the group as a target market or advertising etc.”

This last line worried me. After all, I *was* using the group as a kind of target market; I was using them as the ‘target market’ of my research. I started to wonder at this point the effect that I would have by becoming a member of this group. Was I interfering in something that I did not understand? I reasoned that my joining the group was as much for my own interest as it was for the research. And that since I was interested in self-quantification in and of itself, that my joining the group was not an issue. In any

⁸ Membership in the London QS is multistage. Someone can technically call themselves a member if they have clicked ‘join’ on the London QS Meetup website. They do not need to have attended any Meetups or even done any ‘self-tracking’. But this is not being a member in the eyes of the group, and certainly does not make one an ‘accepted’ member.

case, I decided that before I went to the first Meetup I should think of the 'line' I should have in case I was asked what I was doing there (Goffman, 1967).⁹

Luckily, I didn't have any of the potential access problems that Howard Parker did in his 'View From the Boys' (1974) since the QS is an open group for anyone who RSVPs to the online Meetup site and I look like I could be any member of the QS group (*"we're very open and welcome anyone who has an interest in self-quantifying and self-tracking"*). However I was still nervous about going to my first Meetup – what if they really were "fitness freaks, technology evangelists, [and] personal-development junkies" (The Economist, 2012) and would think I did not belong because I don't fall into any of these categories and have no knowledge of coding/programming/computers? This fear of being 'found out' is a common fear for anthropologists going into the field. Although the consequences of my being 'found out' wouldn't have been as dangerous as it might have been for Whyte (1943), Becker (1953), Parker (1974), or Winlow et.al. (2001) it still could have spelled the end of my ability to become an accepted member.

When I arrived at the UCL lecture hall where the Meetup was taking place, people were already sat sporadically in the descending chairs facing the screen at the front. Some people were sat together whilst many others were sat in isolated seats – it seemed obvious who knew other people there from the way they were comfortably

⁹ There was a time when I was unsure whether or not I should reveal my full purpose of being at the QS Meetups. At one point I thought I would be fully covert, but then having thought about it, I realised that it would not be an issue in the same way that it might have been an issue for people studying more secretive or exclusive groups. When it came down to it, my 'line' revealed that I was a research student studying the implications of self-tracking. This line is not a lie in any way. However, there were certainly some omissions due to the nature of the study - which was certainly more exploratory at the beginning stages than knowing exactly what features I would be looking for. Further, like Burgess (1985) with his teachers, and Atkinson (1981) with his medical specialists, it is highly likely that although those members of the QS with whom I have had regular contact know my position as a 'QS-interested researcher', others in the group with whom I have little contact may not.

interacting with each other and and who was there for the first time (or perhaps those had not spoken to anyone before).

One of the first things to strike me was the number of people that were there. I was expecting a room full of 60 people (the number that had RSVP'd online), yet I could only count around 20 people. Of this number, there were 16 men and only 4 women (a ratio of 4:1), very few visible minorities (only two, including myself), and mostly older people ranging from being in their late 20s to a few who looked to be beyond 60 years old. I was noticeably different compared to the rest of the group because I fell into the minority category of all of the above: female, visible minority and seemingly the youngest there.

In some groups, being visibly very different to the rest poses a problem for entering the organisation, or may even make it impossible – such was the case with those studies that dealt with Italian slums, marijuana users, delinquent men and bouncers (Becker, 1953; Parker, 1974; Whyte, 1943; Winlow et al., 2001). However, at the Quantified Self, no one looked twice at me as I took my seat on the end of a row. Several minutes or so after the designated start-time, Belinda stood up to introduce the evening.

Belinda began by welcoming everyone, and saying that this was a really informal meeting and that there was no hierarchy in terms of the people that attended. She explained the format of the QS Meetup for those whose first time it was: “it’s a very

loose ‘show and tell’ type of event.¹⁰ Five people will speak and there will be time for questions after each speaker”. She made a point of highlighting that this part of the Meetup was only half of it, and the other, vital, part was going to a nearby pub to ‘carry on the conversation’ in more detail.

Before Belinda started to speak, many people had already taken out smartphones, tablets, computers and notebooks. As it appeared to be the norm for people to jot things down, my own note-taking for the research was unobtrusive. Also, it helped that I did not have to find a corner (Goffman, 1989: 130), or worry about having to write “well after the fact” (Maanen, 1988: 223).

One problem that I did encounter, however, was knowing *what* to note down. I thought about the two options presented by Nicholas Wolfinger (2002): the salience hierarchy and comprehensive note-taking. The former involves noting whatever is most interesting to the observer and the latter involves noting down everything by either having a general list of concerns or by noting things down temporally. I aimed for temporally structured comprehensive note-taking to capture as much as I could. The idea was that I could worry about relevance later, but with so much going on, I inevitably ended up operating a form of a salience hierarchy - filtering out things that seemed to be more interesting and relevant.

¹⁰ The ‘show and tell’ type of event that Belinda referred to is the QS ‘Show&Tell’ model: a specific way of presenting an experience of self quantification. According to the QS Website, “the Quantified Self Show&Tell is a regular meeting for people taking advantage of various kinds of personal tracking to gain more knowledge about themselves. We use the show&tell format you learned as a child: stand up and present something you care about, take questions, and sit down. It is usually very fun. Come share what you are doing, and learn from others” (Wolf, 2015). The capitalisation of the term is often haphazard, as can be seen in the above paragraph where, in the first instance it is capitalised, and then later on it is on. For the rest of this thesis I will refer to it as ‘Show&Tell’, with the capitalisation, so that it is clear that I am referring to the very specific activity practiced within the QS.

As Becker (1986:17) remarked “you have already made many choices when you sit down to write, but you probably don’t know what they are”. I wonder what choices I made, both purposefully and unwittingly, to observe and take notes on? Of course, much of what was deemed relevant was guided by the initial research questions that I had in mind - but I tried to give myself enough leeway to let other unanticipated things take root too.

‘Show&Tell’ at the QS

After Belinda’s introduction, the evening’s Show&Tell speakers were invited to come and present one after the other. The topics ranged from tracking snoring, to measuring productivity, to measuring quality and quantity of light-intake, to tracking the decreasing cognitive abilities of someone consuming alcohol. For the sake of brevity, I include only one excerpt of a Show&Tell, and have purposefully selected the one that I take to be the most typical at a Show&Tell.

A Two Year Walk

Harvey is an American man who appeared to be in his late twenties. He was well-groomed and was wearing a fitted black t-shirt with smart jeans. His physique was noticeably well-defined, with hints of muscle showing through his t-shirt. Harvey told us that he was there to talk about the walk he took to work every day for two years, and as he talked he cycled through a set of very sleek looking slides on the screen behind him. I was intrigued by what was to come, since although this was clearly about tracking something (a walk for two years), the QS links were as yet unclear in

these early stages of my membership. He continued to tell us that by tracking his walk, he was measuring his self-control to avoid junk-food shops and eat more healthily. There was a visible nodding of heads and an audible murmur of understanding from the group - as if the relevance for the Quantified Self was suddenly very clear. To me, it still was not.

I had the impression that members of the Quantified Self were solely interested in quantifying how many steps taken, heart beats per minute, weight, sleep, calories consumed - at least this was the impression left by the numerous news articles I had read about them (Dembosky, 2011; Singer, 2011; The Economist, 2012). Harvey's walk, however, was not at all what I had expected. Harvey was simply tracking a walk to work, and when the rest of the group collectively acknowledged the moment when he mentioned measuring self-control - I was confused. Had I missed what QS was all about?

Later I learned that tracking the walk in itself was unimportant until he mentioned the wider problem he was trying to solve: compulsively overeating. Harvey talked about his own personal experience; his presentation was slick and he showed us his own personal methods of tracking the walk. Harvey had seemingly won over the group, evidenced not least by the fact that there was a flurry of excited questions wanting to know his methods and findings in more detail.

After the five Show&Tells were over, Belinda again took the floor to conclude the evening. She thanked everyone profusely for talking and for showing up. She especially thanked a few select members of the QS for helping her prepare for the event. It was interesting that she went to so much effort to emphasise that she is not the

‘leader’ of the group but just happened to be the one to organise the meetings.¹¹ We are reminded once again to join in at the nearby pub to ‘continue the conversation’ and with this there was applause and people rushed out of their seats to try and catch the people that they wanted to question or meet.

I decided to take the opportunity of a break in the flow of events to go up to Belinda and start a conversation. It was clear that once the Show&Tells were over, so was the opportunity for taking notes. So the conversation below is a mixture of how it happened and how I remember it happened:

“That was really interesting,” I said.

“Thanks, I’m glad you enjoyed it,” beamed Belinda. “You never really know how it’s going to go until all the speakers have finished speaking –sometimes it’s hard to know! This is your first time, right?”

“Yeah, this is my first time; I’ve been interested in self-tracking for a while and so I thought I’d find out what others are doing in this space. I’m Farzana, by the way.” I remember thinking that this surely couldn’t end up being my ‘line’ (Goffman, 1967), it was so vague, and much too easy.

“Oh, nice to meet you, Farzana, I’m Belinda. You’re in the right place then. So what do you do, and what sort of things do you track?”

This was more like it, this was how I had expected to feel when it was time to give my ‘line’: slightly nervous with my heart beating a little faster than usual. “I’m actually doing my MPhil at Cambridge. I’m looking at the implications of self-quantifying, and how we can use it to self-manage mental wellness.”

¹¹ The way that the QS is held together is very interesting. In pre-industrial societies, Emile Durkheim (1997) argued that societies had a collective conscience which held it together and prevented anomie – this was through the similar modes of production exercised by the society which was dependant on mutual cooperation. For Marx (1996), however, social order is gained and maintained through the balance of power, whereby, quite simply, the powerful constrain the weaker. In the QS, social order is explained through a mixture of both Durkheimian and Marxian accounts. Whilst a large part of what keeps the QS together are similar *modi operandi* for self-tracking which are dependent on mutual sharing of new technologies and methods as they are tried out, Belinda, as the *de facto* leader of the group, is able to shape the group by screening and restricting the ‘Show&Tell’ platform.

Belinda looked genuinely interested and curious. I felt genuinely anxious. "That's amazing. So important too," she said. "We must find time to talk about your work in more detail at the pub later. You are coming, aren't you...?"

And with this my first steps towards becoming a member were taken. I had not been 'accepted' yet, by any means, but at least I felt closer to it than simply being signed up online. This actual face-to-face interaction with the 'leader', who was interested in what I had to say, changed my sense of belonging in the group.¹² After our conversation, Belinda scurried away to round-up the rest of the attendees to tell them to go to the pub. Armed with what I perceived to be a successful 'line', I felt confident to go and seek out the other members of the group and introduce myself.

The person that I spoke to last that day was Xavier, an academic entrepreneur interested in the kinds of tracking that could be possible with smart meters. This was his fourth Meetup - and it showed. I walked over to the pub with the others still engaged in conversation with Xavier, and as we got to the bar, he offered to buy me a drink. I took this as another sign that the first impression that I made on the group was positive, or at the very least, not negative or offensive.

A few rounds of drinks later, I needed to leave to get the train back. As I announced my departure, Belinda, Xavier and a few of the others got up to either shake my hand or

¹² Even though at every Meetup, Belinda asserts in her introductions that she is not the 'head' of the group or the 'leader' ("*I'm just someone who does the organising, because someone's got to do it or these Meetups will never happen*"), it is difficult to see her as anything else: Belinda is listed on the London QS Meetup website as the 'founder' of the London QS Meetups; Belinda is the one who screens the people that want to present and sets restrictions on those wanting to present a product or too; Belinda is the one who chooses the locations of the Meetups; and Belinda is the one who organises the 'unconferences' as well as created the Working Group. An interesting parallel can be made here between Belinda and the Nuer tribe of the Southern Sudan. Both the QS tribe and the Nuer tribe are acephalous in that they have no self-proclaimed 'head' or overarching authority to rule them, yet both seem to have figureheads who seem to behave in a way such that they can appear to be the *de facto* heads: Belinda in the case of the LQS and the Leopard-skin Chiefs in the case of the Nuer (Evans-Pritchard, 1940).

hug me as a way of saying bye. Belinda apologised for not having spent enough time with me and promised we would find time at the next Meetup. I walked back to the underground station feeling glad that I went to the pub afterwards. If I had not stayed after the Meetup was over and talked to people at the end, or had I not joined the rest of the attendees at the pub, I would not have progressed in becoming a member at all.

Familiarity and Understanding

The more Meetups I went to, the more familiar and friendly the group became. As I walked into the venues, late as usual because of the difficulty of getting there, Belinda nodded me into the room mid-sentence to acknowledge that I had arrived. Leo, who was another regular member would smile and give me a nod. What once was bizarre and unusual was starting to become very familiar. In Harvey's Show&Tell at my first Meetup, I had to look to others for visual clues as to how to react. Now, I was much more adept at figuring out what would go down as a 'good' QS Show&Tell to the other members, and what wouldn't.

In another Show&Tell for example, Mark told of his experience in tracking light. He appeared to be in his late forties and was wearing a dark grey suit. He told us that he was going to talk about watches that measure the amount and quality of light received. He discussed one watch in particular and spoke at length about its various features. We were informed about the different kinds of light that existed and learned that light is able to shift one's biological clock. Ten minutes had passed and I started to feel myself become impatient at Mark's presentation. It was slow and difficult to see the 'aha' moment that I had been becoming accustomed to expect during these talks.

Impatiently I looked around the room, happy to see equally confused and puzzled faces. I was glad that other people looked lost too - it signalled to me that I was starting to understand the QS dynamics a little more. At this point, Jeremy, one of the eldest members of the QS, interrupted Mark: "I'm struggling to see the point of all of this..."¹³

Becoming 'Native'

By this point I found that I had become so involved with the group and their 'self-quantifying' behaviour that, at times, I found myself behaving first as a 'QSer' then a researcher. This sense of 'going native' was also apparent in Whyte's experience as he came to think of himself as 'one of the gang' (1943). In my personal life, I started to track more and more things with the rationale that it would help me to become more a part of the group. However, this meant that in the later QS Meetups, sometimes it was difficult for me to attend to the details of "what was going on" for the other members of the QS because I was too involved in a QS debate about some of the things that I was tracking.

Rather than being detached as an ethnographer should try to be, I started to become emotionally invested in the group and in the processes of self-quantifying. I should have been noticing peoples' body language and how others would become engaged/

¹³ If someone is attending their first Meetup, they can potentially speed up the acceptance process by doing a Show&Tell. However, this is a double-edged sword. I found that this cannot just be any Show&Tell: if the tone of the talk is wrong – if it is too boring, or corporate, or not really about self-quantification in the same way as the rest of the group see self-quantification then they are most likely be labelled as a bit odd or, indeed, as an outsider (Becker, 1953). This can be seen as happening to Mark as he gave his Show&Tell about the quality of light received by the watch. There was an instantly different vibe in the room as soon as the rest of the group realised that he wasn't talking about something that they thought was relevant enough. And this was evident in the fact that Jeremy audibly voiced his lack of approval. So, claiming membership, *doing* membership and being accepted as a member of the organisation are very different.

dis-engaged in certain conversations but I felt as though I was being drawn to those people who were using the same tracking mechanisms as me and I was *excited* to find new methods of analysis or novel ways of using the technology. It was apparent in that moment that my research had been cast aside “in favour of the joys of participation”(Hammersley and Atkinson, 1995: 110).

To prove to myself that I was still able to be critical about the group, I decided to test my assumptions a little at one of the Meetups. As the Meetup took place, I made a few observations and wrote them down with the intention of checking if they were concurrent with Belinda’s observations at the end. I noted down what I thought was the biggest change from this QS and the very first one that I went to, and I noted down who I thought was the ‘best’ QS speaker of the evening. In my opinion, this particular QS meeting was largely made up of sales-pitch presentations that had snuck in under the guise of personal experience, whereas in the early days it was mostly people doing their own personal quantifying. And in my opinion, the best speaker was a Polish man who meticulously quantified his productivity and to-do lists using Microsoft Excel.

I went up to Belinda at the end and asked her for her own thoughts on how this Meetup differed from the earlier Meetups, and who she thought was the best speaker. As Belinda opened her mouth to respond, I suddenly became very aware that if her answer was different to mine, I could risk putting a mark on my carefully built relationship with her and the group. Her response, however, was:

“More bullshit. These days there are so many people who just don’t get it. But I don’t want to be the one who says ‘you are not allowed to speak’ and ‘you are’, so I don’t know what to do...and for sure, the best speaker today was Ola, don’t you think?”

Ola was the Polish man.

At the point at which I had decided that I had enough data and material, I felt as though I had gone some way in becoming an accepted member of the QS.¹⁴ I had been invited to a smaller 'working group' where select members of the QS were invited to discuss in more depth matters concerning self-quantification. I was regularly getting emails and updates from Belinda about the next events and she would ask me my opinion on matters regarding the group. Others had offered to lend me some of their tracking gadgets to try out as they noted that my student status may not have afforded me the ability to go and buy them all myself. However, was I any closer to knowing what the *essence* of the QS group was? Did I know what the QS meant to the members of the QS? Consider the second part of Belinda's response to my question above:

"I'm so glad you think the same. I was beginning to wonder whether it was just me who thought that and I didn't want to be the one who stopped something that everybody else wanted. This is why we're holding the working group meeting next week. We're going to discuss precisely these things and really put our heads together to figure out what it is that we're doing here."

If Belinda didn't even know, then what I knew was only a construction of Belinda's construction of what the QS was. And as the reader, what you come to understand about the QS through reading this account is your construction, of my construction, of Belinda's construction. This resonates with Geertz's (1973: 14) argument that

¹⁴ Despite my confidence that I had succeeded in becoming an accepted member of the group, this is only as I interpret what it means to be a) accepted, b) a member – both of which may mean different things to me than they do to other members of the group, as well as to outsiders who are not part of the group. I am fully aware that any observations that I made were made through *my* history, *my* selfishness, *my* interests and *my* attention-span. There will undoubtedly be things that were missed, things that were seen but deemed to be unimportant, and things that were not so important but seemed to be critical. These "layer[s] upon layer[s] of self-consciousness" (Latour, 1988b: 170) are remnant in the decisions that I've consciously or unconsciously made: for me, as Latour (1988b) recommends, I am just offering my lived world and writing - in all its messiness (Law, 2004).

“anthropological writings are themselves interpretations, and second and third order ones to boot”, and also puts into question the view that only a native makes first order interpretations as it is their culture: even Belinda is still trying to figure out and negotiate what her group is about.

Data Collection

My first QS Meetup, as I noted earlier, was in London in December 2011. Now, four and a half years later, I have attended 21 of the 35 London Meetups that have since been organised. I attended 3 QS Meetups in Oxford, 1 in Manchester and 1 in San Francisco. At each of the Meetups there are at least 3 Show&Tell presentations, and sometimes more depending on who is available. That means I have seen and taken notes on at least 78 live Show&Tells, and the question and answer sessions that followed. I also retrospectively watched 35 recorded Show&Tell videos to supplement those that I had seen in person. This enabled me to view some of the Show&Tell videos a little more slowly so that I could pause and reflect on them as necessary, take more time with the note-taking, and concentrate much more on the content of the presentation. Viewing them live was a completely different experience as I was able to gauge the ‘mood’ of the room, and see the audiences reactions much more clearly. In total, therefore, I have seen around 113 different Show&Tell presentations.

As well as the QS Meetups and the videos of the Show&Tells, I also interviewed people from the QS group so that I could speak to them in more depth. From the outset, I knew that I was going to interview people from the QS group so that I could have much more targeted conversations with them about their self-quantifying practices.

The decision to study those members of the QS who currently attend Meetups was a deliberate one for both practical and theoretical reasons. Practically, these people were available and easily accessible since they were active on the Meetup site. Theoretically, it made sense to me to interview these people since I knew that I would also see them

Source	Quantity
Meetups	26
London	21
Oxford	3
Manchester	1
San Francisco	1
Show&Tell Presentations	113
Live at Meetups	78
Online Videos	35
Interviews	32
London	24
San Francisco	6
Manchester	2
QS 'Un'conferences	2
London	1
Amsterdam	1

at Meetups. I could therefore observe their behaviours and see if it was congruous with what they told me in the interviews.

Before I approached anyone to ask if I could speak with them, I applied for and obtained approval from the Central University Research Ethics Committee (CUREC) to ensure that my methods met the requirements. In addition to this, I completed the National Institutes of Health's 'Protecting Human Research Participants' online course

to make sure that my research took into consideration the necessary issues to ensure participant safety and privacy. Before every interview, I explained the purpose of my study and obtained permission from the participant to audio-record the sessions so that I could then transcribe them and use them in my analysis. Every person that I spoke to consented to the conversation being recorded and so I did not experience any setbacks there.

To identify the people that I was going to interview, I went onto the QS Meetup website and found the list of QS members - I ordered them so that those people who had been on the site most recently were at the top. If they hadn't visited in over a year then I did not message them - the reason for this was that I wanted to speak to people actively engaged in the practice of self-quantification and this was a good way to filter those people who may have just signed up to see what was going on but not really engaged in it. Of course, there is the possibility that they may have been actively doing self-quantification but just found that the group was not useful to them (and these people may well be interesting to talk to for future studies to see the effect that the group itself has on practices of self-quantification) but for the purposes of my own study, I chose to leave these people out.

Table 1: Sources of data collection

I messaged 12 people a day as this was the daily limit for messaging set by the QS website. I sent everyone very similar messages, and the generic message read as such:

Subject:

Time for Coffee and a Chat?

Message:

Hi Zack,

I'm Farzana Dudhwala and I'm a PhD researcher at the University of Oxford where I'm studying the relationship between self-quantifying technologies and the self.

I've been a member of the Quantified Self Meetup group for around three years now and noticed that you're on the list of members for the London QS group but unfortunately I haven't bumped into you at any of the Meetups. As part of my research, I'm taking the opportunity to speak with as many people as possible to understand their views on self-tracking technologies and their implications for self-improvement. Would you be willing to speak with me for around 45 minutes at some point in the next couple of weeks? I'm based in Oxford but I'm going to be coming to the next QS Meetup in London on the 27th May - do you have any time on the 27th/28th to meet with me?

Failing that, I'm happy to arrange to speak over Skype, Google Hangouts, or FaceTime if that's the best means of speaking with you! Please let me know what would work best for you!

Also, please do feel free to ask any questions or for any more information.

Best,

Farzana

If I had met someone before, however, or wanted to emphasise something that they had done that I thought was interesting then I would change a few lines of the message to reflect this. The subject, though, was always 'Time for a Coffee and a Chat?'. I think this made things a little more informal and was truer to the type of event that was going to take place - I have never been really comfortable with the formal 'structured interview' type scenario - I think it kills rapport and puts both parties a little more on edge. A 'conversation' is much more fluid, and allows the chance for a dialogue to

emerge. It also allows the conversation to enter spaces which I might not have foreseen. My role as a researcher, therefore, is to be always on the lookout and trust my intuition as to whether to allow one particular avenue of conversation to continue or to subtly move the conversation onto another, more relevant, topic. This all, of course, involves decision making on my part - and they will certainly not have all been the right ones, but at some point, the line has to be drawn, and the only thing we have to go on is that gut feeling and the experience and knowledge gained from having read the literature and having done more and more of these 'conversations'.

On the whole, the response was as expected. I sent out around 250 of these emails via the Meetup group website, and received around 50 responses - a response rate of 20%. Of these responses, all but one were positive. The responses generally indicated that the person was happy to meet with me and discuss their experiences of self-quantifying. I eventually spoke with 34 people. Most of these conversations were face to face in London, 6 were done in Berkeley and San Francisco, and 2 in Manchester (See Figure 1 for a breakdown of my data collection). I had to speak to a handful of people over Skype or FaceTime for logistical reasons.¹⁵ The conversations varied in length depending on the time constraints and the willingness of my conversation partners to continue speaking with me: on average they were an hour long each, three were only 30 minutes and two lasted for over two and a half hours.

I asked for permission from all of these participants to audio record the conversations and for permission to use the material in my thesis and for any publication thereafter and each and every participant consented. I was pleasantly surprised at the willingness

¹⁵ I had completely ruptured the Anterior Cruciate Ligament in my right leg and was left immobile for a couple of months after having the reconstructive surgery.

of people to want to speak with me and to share their experiences. However, there was one response which was not so positive and this made me think about the reasons why people respond to invitations for conversations or ‘interviews’ a little more.

Generally if people did not want to meet with me, then they just did not respond to my message - their silence being taken either as message not received, or the recipient was uninterested in the request. However, one person that I got in touch with responded simply to ask me why he should want to meet with me, besides “pure charity”:

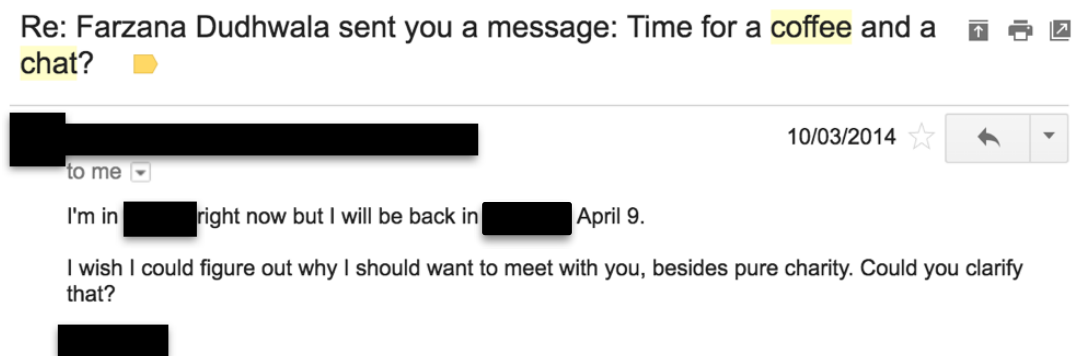


Figure 1: Reply from a member of the Quantified Self

My initial reaction was to ignore the message and not engage with someone who clearly did not want to speak with me. But then it got me thinking precisely about the reasons that someone may want to speak with me at all. What were the incentives, if any, of someone giving up their time to speak with me? What would they be getting out of this? I started to think a little more about this and made a list of the potential upsides and downsides that someone may experience from choosing to participate in this research. After making the list, I decided that I would respond to this QSer after all and send him the list that I had made to see whether it was good enough to convince him to meet with me:

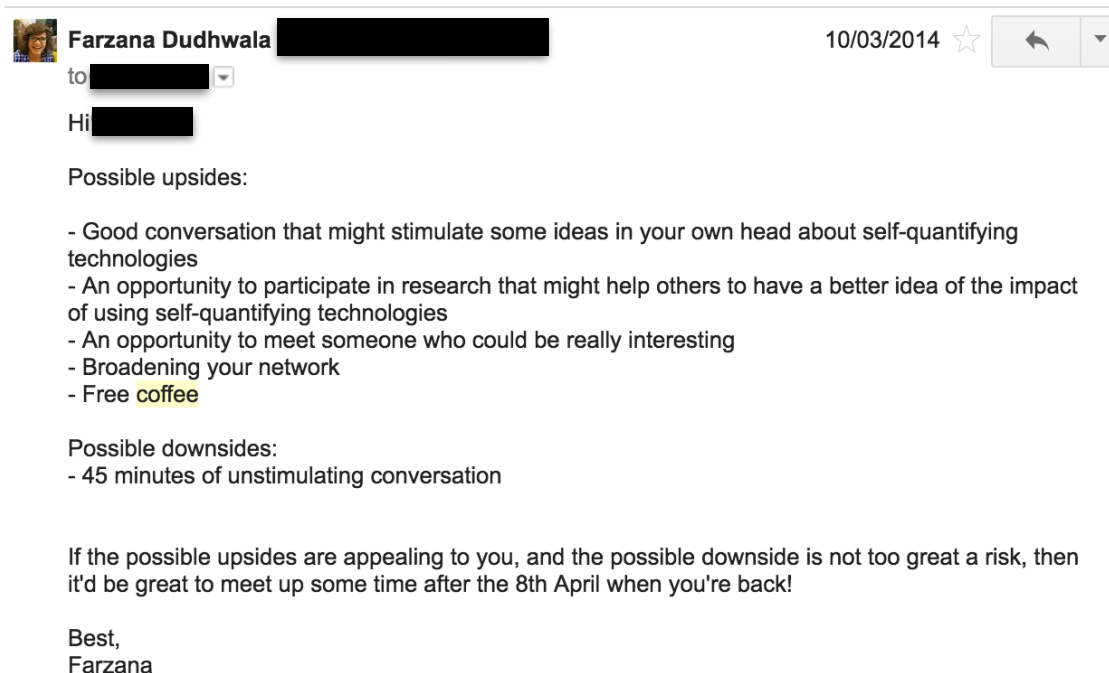


Figure 2: My reply to the email detailing potential upsides and downsides to participating

I thought that my list of upsides was convincing. Other than giving monetary or material incentives (for which I had neither the inclination nor the resources), these were the only things that I could offer. I had thought that especially since a large part of the self-quantifying practice was in talking about self-quantification practices with other interested people, that the opportunity to speak to someone who was clearly interested in this area would have been appealing in and of itself. And, in the end, I thought that if that was not enough, then at the very least I was offering a free cup of coffee!

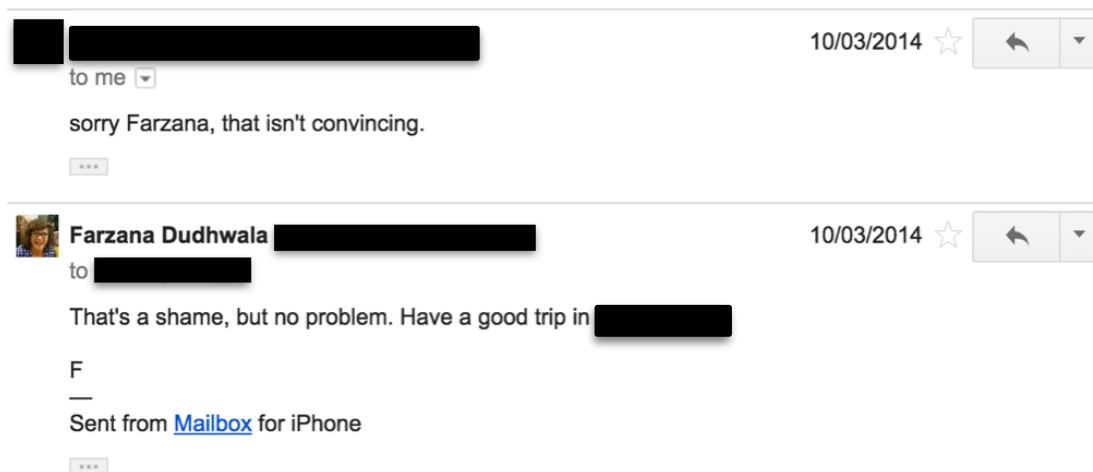


Figure 3: Concluding Responses

It turned out, however, that for this particular QSer, the possible upsides were not enticing enough for him to want to spend 45 minutes conversing with me, and so, unsurprisingly, we never met.

I also attended two 'carefully curated' QS 'unconferences', one in Amsterdam and one in London, a format which, according to the QS website consists in a "carefully controlled balance between order (top-down, lecture-only conferences) and chaos (bottom-up, created-on-the-fly unconference)" (Carmichael, 2011). In practice, this meant that there were some sessions that were scheduled to take place at specific times and in specific rooms, and then other sessions were organised on the fly, with different participants suggesting various topics that they wish to discuss and attracting other interested participants to join their sessions. Similarly to the Meetups that I participated in, most of the participants of the 'un'conferences had notepads, computers, or some note-taking device and were writing at almost every opportunity. I also did the same, and amassed a large quantity of field notes and thoughts from the

events. In the next section I will discuss how I used these fieldnotes and analysed the information that I had gathered.

Data Analysis

Participating in 26 Meetups, watching over 113 Show&Tell presentations, meeting with 32 self-quantifiers, attending 2 'un'conferences, and reading hundreds of blog posts and chats on web forums resulted in a colossal amount of field notes and transcriptions (see Table 1 for a summary of all of my sources of data collection). As discussed above, taking notes at Meetups was the norm and so I amassed pages upon pages of 'real-time' field notes from these events. As mentioned above, I had also asked for and obtained permission to audio record each and every one-on-one conversation that I had, and each of these these were transcribed and then imported into NVivo for Mac - a software designed to help organise qualitative data so that it can be more easily analysed.

I imported all of my source material in the form of transcriptions into the NVivo software and begun the process of coding. According to Lockyer (2004: 137-138), coding is "a systematic way in which to condense extensive data sets into smaller analysable units through the creation of categories and concepts derived from the data". I certainly created a number of categories and concepts that were derived from the data, however, there is no doubt that the codes that I created were in part influenced by the literature that I had already come across and the issues which I thought to be important.

The initial codes were plentiful and unrestricted: any time I came across a phrase or sentence that could be coded, I did. This is perhaps the closest to the 'open coding' suggested by Strauss and Corbin (1990; 1998). This first iteration of coding resulted in 1215 different instances of coding. These codes included nodes such as 'manipulability of number', 'visualisation techniques', 'accuracy of numbers', and 'motivation from seeing graphs'. I then went through these 1215 instances of coding and grouped them together conceptually, so that codes such as 'visualisation techniques' and 'motivation from seeing graphs' were housed under the concept 'visualisation'. This resulted in a total of 130 different conceptual codes. From here, I ranked the conceptual codes to place those with the greatest number of different sources and references at the top so that I could see which concepts were reoccurring the most. Amongst those that were the most frequently coded were 'Number', 'Performativity', 'Self-Awareness', 'Measurement', 'Visualisation', and 'Self-Knowledge'.

This second iteration of what was essentially coding my own coding led to the formation and structure of the four empirical chapters of this research. Viewing these codes alongside the gaps that I found in the literature made it apparent that the concepts of agency, number, visualisation, and how the self is held constant in the midst of all of these, were the areas in which I could make the most important contributions and therefore became the focus of this research.

A final point to be made in this chapter is about how I used the material from my fieldwork. The codes that were created were each created because of some phrase or sentence that was used in either a recorded conversation with me, or during a Show&Tell presentation. These quotes are often used in the thesis to make broader points about the concepts that I have derived from them. In each case, to protect the

privacy of the person making the quote, I have anonymised the names and any identifying features as much possible.

A Reflexive Interlude

There are some broader reflexive points that are worth noting here. My involvement within the QS was a dual one: interested QS member and researcher. People who asked me what I did were told that I was a researcher doing my PhD and that my main research interests were practices of self-quantifying. However, I was also an interested and involved member of the QS. As far as membership went, whatever that really entailed, I seemed to fit the bill: I used self-quantifying technologies on and for myself, I was genuinely interested in practices of self-quantification for the purposed of trying to understand oneself better, I attended QS Meetups and participated in discussions, and I even gave a Show&Tell presentation about my experiences of using a mood tracking app on my iPhone.

I am fairly confident, therefore, that my presence at QS Meetups did not influence the other participants' behaviour. The environment was such that there was a steady flow of people coming and going, each with their own agendas and purposes for being there, and my position as a researcher didn't seem to affect the way people behaved around me. Of course, I cannot be certain of this, as I wasn't able to overtly observe meetings without me actually being there, though this was the sense that I got.

It is also worth noting that only those who are willing to be interviewed can be included in the interview data, however this is why it was imperative that this research set out to investigate the phenomenon of self-quantification through the method of a

multi-sited ethnography. It meant that the views and behaviours of those who were not actively interviewed could also be included via participation and observation in the Meetups and other spaces where the QS met, including virtual ones.

The people whose views I did not capture much at all are those who engage in practices of self-quantification but who might not see that this is what they are doing and therefore do not even know about the QS as a group. The views and practices of these people may certainly inform this research. However, it strikes me that this might be a different project altogether. The purpose of this research is to investigate the practices of self-quantification as they are enacted within and through the QS community and audience, the investigation of 'lone-quantifiers', as interesting as that might be, falls somewhat outside of the scope for the research questions of this thesis.

Finally, I am well aware that the data the I gathered from the interviews reflects the participants' own accounts of their behaviours. There is a human tendency to protect one's own moral identity, however this is the case with any study of this nature, mine being no different. All I can do is present the data that I collected and analysed in a form that is faithful to the source that I got them from. Rather fortunately for me, the methodology of a multi-sited ethnography allowed me to do some sense-checking and validity checking from one site to another - since of the many people that I interviewed, also attended the Meetups, did Show&Tells, and sometimes posted on the QS blog. Whilst it could be the case that all of these public-facing avenues encourage the same protecting of a moral identity and therefore leading to the enactment of a different self, as I will argue in the following chapters, these enactments are as much part of that person as any other, and therefore deserving of analysis nonetheless. In fact it is this very enactment, of the 'quantified self', that I seek to investigate.

Chapter 4:

The Agential Self

Introduction

In Chapter 2 I outlined some of the existing literature regarding technology, the self, and self quantification. I argued that there are substantial gaps in this literature - in particular concerning the relation of technologies to questions of agency, performativity and the explanation of phenomena. I identified and discussed three key questions: do artefacts have politics? (Winner, 1980); do politics have artefacts? (Joerges, 1999); and do artefacts have ambivalence? (Woolgar & Cooper, 1999). Here I noted that the number of explanations for any phenomenon occurring is potentially limitless, whether they be social, political, economic, or other explanations. I argued that for a particular explanation or theory to be formed, certain boundaries are created to stop the analyses from heading into an infinite regression. Therefore, rather than

trying to pinpoint the ‘*true*’ explanation for why a phenomenon occurred, I suggested that it is more important and fruitful to explore how these boundaries are made at all, by whom, and for what purpose.

Also in Chapter 2, I briefly discussed some ideas offered by Karen Barad. Specifically, I argued that her concept of ‘intra-action’ (1996) seemed to be a promising way of trying to understand why some phenomena are backgrounded whilst others foregrounded. Similarly, I suggested that her notion of the ‘agential cut’ offers a potentially useful way of delineating what does and what does not get included in certain explanations and justifications of phenomena. I found that one of the main problems with Barad’s theory was that it remained just that: an abstract *theory* derived from a reading of some esoteric experiments in quantum physics. In theory, the notion of ‘agential cutting’ seems to be a useful way of thinking about the world and about how explanations and phenomena come into being, but how does agential cutting work in practice?

This chapter thus explores how, in practice, boundaries are made around the self in the context of self-quantification - what does or does not get included in the ‘self’? What counts as a ‘self-quantifying technology’? What role do these technologies have in the making/doing of the ‘self’? The chapter begins with accounts of two separate interview moments with two members of the Quantified Self. Following these vignettes, I discuss some of the questions that arise from them, assessing to what extent the concepts of ‘intra-action’ and ‘agential cutting’ are useful in answering these questions. I offer two further vignettes to account for the type of metric being measured, to see what changes in this instance. I then discuss matters of agency and performativity to assess the relationship between the self and technology, and whether it is even possible or useful to make this distinction at all. In any case, I examine what

might count as the 'self' or as a 'self-quantifying technology' and through this examination, discuss how the self is 'done' or 'made'.

Practices of Self Quantification 1

Guessing Glucose Levels

I first met Ben near Bank Underground Station in London, at a coffee shop that I had not been to before. I characteristically arrived a little earlier than the arranged time so that I could scope out the place and find seats that were in a relatively quiet spot. I had been caught out once before where I arrived just on time and then was stuck sat next to the fancy coffee machine which periodically disrupted the flow of the conversation as it hissed and steamed its way through the many cappuccinos and macchiatos of the morning. This coffee shop, suggested by Ben in our email exchange, was very 'hip'. It had an equally fancy coffee machine than the one in the last meeting I had, and so I strategically sat as far from it as I could this time. I took out my iPad and opened the 'Notability' app, found my stylus, set up my dictaphone, and sat patiently waiting for Ben to arrive.

About five minutes after the arranged meeting time, which was 3.30pm, Ben arrived clearly looking as though he had rushed to get there. He apologised for being late before sitting down in the chair next to me. I got Ben a coffee and myself a tea and then begun our conversation about his experiences and thoughts on self-quantification.

Ben was in his early thirties and a keen runner. He was recently diagnosed as having 'type 1 diabetes' - a condition where the pancreas does not produce any insulin, which is the hormone responsible for regulating the amount of glucose in the blood. For

someone who was a keen athlete, being diagnosed with diabetes was a big blow to Ben, who told me that he worried he would not be able to keep up with his running.

He used to go for runs without tracking them or using watches and described himself as a 'happy-go-lucky kind of guy'. Since the diagnosis, however, Ben acquired a blood glucose monitor and measured his blood glucose level several times a day, and also started to use watches and apps on his mobile phone to track his runs.



Figure 4: A Blood Glucose Monitoring Device Available on the Market Today

During the one hour that we spoke, Ben took out his blood glucose monitor and told me that he would guess what his blood glucose level was whilst simultaneously measuring it with his device to see if he could get it right. When telling me how many millimoles per litre (mmol/L) of glucose he thought he had in his blood at that moment he started to describe his day to me. He explained that he had drank one cup of coffee and that he thought that the lunch he'd had a couple of hours earlier was

quite low in carbohydrates. He also told me that he had rushed to meet me as he was running a little late, and so taking all of this into account, he guessed that his blood-glucose level would be about 6.5 mmol/L (he is usually somewhere between 4 mmol/L and 8 mmol/L).

He then took out a little dark green instrument which housed a sharp point at the bottom right hand side corner of it. He released the little point and pricked his finger. Ben licked off the first drop of blood and then squeezed either side of the little cut to force out another drop, which he quickly guided towards the bottom of the device. The display was facing me and so I was the first to see the blood-glucose level indicated on the screen. It showed 7.5 mmol/L.

Relative to where he told me he normally was, this was evidently quite a high reading for him. As he turned the device so that he too could see the reading, he looked a little surprised. He smiled a little and immediately started to justify why his reading was much higher than he thought it was: the low-carb lunch he ate was in a coffee shop and it was always difficult to tell how much extra sugar they put into the food to make it taste better; the coffee he had was in a larger mug than usual; and his walk may not have been as brisk as he thought it was...

Overruling the Recommended 'Recovery Time'

Allowing people to choose where they would like to meet with me for a 'coffee and a chat' meant that I often got to see places that I may never have otherwise come across. For this meeting, Leo had picked a charming little cafe on a boat that was permanently moored on the River Thames. It proved to be very difficult to find and so rather than arriving a little earlier as I usually like to do, I arrived just as I saw Leo walking in.

Luckily the little boat-cafe was not busy mid-morning on a Tuesday and so we were able to find a relatively quiet spot. As the barista took our orders, I took out my usual paraphernalia: iPad, stylus, and dictaphone.

I had known Leo as a 'QSer' for at least two years at this point - he was one of the first people I met at my first QS Meetup. Leo told me that without knowing the name 'The Quantified Self' he had already been tracking himself for many years - accumulating over 8 years worth of weight data. He said that he would also describe himself as a 'gadget lover' and that he had a disposable income which allowed him to buy and try out a number of different devices. The latest device he had bought was a Garmin sports watch - a running watch that measures speed, distance, route, and time of the users run by using the in-built GPS chip, as well as heart rate by connecting to a chest strap.



Figure 5: A Garmin watch showing recommended 'Recovery Time'

Leo was pretty excited about this new watch - he told me that it was the best he's ever had. "One of the cool features it has" he tells me, "so six minutes into any run, it'll be

measuring my heart rate variation, right? So it'll determine, it'll pump up, and I'll look down and it'll say, you know, recovery level is good, excellent, or whatever. It'll basically say you, you know, mostly seem to be restored. And you can go for it." At the end of a run, the watch gives an estimate for how long he should wait before going on his next run.

In general, Leo said that his watch would tell him to wait between 6 hours to 36 hours between runs, which he thought was reasonable. A few days ago, however, it told him to wait a significantly longer time. "I ran six and a half miles - which is not a lot for me - just a week ago, and it said to sit down and rest for three days. Like, *THREE DAYS*? I'm like, what? But the thing is that actually the watch had said that, and it did coincide with how I felt. I was just wiped. Like I'm totally missing a gear". I asked him whether he actually waited the recommended three days before going on his next run, and he admitted that he had been for a run just two days after that run.

I asked him why he disregarded the advice given to him by his watch. He reasoned that "I use the watch as a rough guide - what I'm trying to do right now is gauge it against my mental feelings - does the reading fit with how I feel? And so far it's been pretty good - and so as I start to trust it more as a guide, I might give it more weighting - but I'll never probably give it absolute weighting - and what it's not saying is that for the next three days stay at home, don't go out, don't go to work, just that I should take it easy..." In other words, he told me that the watch was best used as a heuristic rather than treated as gospel.

Two Differing Responses

These vignettes depict two practices of self-quantification. In the first, we encounter Ben, a recently diagnosed diabetic who went from being a 'happy-go-lucky' guy who didn't measure or track his runs, to now using a blood glucose monitor several times a day as well as using an app to track his runs. In the second vignette we meet Leo, a keen self-quantifier who says he has been tracking himself since before the 'Quantified Self' was formed as an established group. In both instances, a technology is used to quantify some aspect of the self (blood glucose levels for Ben, and running activity for Leo), and some output is received (mmol/L of glucose in blood, and running metrics coupled with estimated rest period).

Interestingly, the consequent reactions to the outputs of the technology were very different in both cases. For Ben, when the blood glucose monitor revealed that his blood glucose level was particularly high relative to his normal range, and higher than his own guess about what it was, his narrative account of his day rapidly changed. It appeared as though he felt the need to justify why it could have been the case that his meal may have contained more sugar than he thought, or how his walk may not been as brisk as he had originally indicated, and so on. Of course, there was nothing stopping him from sticking to his original narrative, but it seemed as though the reading on the device made his original assertions less credible to himself, or at the very least compelled him to revise certain aspects of his narrative. In a sense, Ben felt the need to justify himself so that his explanation of events and the reading on the device corroborated each other.

This has some parallels with Festinger's (1957) concept of 'cognitive dissonance' - the term used to describe the stress or anxiety felt by someone who holds two or more

contradictory beliefs, or when some information is discovered which opposes a pre-existing belief. In this case, the blood glucose monitor opposed the narrative account that he had described to me which led to the belief or feeling that his blood glucose level was much lower than the monitor showed. Perhaps 'technological dissonance' might be a more apt term to use here - where the self-quantifying technology has given some information or data that contradicts what one feels or thinks one knows about oneself.

However, the reading on Leo's device led to a different type of reaction by him. He looked at the reading on the watch and disregarded the advice that it gave him to rest for three days. For Leo, the watch was more of a rough guide to be used to check in with how he was feeling and then decide how much weighting to give to the advice. He even admitted that he felt as though he was 'totally missing a gear', yet this was not enough for him to have taken the recommended full three days off from running. So why in one instance of self-quantification did Ben listen to what the self-quantifying technology told him, whereas in the other instance, Leo ignored it?

There are a number of possible explanations. One is that Leo has less trust in the self-quantifying technologies and therefore only uses them as a heuristic rather than as something by which he ought to be commanded. But this explanation is somewhat unsatisfactory - Leo is a self-proclaimed gadget lover and he had been heavily praising this Garmin Watch as one of the best he has had. It seems unlikely that the reason is to do with scepticism of the technology for Leo. Another explanation could be that the *kind* of information that is given by two devices is different, and that this could be causing the differences in response.

The blood glucose monitor used by Ben tests the chemicals of the blood to produce a measure of how much glucose is present - if this level is too high or too low it risks hypoglycaemia or hyperglycaemia which could prove fatal. This is different to a chest strap monitoring the user's heart-rate and telling them to rest for a few days. Although there is a possibility that the user may get injured from over-training - the consequences seem much more severe in the former case than in the latter. Is there something, then, about the *type* of measurement that indicates to what extent the output of a self-quantification may lead to action or not? Let's take a look at two more practices of self-quantification which will help to begin to unpick this question.

Practices of Self Quantification 2

Not Enough Calories Burned

Tamara had generously given up time on her lunch break to meet with me near her offices in Soho in London. She worked for a social media company and had recently become interested in self-quantification. Alongside tracking her finances through readily available data from her debit card expenditure and Oyster card usage (a contactless prepaid card used for public transport in London), she had recently downloaded the 'Map My Ride' application on her mobile phone. This app is designed for cyclists and measures and records the distance cycled, speed travelled, location/route, and calories burned during the ride.

Tamara cycles to work every day. For a long time, she felt as though her ride to work required substantial effort and she commended herself for choosing to cycle rather than taking public transport each day. When she got into work, Tamara would routinely grab a cup of coffee from the kitchen, along with a morning snack - often a

croissant or a pastry - which she consumed happily without guilt since she had cycled into work in the morning and thought she had earned a treat.



Figure 6: Screenshot of the Map My Ride application

As her curiosity increased with her newfound interest in self-quantification, Tamara began to track her commute to work and back with the Map My Ride app. After seeing the post-ride data on the app, she told me that being able to see the number of calories burned with each ride actually made her feel worse about her ride. She told me that she had previously felt really good about her rides, but when she saw that she had barely burned any calories in relation to the amount of effort she had perceived herself exerting, it was disappointing.

Furthermore, her feeling of disappointment was made even worse when she started to use the 'food logging' feature of the app - which allows the user to input the food they consume to be told an estimate of the amount of calories in the food. Comparing the number of calories burned in her morning cycle to the number of calories in a

croissant/pastry alerted her to the fact that the morning cycle certainly “did not justify” her being able to enjoy her morning snack.

An Improved VO2 Max

Samuel was one of the oldest people that I had come across who was involved in practices of Self Quantification. At the time that we met, for over two and half hours in the dining area of the Marriott Hotel at Kings Cross Station in London, Samuel was 72 years old. One of the first things he told me was that he became interested in preventative health in 2006, and he spent a lot of time wondering how he could live longer and in good health. His aim was to “get to a hundred, be physically fit, mentally fit, sexually fit, and actively contribute in all sorts of ways”.

Samuel told me that he became concerned when, 8 years ago, he had begun to present with symptoms that indicated early ageing: he had high blood pressure and was carrying excess weight. Since then, he started running experiments on himself to understand the lifestyle and diet factors that might reverse these signs of ageing and contribute to longevity. He started to take supplements, restricted his calorie intake and exercised much more rigorously. He proudly proclaimed that he lost 22kg during this time and managed to reduce his blood pressure - he said that he had more energy now than ever, feeling physically and mentally like a 30 year old.

For Samuel, even more impressive than his weight loss and reduced blood pressure were the gains he saw in his fitness levels, which he assessed primarily by looking at his VO2 max (VO2 max is a measure of the maximum volume of oxygen that a person can use. It is measured in millilitres per kg of body weight per minute - the higher the

VO2 max value, the more intensely the person can exercise). When he first measured his VO2 max level it was 23 ml/kg/min. He told me at this point that a young athlete would have a VO2 max in the region of 60 ml/kg/min or more.



Figure 7: A generic 'breath training' device

Alongside taking more care of his diet and exercise regime, Samuel also bought a device which would 'train' the muscles that allowed him to breathe to be stronger and more efficient. Quite simply, it was a device that he had to breathe into through various levels of resistance to increase the amount of oxygen he could take in with each breath. After a few years of his new regime of supplements, diet, exercise and breathing training, Samuel increased his VO2 max to over 30 ml/kg/min - something he told me that he was very proud of.

Here we have two more self-quantification practices. The first depicting someone who began to track her commute into work each day, and the second depicting someone experimenting on himself to increase longevity and health. The experience of Tamara's bicycle ride into work raises some important questions about the role of technology in

the 'making' or 'doing' of the self. Before Tamara looks at the data on her MapMyRide app, her experience of the ride is very different in comparison to her experience of the ride after she has looked at it. Before looking at the data on the app, she viewed her ride as a positive ride which made her active in the morning and after which she was happy to have her morning coffee and snack. However, looking at the data on her app, her experience of her ride became less positive. She began to compare the level of exertion she experienced with what she considered to be a relatively low number of calories burned, which she then compared to the number of calories in her daily croissant. Having seen that the number of calories in the croissant was still more than the number of calories she had expended from the ride, she was not as pleased with the ride. Overall, she argued, her ride *without* the app was experienced much more positively than her ride *with* the app.

One of Samuel's biggest senses of achievement of his self-quantification practices is increasing his VO2 max from 23 ml/kg/min to over 30 ml/kg/min. This is a good example to highlight the point that it is much more fruitful to consider the practice of self quantification as being more productive than it is representative. In once sense, it could be argued that it is easier to judge feeling good about a particular bike ride (the rider may have felt particularly fast, strong, fit, exerted, or worked out), than it is to 'feel' a 7 ml/kg/min increase in VO2 max. In this sense, the technologies used to measure VO2 max are a fundamental part of the VO2 max, since without it Samuel has very little, if any, indicator of a 7 ml/kg/min increase.

The technology practices therefore seem to have an important bearing on Samuel as a self that has an increased VO2 max, and therefore a self who is succeeding on his quest for longevity and good health. Perhaps these technology practices can even be said to

perform this aspect of Samuel. What might it mean to argue that the practice self-quantification is 'performative'?

The Performative Nature of Self-Quantification

There are many variations and interpretations of 'performativity' in the literature. Often, the notion of performativity is thought of in the context of questions such as "can saying make it so?" (Austin, 1962: 7). Austin (1962: 12) argued that there are "some cases...in which to say something is to do something; or in which by saying or in saying something we are doing something". For example, Austin maintains that uttering the words 'I do' at a wedding is actively performing something in that moment: it is performing the marriage of the two people who say them. However, speech acts are not the only instances where performativity is important. Others have appropriated their own definitions of the concept in a number of different domains.

Goffman's (1959) notion of performativity, for example, involves distinguishing between a frontstage and a backstage 'performance' of the self, by the self. The latter is thought to be the 'true' self, whereas the former is the 'performance' or the role played according to social conventions and norms. This notion of performativity is based on a literal dramaturgical reading of the term - using metaphors from theatre to explain its workings. However, the performativity that I am concerned with here focuses on the more recent instantiations of the term which move away from the dramaturgical/representational aspect into the ontological sphere.

Butler (1993; 2010; 2013), for instance, clearly distinguishes her notion of performativity from Goffman's. The difference being that for Goffman, the self has a stable interiority

(the 'backstage' self) and the performance is a set of external roles played by this self with regards to social norms and expectations. For Butler, however, there is no stable interior 'self' (2013). In fact, the very idea of interiority is itself performed and regulated. This means that the fact that something appears to be a given or seen as a pre-existing interiority is precisely the result of it being repeatedly performed and reified as such. Therefore, to say that something is performatively constituted is to say that it does not have a stable core prior to the behaviours and expressions that bring it into being.

However, to maintain something as an interiority in the way that Butler outlines, there is a sense in which, as Law and Singleton (2000) argue, performances must rely on previous performances - either to repeat/reify them, or perhaps to modify them and suggest alternatives. How are these performances (or performances of previous performances) done? Law and Singleton's version of performativity rests upon the assumption of a number of heterogeneous elements which 'assemble' together to produce certain consequences (the performance).

In the context of self-quantification this would mean an assemblage of entities such as, in the case of Ben for example, the blood glucose monitor, sugar, blood, food, fingers, a 'normal' range of mmol/L, etc. The coming together of these entities, at least according to Law and Singleton's ideas, performs Ben's state of having a higher blood sugar level than both what he had intuited and relative to his normal range. However, this analysis of the practice of self-quantification still leaves too many questions unanswered. Why these specific entities? How do they come together? Why was the coffee table that Ben and I were sat at not relevant, or the lighting in the cafe, or the colour of my jumper? In other words, it could be otherwise! Further, could it be that we

have jumped the gun in assuming that the 'entities' exist in and of themselves in that particular form - what performances had to be performed to get to a 'blood glucose monitor' in the first place, for example? The problem with Law and Singleton's version of performativity, therefore, is first that it doesn't account for how particular entities are 'chosen' for assemblage, and second, it is implied that these heterogeneous entities pre-exist the attempts to assemble them - that they are the cause for some consequential action.

From a Baradian reading of performance, however, these heterogeneous assemblages are not a 'given'. They are not pre-existing jigsaw shapes just waiting to be put together. This is similar to Butler's (2013) argument that there is no pre-existing stable core to gender. However, the two theorists depart on their conceptions of what 'matters'. Butler relies heavily, if not solely, on discursive practices as performing all else, neglecting to engage with the role of materiality. For Barad, discursive practices are only one part of performativity - both matter and discourse are invoked in a performance at the same time. In the terms of one of Barad's (2007: 132) famous slogans: "the only thing that doesn't seem to matter anymore is matter".

Another point of contention with Law and Singleton's (2000) version of performativity is that their use of the term assemblage implies a distinction between those who are doing the assembling and the entities that are being assembled. As argued in the previous chapter, in the context of self-quantification it has been suggested that we take into consideration the embodied, complex ontology of the self rather than imagining the human/machine, assembler/assemblage relationship as a simple material/digital duality (Gardner & Jenkins, 2016). One way to overcome this problem, would be to take on board Callon's (2006) suggestion to use Deleuze and Guattari's (1998) offering

of the French word '*agencement*'. *Agencement* has the same root as agency and refers to the capacity of arrangements to act differently depending on their configuration(s). This concept of *agencement* is much closer to a Baradian reading of agency.

For Barad, everything/anything has the *potential* for agency. Furthermore, she argues that it makes no sense to assume that there is a distinction between human and material agency because that would presume that either had certain qualities about them which preceded interaction with them. For Barad, "there are no such independently existing objects with inherent characteristics" (2003: 816). For this reason, Barad argues that the representationalist account of the world, where, for example, scientists purport to merely *represent* the reality that is already out there, cannot hold. Barad describes her way of looking at the world as an 'agential realist ontology' and arrives at this theory through the use of a 'diffractive methodology' in which she uses the insights of quantum physics to think about the nature of the world. Her theory is largely rooted in the infamous debates surrounding the 'double slit experiments' in quantum physics between Albert Einstein and Niels Bohr (Einstein, Podolsky and Rosen, 1935; Bohr, 1935).

A Short Foray into Quantum Mechanics: The Double-Slit Experiments¹⁶

In the early nineteenth century, the double-slit experiment was designed to determine whether a given entity exhibits a 'particle-like' pattern or a 'wave-like' pattern when passing through a piece of apparatus with two slits in it. The experiment was designed

¹⁶ The double slit experiments are not as straightforward as this brief summary may suggest. Further, it's reception as a foundation on which to build a new 'ethico-onto-epistemological' theory (Barad 2012b) was not entirely positive and without question either. For a messier, yet more comprehensive version of the quantum entanglements and the questions raised about it's suitability as the basis on which to form a new STS theory, see appendix A.

so that the projection of the entity that is fired through it can be seen on a screen. If the entity is a particle, then it can only enter through one of the two slits and the projection on the screen will be directly opposite the slit that it passed through. This is because the nature of a particle is such that it can only occupy a certain space at a certain time - it cannot be in two places at once. If, however, the entity is wave-like, then it is not bound by space and time since it travels in such a way that it can occupy a greater space through time. Therefore the projection will reveal an overlapping concentric wave-like pattern.

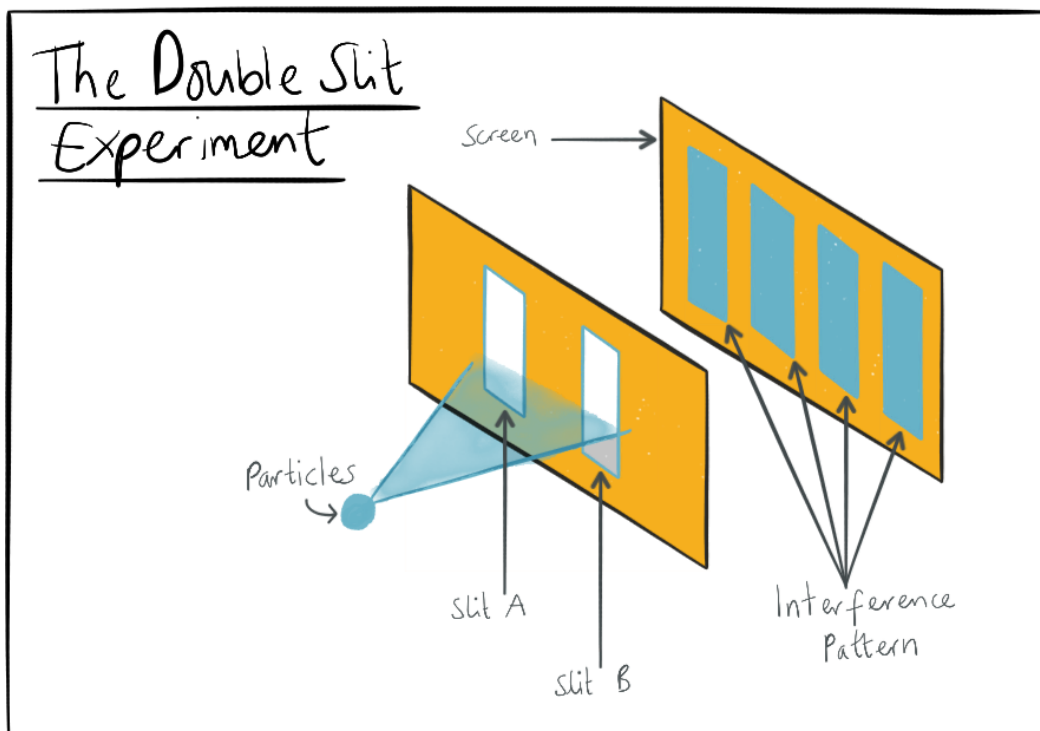


Figure 8: The double-slit experiment showing a particle emitting a wave/diffraction pattern

When doing this experiment with an electron, one would expect (given the commonly held view that an electron is a particle rather than a wave) that the projections would be in two discrete places opposite the two slits. However, the experiments actually showed that firing electrons through the slits resulted in a projection that showed an

overlapping concentric wave-pattern. To understand how this is possible, Einstein devised an experiment to observe which slit the particles went through. He put a spring on one of the slits which would account for movement if the entity went through it. Einstein argued that if it went through just one slit (like a particle) but had a diffraction/wave pattern (like a wave) then an inherent contradiction in quantum physics would be unearthed and we would therefore need a new way to think about how to explain the entities in the world.

However, Bohr (the physicist at the heart of Barad's work) argued that Einstein was mistaken in his assumptions. Bohr argued that in adding the spring, Einstein changed the *apparatus* that was fundamental in the production of both the entity and its projection. In other words, he argued that the results of any experiment are the entanglement of the apparatus used and the observed object. In effect, "the very nature of the entity – its ontology – changes (or rather becomes differently determinate) depending on the experimental apparatus used to determine its nature" (Barad, 2012a: 42). This interpretation of events has since become known as the 'Copenhagen Interpretation'.

Heisenberg was dissatisfied with Bohr's interpretation and argued that the reason that the pattern changes from a wave to a particle pattern is because the change made to the apparatus is intervening in the experiment and thus disturbing the entity. This, he argued, constrains what we can know about the entity, because each measurement disturbs what it is that is being measured - so trying to measure the disturbance includes within it its own disturbance and so on. Since it would always be uncertain what the precise disturbance was, he called this the 'uncertainty principle'.

Yet again, Bohr was unconvinced. He argued that Heisenberg was mistaken in characterising the events as being to do with uncertainty. Instead, Bohr argued that the issue is one of 'determinacy'. When we make a measurement, he maintained, it is not that we disturb the 'true thing' that is being measured and so that our knowledge is consequently uncertain with regards to the 'objective truth'. It is that *there are no such 'true things' to begin with*. There is no measurement-independent 'stuff' waiting for the right experiment to uncover it. The interaction of the apparatuses and the conditions of the experiment *are* the things-in-being. They do not exist outside of this.

My point is not to discuss these quantum entanglements in terms of their impact on scientific thinking, but because of the important philosophical implications of the debates and the various justifications used by each side of the argument. And it is the philosophical implications of Bohr's account in particular that is the most useful for us since he effectively reconceptualises the ontological nature of the world in his explanations of what was going on in the double-slit experiments.

For Bohr, the real issue is that things are 'indeterminate': there are no things before the measurement, it is the very act of measurement that produces determinate boundaries. So, whilst Heisenberg is dealing with what he considers to be an *epistemological* problem - that of *how* to know things, Bohr is working with an *ontological* problem - of *what* it is we are trying to know in the first place.

Following this, Barad maintains that there is no world already 'out there', and it is *made* or only *becomes* in the moment where 'intra-action' occurs: "the world is intra-activity in its differential mattering" (Barad, 2003: 817). 'Intra-action' is a term used to refer to a simultaneously reciprocal action between different entities, and it is only in these

moments that specific things may become apparent. These constantly ongoing interactions are termed ‘material discursive practices’ and it is through these practices that certain boundaries are enacted and performed.

This world-view has certain implications for STS, and consequently for an analysis of the role of self-quantifying technologies in creating boundaries around the self. Subscribing to an agential realist ontology would lead one to the view that a given phenomenon is not the ‘result’ of experiments or research. The experiments or the research process *is/becomes* the phenomenon itself. That is, they play a crucial role in its constitution as a phenomenon which is only *that* phenomenon with *those* particular experiments or research process. What does this mean for the role of self-quantifying technologies in the production of a quantified self? To what extent does the very act of self-quantification produce a boundary around the self, and in turn perform the self?

Let us think about this in relation to the vignettes above. Tamara’s ride into work was a completely different ride altogether when she quantified it, than that when she didn’t quantify it. Before the addition of the MapMyRun app, the bike ride was an effortful ride which justified feelings of accomplishment and the eating of a croissant. After it had been quantified using the app, however, it became a disappointing ride which failed to meet expectations regarding calories burned vis-a-vis perceived effort. The whole phenomenon was a different entity here altogether.

Similarly, we can in some respects see how, at least for Ben, the use of the blood-glucose monitor *produced* a certain type of self rather than merely describing it. Prior to measuring his blood-glucose level with the monitor, we could say that he was “Ben-with-relatively-normal-blood-glucose-levels”, or “Ben-who-can-intuit-his-own-blood-

glucose-level” or “Ben-who-is-self-aware”. However, the use of the monitor shifts this somewhat. With the reading on the device he becomes “Ben-with-relatively-high-blood-glucose-levels” or “Ben-who-is-unaware-of-his-own-blood-glucose-levels” or “Ben-who-is-not-self-aware”, for example. But how are certain aspects decided as being *the* relevant ones if there exist a number of potential other aspects that could be focused on? Once again, it seems as though ‘it could be otherwise’, yet how does one decide amongst these potential others? Is this even possible?

In the next part of this chapter I discuss intra-action with regards to the self. In particular, I discuss how the notion of ‘agential cutting’ is a useful way in which to understand how boundaries are made around the self, and potentially explain how certain ‘otherwise’s’ are chosen over others.

Self Intra-action

Whilst the theory of agential realism does not explicitly focus on the ‘self’, Barad’s ‘On Touching – The Inhuman That Therefore I Am’ (2013) describes the discovery of the electron in the nineteenth century and then uses this to ‘queer’ the very notion of the ‘self’. Her ideas on the self have important implications for thinking about the concept of the ‘agential self’ in the context of using self-quantifying technologies.

For many, the perception of touch involves some sort of ‘contact’ (the hands touching/ being in contact with another’s face, or the touch/contact involved in holding a pen). A scientific explanation of touching, however, turns that notion on its head. Barad (2013) explains that when ‘touching’ something, you are never really *in contact* with that thing. In fact, the electrons in the atoms of your fingers are actually electromagnetically

repulsing the electrons in the atoms of the pen. The electrons can never, and will never, come into direct contact with one another – it is physically impossible. This allows Barad provocatively to assert that “repulsion is at the core of attraction” (2013: 209).

What does this have to do with the nature of the self? Physically, the electron is a ‘single point carrying a negative charge’. Since the electron is a point particle and therefore cannot have a radius (since it is zero dimensional) then its interaction with its surroundings is infinite. Further, these surroundings are created by its own electromagnetic field through the exchange of a virtual photon with itself and so its interaction with itself is also infinite. This also makes it very difficult to trace the separation between the electron and its own self-created environment (in quantum physics, this environment is known as the ‘void’ and the electron is the ‘particle’).

Further, because the interaction of the electron with its surroundings is theoretically infinite (physicists refer to this as ‘an infinite sum over all possibilities’), and the electron, in creating and then absorbing its own photon, is intra-acting with itself, it follows that the possibilities for self-intra-action in general are also infinite! Barad (2013: 213) puts it a little more articulately: “hence, self-touching is an encounter with the alterity of the self. Matter is an enfolding, an involution, it cannot help touching itself, and in this self-touching it comes into contact with the infinite alterity that it is”.

Here we see the transition from pure particle physics to (moral) natural philosophy. Barad shares with us the view of one of the key authors in the Quantum Field Theory, Richard Feynman. He argues that “instead of going directly from one point to another, the electron goes along for a little while and suddenly emits a photon: then (horrors!) it

absorbs its own photon. Perhaps there's something 'immoral' about that, but the electron does it!" (1985: 115–16).

So, for Barad, the self intra-acts with itself and this *self-intra-action* indicates that the very notion of identity can be 'queered'. What, then, is the 'self' according to Barad's argument? If, as she tells us, the quantum of an electromagnetic field is a photon, and the quantum of a gravitational field is a graviton, then what is the quantum of the self? Is the comparison even possible? This is a question that Barad is puzzled by too. Through her work on amoeba colonies (slime molds which seamlessly morph from single cell organisms into aggregate complex organisms with their own immune and nervous systems) she questions the very definition of what counts and what does not count as an 'individual' (Barad, 2012a). Are the amoeba colonies an aggregate of individuals or do they become one single entity? In the same vein, is the self an aggregate of, for example, individual emotions, chemical responses, self-quantifying technologies, and negative charges which never actually come into contact, or is it a single and cohesive entity?

If the former, then the 'self' is a perversion simply in its 'being' (at least according to those who ally themselves to Feynman's line of thought) since it is the aggregate of many individual selves touching or intra-acting with themselves. The self here both projects and envelops itself at the same time. Self-quantifying technologies, therefore, are at once *without* and *within* the self. They are *without* in the sense that these are 'external' technologies quantifying the self and indicating to it what that self is. However they are also *within* in the sense that it is the self that is using the technologies to quantify itself and interpreting what it is being told. Therefore, the self is

simultaneously 'being done to' and 'doing' in the same way that the electron is absorbing the very photon that it itself emits.

Although the case of the electron as described by Barad has built into it the possibility for an infinite number of potentialities and alterities, she does not fully explain why one particular potentiality comes into being rather than another. *That* intra-action happens is explained in great detail by Barad – but why it happens in any one particular formulation over another is less clear. Her concept of 'agential cutting' is Barad's attempt to address this problem.

Boundary Making Through Agential Cutting

The notion of an *agential cut* is an intriguing aspect of Barad's theory of *Agential Realism*, especially with regards to understanding the self. An *agential cut* is the temporary separation of certain phenomena. That is, agential cutting is the making of a temporary boundary between phenomena so that they can be studied, communicated, enacted or understood. An *agential cut* momentarily defocuses everything except for the phenomenon in question. Without these *agential cuts*, everything is enmeshed in an intertwined web of relational ontology where nothing can be differentiated from, or conceived of, without anything else. Thus, according to Barad, making an *agential cut* allows certain phenomena to be momentarily distinguished and performed.

In a sense, the concept of an *agential cut* is very similar to Woolgar and Pawluch's (1985) notion of *ontological gerrymandering*. Like agential cutting, *ontological gerrymandering* is the notion that there is a temporary 'backgrounding' of certain phenomena whilst other phenomena that are being problematised at that moment are

brought to the fore. However, the two ideas diverge in their conception of what remains, if anything, in the 'background'. Barad argues that the background does not already exist, just waiting to be foregrounded at the right time. Within *ontological gerrymandering* it is implied that there is a choice of which phenomena to background and which to focus on, whilst Barad maintains that the phenomena only exist in that moment of focus - there does not exist a number of different phenomena from which to choose. They are made in the very act of agential cutting. And disappear when that cut is no longer relevant.

Barad also argues that "agential cuts do not mark some absolute separation but a cutting together/apart – a "'holding together' of the disparate itself..." (Barad, 2012a: 46). So as well as defocusing some things, it brings and holds together others. The *agential cut* can thus be seen as the making of a boundary, which requires a separation of some things to enact the holding together of others.

According to this idea, when sharing certain 'knowledge' about something, we are sharing with others the specific *agential cut* that we have made involving particular *apparatuses* and *discourse*. In the context of people using self-quantifying technologies, how are agential cuts made when drawing a boundary around what the 'self' encompasses? Is it possible to know other peoples' agential cuts - to know what they have separated and what they are trying to hold together?

The self that concerns this research is the self that is quantified using some sort of self-quantifying technology. That is the crucial element in what does, and what does not, get included in the agential cut, or to put it more broadly, in the boundary around the self. What then counts as a 'self-quantifying technology' to the people that are using it?

Working backwards from Barad's notion of agential cutting we find that agential cutting is the result of an intra-action, which itself is the production of the inextricable coming together of what she terms 'discourse' and 'apparatus' (see Figure 9).

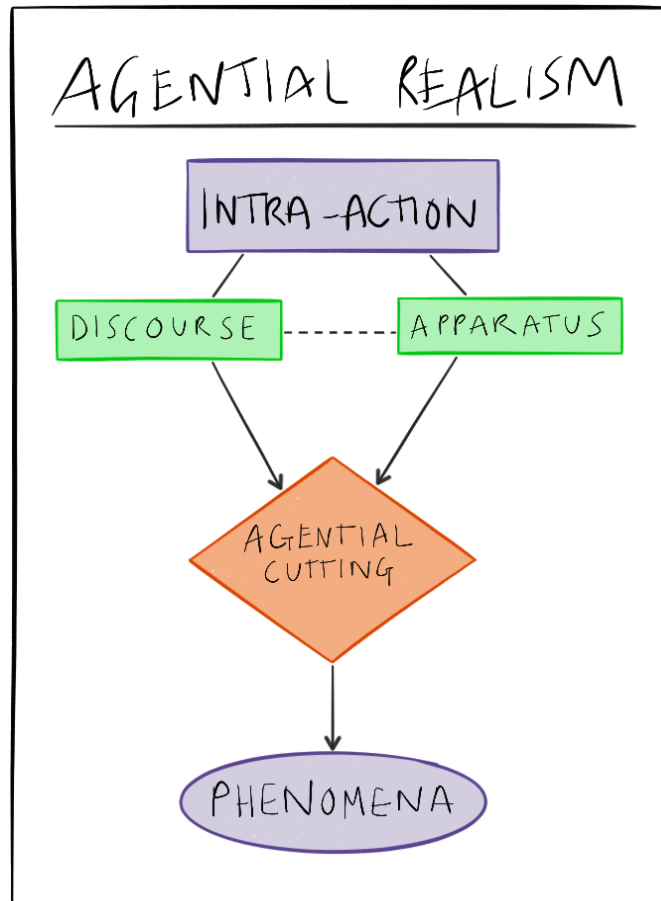


Figure 9: A diagram crudely depicting the process of agential realism

Very briefly, discourse is not simply a word used to describe what is said, but also what enables or restricts what *can* be said. Apparatuses are not simply laboratory tools or even self-quantifying technologies that are used to uncover the 'truth' or find out the 'real' results. For Barad, "apparatuses produce differences that matter - they are boundary-making practices that are formative of matter and meaning, productive of,

and part of, the phenomena produced..." (Barad, 2007: 146). Thus, the apparatus and the phenomena cannot be separated.

This idea can be linked back to Bohr's criticism of Einstein's idea to add a spring to the double-slit experiment to observe or measure what was going on. If you recall from the discussion about the double-slit experiment earlier in the chapter, Bohr's main objection to changing the apparatus of the experiment (by adding something to it) was that it would be measuring and producing an entirely different phenomenon altogether. It could no longer be said to be the same thing.

If we return to the vignettes presented at the beginning of this chapter, what might count as the self-quantifying technology in each of them, and why? In the case of Tamara, (as with all the vignettes) there is a seemingly obvious answer to the question of what the self-quantifying technology is for her (the MapMyRun app) - not least because it is the very focus of the conversation that I had with her about self-quantification. But why is this the case? There are many things involved in her commute to work: the bicycle, traffic lights, her helmet, etc. Why were these things not taken to be the self-quantifying technologies? Perhaps self-quantifying technologies in this instance ought to be something that produces a difference that matters.

I have already discussed that Tamara's experience of the ride was qualitatively different, before she quantified it using MapMyRide, from her experience of the ride after having quantified it. Since we can reasonably assume that the only thing that significantly changed in those two instances was the use of the MapMyRide app - she had the same bicycle, we can assume that the traffic lights had not changed, and she wore the same helmet - then the app can be considered the self-quantifying technology

in this instance. Similarly, Ben's blood glucose monitor was complicit in producing a difference that mattered. In fact, the reading on the machine was the reason that he changed his entire narrative about his day. With the reading on the device, his self was a different phenomenon altogether: he was now ben-with-high-glucose-levels.

The distinction between the concepts of *discourse* and *apparatus* can be quite confusing since they are both, by Barad's own theory, upshots of some agential cut, rather than independently existing entities. The distinction between them is therefore rather contrived - and the examples from the vignettes above show that in each case, the self-quantifying technologies can be read as both apparatus or discourse interchangeably. However, in a more general sense, the concepts of *discourse* and *apparatus* allow us to move beyond questions rooted in naïve representationalism, such as 'are these technologies accurate enough to tell us who/what we really are?', to more pertinent questions rooted in ideas of performativity, such as 'to what extent are these self-quantifying technologies implicated in the 'doing' of the self?'.

They are, therefore, also useful in understanding the implications of self-quantifying technologies on agency and performativity, and in trying to ascertain what might count as a self-quantifying technology in the first place. The two main ideas behind the concepts of *discourse* and *apparatus* in this context are firstly that they enable/constrain what can/cannot be said, and secondly they produce 'differences that matter'. From my interviews and observations it is apparent that perhaps one of the most important aspects of self-quantifying technologies are that they enable (and also have the capacity to constrain) what can and cannot be said. The blood glucose monitor enabled Ben to say that he has diabetes and a high blood sugar level at the moment, but also constrained him in the sense that he felt that he needed to change the original narrative

that he gave about his day. Similarly, Samuels's breath analyser enabled him to talk about an improvement in his VO2 max and allow him to present himself as someone who is relatively very fit for his age.

The Production of Fluid Selves

In what ways, then, is Barad's theory of agential realism, a useful and provocative way of re-thinking notions of how the self is *done* using self-quantifying technologies? As I have argued above, agential realism provides a radical departure from previous theories of the self which deal with performativity and agency. The foundation for Barad's theory is quantum mechanics and a specific set of experiments within that field: the double slit experiments. Her theories about 'queering the self' are based in physics, too. This diffractive methodology that she employs, however, is not without faults. Take Barad's example of the nature of the electron as being akin to the self. There is a problem with taking the electron and the 'self' as being comparable. When the electron creates its own photon and then absorbs it – it absorbs it in its entirety. It does not make choices about which part of the photon to absorb; it does not reject certain photons; and it certainly does not try to reconfigure the photon.

The case of the self with respect to self-quantifying technologies is rather different. The self that is created through the self-quantifying technologies is negotiated. Sometimes the technology is absorbed entirely and enveloped into the self, as was the case with Tamara feeling worse about her ride after she quantified it, and Ben changing his narrative upon seeing the reading on the device. At other times, however, the technology is rejected, moulded, reinterpreted or discarded. There are certain moments

where people may ‘negotiate’ with the technology or the reading on the device. Leo, for example, decided to disregard the advice on his Garmin watch and go for a run anyway. What is apparent, though, is that these technologies are *productive* of the self rather than merely descriptive. They go some way in performing the self by both producing differences that matter and also by enabling/constraining what can be said about the self.

What is also apparent here is that the self is not a fixed and stable entity. It appears from my interviews and observations that the self is much more fluid and changeable. Does it make sense, then, to continue to talk about the ‘self’ as a singular and fixed entity rather than talking of constantly producing and performing ‘selves’ - where the boundaries are increasingly being broadened to allow for things not traditionally included, such as self-quantifying technologies? For example, the self that I was interacting with before Ben’s blood glucose device contradicted his intuitions was instantly different to the self after the blood glucose device had given it’s reading. Similar things can be said about Leo’s run after the watch told him that he should rest for three days, and his admission that he had felt as though he was totally missing a gear, about Tamara’s experience of her commute to work, and about Samuel who physically and mentally felt like a 30 year old.

Conclusion

Using the case of the Quantified Self, I have shown how the theory of agential realism, with particular reference to the concepts of intra-action and agential cutting, is a useful starting point to thinking about the role of self-quantifying technologies in the way that

the 'self' comes to the fore in certain contexts. The concepts of 'discourse' and 'apparatus' allow us to see how self-quantifying technologies can enable/constrain what can be said about the self, as well as how they come to produce differences that matter. And in this context, what matters is the self. In being productive of the self, self-quantifying technologies are implicated in the process of 'agential cutting' - that is, the process of making boundaries around that which comes to be known as the 'self' in that moment. For instance, in enabling Samuel to say that his VO2 max had increased from 23 ml/kg/min to over 30 ml/kg/min, the VO2 measuring breath analyser is complicit in the production of a self-that-has-improved. In constraining Ben's ability to talk about a 'light in carbohydrates lunch', his blood glucose monitor is a fundamental part of the production of a self-that-has-high-levels-of-blood-glucose. And so on.¹⁷

What is interesting here is that these self-quantifying technologies seem to be facilitating a new boundary around that which we would traditionally call the 'self'. And this 'self' is not a single, fixed entity, but something that is continually being enacted as it envelops these self-quantifying technologies, which, at the same time, are

¹⁷ It is perhaps worth reflecting here on the restrictions of language such that it appears that my conclusion runs counter to the points about intra-action that I have discussed throughout this chapter. It may seem that in saying that self-quantifying technologies are productive of the self and implicated in agential cutting, where the VO2 measuring device *enables* Samuel to say one thing, and the blood glucose device *constrains* Ben's ability to say another, that I am ascribing some determining capacity to the technology. On the contrary, I am simply trying to highlight that these technologies are a part of the self that results through their use, and the choice of the words 'enable' and 'constrain' are deliberate as they are the words that Barad (2003, 819) uses in her explanation of the term discourse. As pointed out in an epigram attributed to Nietzsche (1966), "we have to cease to think, if we refuse to do it in the prison house of language; for we cannot reach further than the doubt which asks whether the limit we see is really a limit". In other words, we are condemned to use the language that we have available to us even though this language may house deep assumptions that we are trying to get away from in the first place. And in this case, I inevitably must draw on language which reproduces assumptions about the relationship between technology and the self that seems to attribute capacity to the technology, even though this is the very thing I am trying to move away from!

producing this self. This is where the role of agential-cutting becomes important - since this is the mechanism by which this rather fluid and changing concept of the self becomes momentarily stable and has the appearance of being fixed.¹⁸ Rather than self-quantifying technologies reflecting a stable self already out there waiting to be depicted through the data they produce, I proffer the idea that the self-quantifying technologies *are* the selves in their multiple enactments and thus cannot be separated from the practices of using them.

Whilst this chapter focused on the role of self-quantifying technologies in the production of the self, as I found from both the literature review and from the fieldwork that I conducted, this is not the only aspect of self-quantification to have a bearing on the self. Common to each of the self-quantifying technologies discussed above is the numerical data that resulted from their use. In each case, the technology (the breath analyser, the mobile phone application, the watch, and the blood glucose monitor) was different, yet these technologies all produced a *number* of some sort. This is perhaps unsurprising since these have all been termed *self-quantifying* technologies. What, then, is the role of number in practices of self-quantification? And how do they figure into the production of selves? These are the questions that will be explored in the next chapter.

¹⁸ The fluidity of the self and the issues that this poses to maintaining constancy of the self is the focus of Chapter 7.

Chapter 5:

The Quantification of Self

Introduction

Numbers are crucial to self-quantification. It is implied in the very name: self-'*quantification*'. The data collected by the various self-quantifying technologies used most often come in the form of numbers. This may be in the form of raw numbers, transformed percentages, percentiles or averages, or it may be numbers that have consequently been converted into graphs and charts. Regardless of the form they take, most self-quantifying technologies involve numbers in some way. What, then, are the role of numbers in practices of self-quantification? Why are numbers deemed as so important in the processes and practices of self-quantification? These are the questions that are addressed in this chapter.

In this chapter, I have grouped theories of number into three broad analytical schemes - each which have a slightly different perspective on the nature and role of numbers. The first scheme looks at *numbers as fungible objects* - pre-packaged entities ready for use by whoever receives them. The second scheme revolves around seeing *numbers as constructed artefacts*. I look at how numbers are created through supposed social or bureaucratic need but often end up taking on a life of their own. The final analytical scheme discusses *numbers as material-semiotic devices*. Here I discuss theories which see numbers as embedded in the present and as inseparable from the particular practices which brought them into being. Further, it looks at how these numbers are maintained and upheld.

In a sense, these three ways of theorising numbers can be seen as focusing on different stages of the life-cycle of numbers. The first scheme looks at numbers as they are already *done*, the second at how they are *created*, and the final scheme looks at how they are *maintained*. I aim to evaluate these three schemes in light of the empirical material that I have collected and analysed.

There are three main findings. First, in the process and outcomes of self-quantification the number often ends up displacing the tracked behaviour/metric as an end-in-itself. Second, contrary to much of the literature, numbers are not valued because of their apparent 'objectivity' or the 'truth' inherent in them, but rather because they are perceived to offer *consistency* of information. Finally, I show that numbers are often a way of *seeing* things that are otherwise unknowable and intangible. They provide a way to chart and graph data which show change and can even construct a sense of improvement or deterioration, as the case may be.

Numbers as fungible objects

One way of thinking about numbers is to see them as fungible objects. Here, numbers can be thought of as 'black boxes' in the sense that they become neatly packaged objects which can be moved and exchanged from place to place without much effort or problem (see Callon and Latour, 1981, Latour, 1999).

Latour's (1986) concept of 'immutable mobiles' is useful here. The two main characteristics of immutable mobiles are that they are both durable and transportable. Put together, they refer both to the unchanging nature of a certain thing or idea and to its ability to be taken to different spaces, places and contexts without transformation of that thing or idea.

Whilst the concept was not conceived of as a way to explain the characteristics of numbers *per se*, it is nonetheless a useful framework for thinking about them. Latour's (1986) two main examples of an immutable mobile are the printing press and maps. In the case of the former, Latour argues that the printing press allowed ideas which were previously changed from person to person to be spread across space and time without distortion. In fact, he argued that ideas were made more accurate "just as a consequence of more mobilization and more immutability" (Latour, 1986: 11).

Maps, too, share these characteristics. Latour goes into detail about La Pérouse's journey through the Pacific for Louis XVI. We are told that he arrives at a place that he calls 'Sakhalin' where he meets an older Chinese man from whom he sought to learn whether 'Sakhalin' was an island or a peninsula. The older Chinese man draws a map of the place in the sand and La Pérouse copies this onto paper. Latour argues that on

the face of it, the Chinese man's map in the sand is no different to the drawn map in pencil in La Pérouse's notebook. However, on deeper reflection, there is one crucial point of difference. The Chinese man can draw this map time and time again at will since he was born there and knows the place well. For La Pérouse, however, the map is the very thing he is there to get and the very thing that he hopes to transport (without distortion) back home to Versailles. The map will allow him to be able to *prove* what Sakhalin is really like and it will be used for future ships to navigate to and around Sakhalin. La Pérouse's map thus achieves the status of an immutable mobile because it is used in many different contexts, places and spaces whilst remaining undistorted.

Numbers can also be seen as immutable mobiles. Like the philosopher François Dagognet, Latour argues that "everything, no matter where it comes from, can be converted into diagrams and numbers, and combinations of numbers and tables can be used which are still easier to handle than words or silhouettes (Dagognet, 1973)" (Latour, 1986: 20). Here, then, we can see that numbers are seen as much more valuable in terms of disseminating undistorted ideas than words on a page.

This makes intuitive sense, too. Consider, for example, the use of numbers in the British university grading system. British universities assign 'classes' to papers and examinations ranging from an 'Ordinary' to a 'First'. Scoring above 70 marks secures a student a 'First class', between 60 and 69 attains an 'Upper Second Class', between 50 and 59 is rewarded a 'Lower Second Class' and so on. With this in mind, it is ostensibly much easier to work with the number 71 than it is with a three paragraph description of the structure and content of an essay which is of First class quality.

It also seems obvious that it is easier to compare a mark of 71 with a mark of 65, than it is to compare a three paragraph description of a first class essay and the same of an upper second class essay. It takes just one glance - both to see that the 71 is better than the 65, and also that they are one class apart in terms of grading. Without the numbers, one would have to read the three paragraphs and then work out which was thought to be 'better' than the other - and this might not be so clear cut from the comments. However, ease of use does not mean that it is more *objective*. In fact, 'ease of use' most often hides the major assumptions and subjectivities which make it appear so easy in the first place.

So, whilst it may be reasonable to grant 'easiness' to numbers and to see that numbers allow comparisons to be made without much effort, it is not reasonable to say that they are more accurate as a result, which is precisely the conclusion that Latour draws in his paper (1986: 11). Going back to the example of university grading reveals how much *stuff* is concealed within a number and how making comparisons based on *just* a number can lead to severely distorted conclusions and a satisfaction with incomparable comparisons. For example, graduate schools often compare students' scores on their Masters programmes as if every institution's and country's grades were perfectly interchangeable. In reality, a 71 from a British university is not comparable with most other country's systems of grading. Even more so, a 71 from one British university is often not even comparable with a 71 from another university. For instance, a mark of 71 at the University of Oxford is classed as a 'Distinction' at Masters level, whereas it is only awarded a 'Pass' at the University of Cambridge, and these are two British institutions which are perhaps more comparable than most. It seems then, that although the actual number may be an immutable mobile, the meaning behind the

number most certainly is not. To use another of Latour's terms, numbers can thus be seen as 'black boxes' – something which "contains that which no longer needs to be considered, those things whose contents have become a matter of indifference" (Callon and Latour, 1981: 285).

A similar yet nonetheless different view on numbers is that they are valued because they are thought to enable objective knowledge that is free from personal judgements. This account is championed by Porter (1992; 1995), who argues that numbers can be disseminated across time and place. In this regard, he calls numbers and the process of quantification 'technologies of distance' (Porter, 1995: ix). In particular, the special characteristic of numbers, and what allows knowledge to be so objective, is the structured grammar of mathematical language and the rigid rules that it follows. In many ways, Porter's treatment of numbers is very similar to Latour's conception of immutable mobiles, especially with the idea that numbers can be transported across time and place. Consequently, both suffer from similar criticism: even if numbers are ultimately regarded as objective and free from scrutiny, we are told rather little about how they came to be that way in the first place?

However, Porter's account of numbers goes beyond just treating them as objective devices which create or increase the amount of trust placed in something. Porter argues that numbers must also be seen as 'strategies of communication'. In this regard, numbers can be seen as giving people a shared language through which to be able to communicate their subjective states with one another (Porter, 1995: viii).

Whilst this view of numbers is useful for understanding how numbers can be used once they become reified fungible objects, it does not say much about how the numbers

become reified or treated as fungible objects in the first place. Our second analytical scheme takes a step back and starts to unpick some of the processes whereby numbers *become*.

Numbers as socially constructed artefacts

Another way of looking at numbers is as socially constructed artefacts. Ashmore et al (1989) discuss the Quality Adjusted Life Year (QALY) – a concept invented by health economists to attempt to apply a metric to the subjective characteristic that is the quality of life. The measure itself, as well as the numbers it produced, was a source of much controversy and confusion. In fact, the authors devote a whole chapter to clippings of newspaper articles which explained what QALYs are in a number of different and often contradictory ways. For some, the QALY was simply a type of scale, for others it was the basis of cost benefit analysis, and for others still it was the basis for choosing between life and death. The numbers derived from the formula behind the QALY, are at once made into im/moral and un/ethical numbers with powers that were once reserved only for (the) God(s).

However, Ashmore et. al. show that the apparent inventor of the QALY, Professor Alan Williams of York University, believed the QALY to be a “simple, versatile measure of success which incorporates both life expectancy and quality of life and which reflects the values and ethics of the community served (Scotsman, 3 Dec 87)” (Ashmore et al., 1989: 63). By giving a single number to the quality of life, Williams sought to make the choice between different types of treatments and operations much more efficient. Rather than rely on peoples’ subjective judgements, the aim of the QALY was to enable

decision making to occur based on an “objective index” (Ashmore et al., 1989: 98). However, as Ashmore et al. rightly argue, in trying to provide a solution to the health manager’s problem, Williams managed to change the very nature of the problem itself. Rather than being a measure of someone’s relative gain from an operation in comparison with someone else’s, “the benefit to be gained from, say, coronary artery surgery becomes the number of QALYs it generates and nothing else” (Ashmore et al., 1989: 91).

Once the intricacies and complexities involved in understanding the quality of life are subsumed under a single number, it takes on an ontological identity of its own. It is no longer an accurate picture of the thing it was created to represent, but wields its own power to make everything else behave in ways which conform to that number. For instance, another article quoted by Ashmore et al. (1989: 64) is from the Guardian on the 5th November 1986 and states that “LATE 20th century man, it seems, engages in the pursuit not of happiness but of QALYs”. This shows how a number can come to displace the thing that it initially purported to measure, and can become a self-reinforcing measure of itself only. By changing the way the quality of life debate is framed by including the QALY figures, by writing reports on the different QALYs earned by different types of operations and by framing budgeting decisions based on QALYs, the numbers become a powerful entity in and of themselves which can be used by those who create them to serve their own agendas. As such, numbers can be potent tools for people who need to persuade people to take certain (in)action.

Numbers can also be seen as a controlling mechanism even if they were not originally created for that purpose. In a BBC documentary series, Adam Curtis (2007) looks at the role of numbers in the NHS. Numerical targets were given to employees to allow them

more freedom in the way that they did their jobs. Rather than micro-managing every process, employees could now find a way to do their jobs (and meet their targets) in a way that best suited them. However, Curtis (2007: <00:01:37>) argues that “the attempt to liberate people from the dead hand of bureaucracy has led to the rise of a new and increasingly controlled system of management driven by targets and numbers”. The apparent freedom bestowed upon the NHS employees by their bosses had a severely adverse affect. According to Curtis (2007: <00:57:09>), “it meant shedding all ideas of working for the collective or public good, and becoming instead an individual constantly calculating what would be to one’s advantage in a system driven by and defined by numbers”.

Numbers as material semiotic devices

The third broad analytical scheme encompasses the view of numbers as material semiotic devices. One of the main proponents of this way of seeing numbers is Helen Verran. Verran (2012: 112) argues that “modernity itself seems to be afflicted with an ongoing blindness when it comes to the social functioning of number”. This account of numbers is perhaps the most political:

“...in articulating the social functioning of number, I treat it as a material-semiotic device. This is a quite different way of framing numbers than treating them as either universal abstractions or as culturally relative social constructions. It keeps both numbers and those who use them as present in the here and now... this way of thinking about numbers makes them as inseparable from the practices in which enumerated material entities come to life, and as semiotically agential (Verran, 2001). It recognises that the workings of numbers are deeply embedded and constitutive of the real.” (Verran, 2012: 112)

Verran distances herself from treating numbers as either ‘universal abstractions’ or as ‘culturally relative social constructions’. Her preferred view is seeing numbers as embedded in the present and as inseparable from the practices in which they are brought into being. This view makes it much more difficult to see numbers as immutable mobiles. In fact, their ‘mobility’ is severely restricted if numbers are only to be understood in the present practices in which they are constructed and used. Seeing numbers in this way also greatly reduces their apparent claim to comparability; it means that a 71 from Cambridge will be seen as a 71 from Cambridge, and a 71 from Oxford as a 71 from Oxford – the two cannot be seen as interchangeable, because they are not so.¹⁹

Verran further argues, like Ashmore et al. (1989), that measuring things changes the nature of what it is being measured. Much like the findings of Goodhart (1975) and Campbell (1976) who found that once something is measured or quantified, the thing being measured changes and transforms, Verran (2012: 115) argues that by the end of the 1930s, in the US and other national economies, Gross National Product (GNP) had become the one true measure of the economy and this changed the very nature of the *economy* as it was measured. It meant that new writings, theories, policies and interventions were created just to keep enacting this number. These policies were upholding the number, creating it, refining it and manipulating it. It was once created to describe something much more complex, but it gradually became the end in itself.

¹⁹ On this point it is worth recalling Mol’s (2002: 55) concept of ‘coordination work’ where she argues that it is possible to make seemingly different things comparable with each other if the right kind of coordination work is done. With the example of university marks, there would need to be what Mol terms ‘calibration’ where she argues that “the threat of incommensurability is countered in practice by establishing common measures” (2002: 84). In other words, the possibility of translation is allowed where a 70 from Cambridge is made to be seen as equivalent (or otherwise) as a 75 from Oxford.

GNP is the very 'thing' that is aspired to – not the well-being of the economy, but the production of an ever greater GNP value and rank within the GNP ordering system.

If numbers and measures do not really measure what they set out to measure, then why are there so many numbers still determining policy decisions? For Verran, this is because numbers are potent political and cultural agents. This is perhaps because they are very easily *treated as* immutable mobiles which can black box a huge amount of complexity as well as hide a number of assumptions upon which the number is created. For example, Verran focusses on the numbers involved in an advertisement poster about carbon emissions in Australia. She argues that nature should not be quantified; to do so would be to detract from the aesthetics of it. Nature has value in and of itself without the need to attribute a quantitative value to it, but the makers of the poster have applied some formula or algorithm (which is not disclosed anywhere on the poster) to nature which allows them to, for example, estimate that the value that Australian households are willing to pay for a 1% improvement in the health of the Great Barrier Reef is somewhere in the region between \$434–811 million. And we are told that this is calculated using “the Net Present Value (NPV) over 5 years using a 10% discount rate”.

If we go back to Latour for a moment, he argues that to convince someone of something “you have to invent objects which have the properties of being mobile but also immutable, presentable, readable and combinable with one another” (Latour, 1986: 6). Using a figure like the one on the Australian poster does just this. It gives a figure that is apparently readable, presentable and is combinable with other figures. Most of all, however, it gives a quantity that is very easily comparable. But what is hidden in this estimated value? First of all, it is an assumption that the Net Present Value is a

reasonable measure of ascertaining the value of something in the future, and that a 10% discount rate is sensible. Second, it assumes that both the reader and the people surveyed understand a “1% improvement in the health of the Great Barrier Reef” equally. Third, did every household in Australia say that they were willing to pay money to save 1% of the Great Barrier Reef? What of those households that actually demanded compensation because trying to achieve a 1% health benefit came at a larger personal cost to them and their businesses? The list could go on *ad infinitum* but the point is clear: there are endless assumptions and frameworks hidden in numbers which go unquestioned.

The reason why numbers are regularly preferred over qualities, or why there is often a hint of disparagement levelled at qualitative methods, is not because numbers are inherently more objective and rigorous, or because they are closer to the truth, but rather because numbers are very good at masking the subjectivities that are present in creating them in the first place. They are easily turned into apparently immutable mobiles, which, as we have seen above give them the advantage of being able to be disseminated without distortion, and they are, fundamentally, much ‘easier’ to create, handle and digest than qualitative descriptions and narratives. They are much easier to use in justification of policies, in comparing different candidates applying to a school, in ranking which country is financially ‘better’ than the others, and so on.

The Role of Numbers in Practices of Self-Quantification

Displacement of the original thing to be measured

Ashmore and Verran's argument is that there is a likelihood for the 'means of measurement' (the QALY or the GNP for example) to become more important than the thing that was originally being measured. This is something which is also apparent with people who use technologies to quantify and measure themselves.

As one member of the San Francisco Quantified Self Group, Deborah, puts it:

"When I get really deeply into, like, running the numbers, it definitely makes you eat healthier, which is good. But then I get really obsessed with, like, the number of calories, or protein grams, or whatever. Like, the thing I'm on in those areas, and like, I've got to recognize it before it's, like, I've got to ease back from this and just kind of like, live my life and not be obsessed with like, the data"

Deborah initially acknowledges that numbers help her to "eat healthier". But she is also quick to tell me how the number of grams of protein or amount of calories consumed start to become more and more the focal point of the quantification. She tells me explicitly that she needs to be careful not to let the numbers supersede the original goal of a more healthy diet.

"I just want to live my life, and not be upset by like choosing the stupid little numbers. That's the hard part, right, like to figure out how to decide what the goal is going to be."

And here it becomes even more apparent that numbers can and often do come to displace the thing that was being measured in the first place. Whilst Deborah's original

aim was to eat healthier, she is now struggling to reconcile this goal with the goal of obtaining the 'stupid little numbers'.

Deborah's view is not atypical amongst people who use self-quantifying technologies. Consider another example. A busy mid-level manager of a company told me during a QS Meetup that when he got home from a stressful day at work, the one thing that helps him to unwind was to go for a run: there was something about the sound of his feet hitting the pavement and the wind blowing through his hair, he told me. At some point he discovered the 'MapMyRun' app and started to track the speed, distance and time of his runs. This was great, he said, because it would record all this data for him: he could see how fast he was running and also see on a map the routes he was taking. Better still, he could see how much he had run this week, or last month, or the number of kilometres he had ever run.

He then told me that one day he came home from work and felt stressed, as he sometimes does, and so he decided to go for a run in the hopes of feeling better. He picked up his bottle of water and his iPhone, switched on the app and ran a few steps before his iPhone ran out of battery. Rather than continue the run to de-stress, as was his original motivation, he went back home to put his phone on charge - after all, he said, "an unmeasured run is a wasted run...". Somewhere along the way, the tracking of the runs and the consequent data became more important to him than the reason he started to go for the runs in the first place - to de-stress!

The numbers (or lack of) can also retrospectively change how one intuitively feels about a certain behaviour or act. Dom tells me about his purchase of a Polar watch - a

wrist watch designed to measure heart-rate and use GPS to track distance, speed and geo-location of runs. When I asked him what he thought of the Polar watch he said:

“Brilliantly. The only thing I don’t like about the one that I bought is one time I went down to the gym, having a really good session I accidentally pressed the little silver button on the front and lost the numbers for that session so I had to estimate the data which had me uncomfortable for the rest of the day because I’m just a little bit OCD.”

Dom justifies his unease at losing the data by arguing that he is a little OCD. However, this feeling of ‘loss’ when data goes missing or fails to record is apparent in many people who use self-quantifying technologies to track themselves. The result for Dom is that he goes from feeling like he’s had a ‘really good session’ in the gym to feeling ‘uncomfortable for the rest of the day’. His enjoyment of the good gym session is diminished upon realisation that he has lost some of the data that had been recording it.

The feeling that an untracked or unmeasured activity is wasted is shared by countless numbers of people who use self-quantifying technologies to track their behaviours. In January 2015, Fitbit tweeted an image with the caption: “If you go for a walk through the woods and you forget your Fitbit, do the steps count?” (Fitbit, 2015). This, of course, resonates with the classical philosophical conundrum, which asks whether, if a tree falls in the forest with no one there, would it make a sound? In a sense, members of the Quantified self seem to be replaying classical philosophical problems through their practices of self-quantification.

This particular conundrum, led to a blog post being written by Ernesto Ramirez, a ‘program director’ for the Quantified Self. In it, he has collated a whole stream of Tweets all addressing the same issue - people have tweeted about feeling irritated or

annoyed that they had forgotten their Fitbits on days when they had taken many steps and then wondered whether their steps counted at all if they hadn't been recorded.

Ramirez's (2015) blogpost comes with a disclaimer at the end:

"Please do not mistake intent here. I am not poking fun at these people or the way they think. I am one of them. I have an intimate relationship with the machines that count up my life. I also wonder about the life that is lived, but not captured. I sometimes stress over gaps in my data streams. I too ponder the nature of numbers and the meaning in what some feel is meaningless".

Despite the stream of evidence given above to suggest otherwise, it is important to stress that this view of 'activities not mattering' if they are not recorded is not a view that is blindly accepted by all people who use self-quantifying technologies. These views are often challenged by those who do not use such technologies and sometimes even by people within the self-quantifying community who may not take the numbers and the data to be as important as others. A Facebook status update by Mark who is a keen cyclist, and the subsequent responses to his post highlight this point well (see Figure 10):



Figure 10: Screenshot of a Facebook status

“What’s the fucking point”. The despair in this Facebook status update is signalled by the lack of a question mark. For Mark, the fact that his Garmin did not save his ride data means that he has ‘lost’ his ride. What is interesting here, though, is the third response to the status. The response (by a friend of Mark’s who is also an avid cyclist) tells Mark not to let the machines rule his life. She talks about his bodily reactions to the ride and how he felt afterwards as being a better indicator of the ‘reality’ of his experience. The statement that “you are your experience, your legs, your lungs and you[r] heart” seems to be a direct backlash against the deluge of articles which declare

exact the opposite, that 'you are your data'.²⁰ Mark's response to his friend is also interesting. Mark claims that he knows that his friend is right but sometimes he loses sight of the bigger picture (presumably that he still did the ride regardless of it not being recorded in his Garmin). Yet, looking at the data is still important to him despite not always fully understanding what it means.

What does it mean that Mark still likes to look at the data regardless of whether he understands it or not? What is it about seeing the data that is so appealing? These important questions surfaced time and time again in my observations and interactions with people who use self-quantifying technologies; they are discussed in more detail below. In the context of displacing the original thing that is being measured, it seems as though data that results from self-tracking starts to become a goal in and of itself. Even though there are people who rise up against this need for the data (people such as Mark's friend), they seem to be in the minority amongst self-quantifiers. Finally, when I spoke to Mark about his Facebook status on the day that he posted it to find out more he maintained that even with the admission that he knew his friend was right and that he knows he often ends up losing sight of the bigger picture, he still felt "absolutely gutted" that he 'lost' his ride.

For Verran, numbers are seen as cultural and political agents that are capable of manipulating or steering decisions. However, it seems as though the pursuit of numbers in the context of quantifying the self is different. Deborah's fear of obsessing over the numbers is perhaps a reflexive pull on her part to try not to lose sight of the original goal of keeping a generally healthier diet. Dom's frustration at losing his

²⁰ For example see: <http://magazine.good.is/articles/the-quantified-self-you-are-your-data>; <http://pando.com/2013/05/20/you-are-your-data-the-scary-future-of-the-quantified-self-movement/>; <http://genomemag.com/you-are-your-data/#.VQv6GhDkegk>.

numbers, the CEO's decision not to run because he wouldn't be able to obtain his numbers at all, the many people upset at losing their Fitbit steps and Mark's despair at 'losing' his ride are perhaps more to do with a feeling that the numbers validate behaviour, and to keep a record of this is to have evidence of it, perhaps even to be able to prove it. In Dom's case that might not be so surprising given his goal is to lose weight and that is in large part mostly communicable with others as well as to himself through the use of numbers. However, the CEO's case is the most surprising since his goal for running was not to run faster, harder, or stronger, but to alleviate stress. It is in his case that Ashmore et. al's (1989) and Verran's (2012) warnings of the measurements displacing the original goal are most apparent.

Consistency over Truth

It appears from the literature, and particularly in Porter's (1992; 1995) work, that numbers are valued because they are believed somehow to be more objective, or closer to the 'truth' than other forms of information or knowledge. This assumption is written into the very name of the 'Quantified Self', where it is interesting that the name is not the '*Qualified* Self'. The preference of quantities over qualities is the obvious from the very outset.

However, throughout my observations and interviews, it became apparent that the actual number itself is not valued because it is closer to the 'truth'. In fact, there is a common acceptance amongst many who use self-quantifying technologies that the devices they use produce numbers which are not entirely accurate. They often know that the amount of steps that the device tells them they took is not exact. Or that it

cannot be true that they woke up 6 times last night when they are sure they slept all through the night. But this does not matter - not enough to make them stop using it anyway.

What does seem to matter is the belief that the data and results are consistent. Even if they are consistently wrong. One of the members of the London QS that I spoke to was using self-quantifying technologies to lose weight, Dom, argued this very thing:

"I try to calculate the calories all the time so that even if it is completely wrong it just makes it consistent. Consistently wrong."

He then goes on to say:

"I found a website that has a free calculator. You put in your age, bodyweight, how long you exercise and your average heart rate and it spits out a calorie number. I am well aware that it's an approximation but it is the same approximation every time so I can tell from that if I've either done more or less than I had planned to do. And that, frankly, is all I care about."

From the first vignette we see an acknowledgement that the number given by a website that Dom was using was an 'approximation'. What matters to him, however, is not that the numbers are not 100% accurate, but rather that the approximation is the same every time. It is also acknowledged that consistency is something that is offered by numbers and quantifying above and beyond that which can be offered through qualitative data and descriptive narratives. Another member of the London Quantified Self, Ilya, when asked if he tracked mood, said that he did not because mood was more of a "qualitative aspect". He told me that he preferred quantitative aspects of self-tracking because they are more accurate, and that this accuracy was a result of being more consistent:

Me: Have you ever tried tracking mood or anything like that?

Ilya: No. I probably just do...Well it's kind of, that's more of a qualitative aspect.

Me: So you prefer the quantitative one?

Ilya: Yeah.

Me: And why's that?

Ilya: Well it's more accurate.

Me: What do you think makes it more accurate?

Ilya: It's all about, it's about the way that I interpret the data that would be consistent, whenever I see them. Whereas my own definition of qualitative feelings can differ.

The concern here is that qualitative monitoring or tracking cannot be as consistent, and consequently as “accurate”, as quantitative measurements - at least in terms of what members of the QS may count as ‘accurate’.

On the one hand, this seems quite intuitive. It is more likely that the same number will be repeated for a given metric than it is for the same written description or narrative to be repeated *if* there is a limit to the numbers that can be entered, but not a limit to the words or combinations of words/sentences. When tracking mood, for instance, if the quantitative measuring of mood restricted input to integers between 0–10 versus allowing a choice of the whole of the English Language, then it is much more likely that the use of numbers in tracking mood will appear a more consistent method than using words/narratives.

What, then, if the choice of words was restricted, too? In that instance, are both methods of self-tracking rendered as consistent as one another? And what are the implications of reducing emotions to one word? Is it any different to reducing emotions to one number? The people that I encountered and spoke to at the QS Meetups noted a clear difference between using numbers and words: numbers were consistently said to

be more objective, consistent and generally preferred over words. In one conversation, Nick explained to me why he thought it was necessary to have numbers as the output of self-quantification:

"My personal belief is that any kind of self-quantification you do need to have a numerical measurement at the end. So even if it's something that's subjective, like mood, or that feeling, location, or whatever it needs to translate it into numerical value, so you can then, that's basically what's going to lend you the analysis side."

However, a case can also be made for the opposite argument, too. Within the QS, words are often thought to be more subjective and open to interpretation than numbers. However, it could be argued that numbers leave room for far more interpretation than words. I shall continue with the example of mood-tracking since it is perhaps one of the most popular 'qualitative' aspects of oneself that people tend to measure. When using a number scale to track mood, entering a 6 can mean that one is, perhaps, stressed but not anxious, irritated but not depressed, a little aloof and also a little lethargic. Whereas if single words are used instead of single numbers, then 'stressed' means stressed and all the little nuances of mood may get lost. One would have to dig a little deeper to uncover and unpack the number 6, but 'stressed' largely says it all without leaving much room for manoeuvring. Here, I argue, the word becomes much more of an 'anchor' than the number, where the number seems to have within it the capacity for multiple layers of interpretations and meanings. Usman, a member of the London QS, described the issue to me as such:

It is difficult, mood is like your heart rate - it changes and fluctuates throughout the day and the threshold really isn't as clear as 'happy', 'sad', 'unhappy'. They're like moving into each other and they merge sometimes. You can be both happy and sad at the same time because like you'll be watching a film and you can be happy and sad about something because that's a real thing. How do you track that? Do you then create a

duplicate and say you are not 'happy' or 'sad' but 'sad-happy', or 'happy-sad'? Like, that's really hard to track because all that may have fallen by the wayside in those numbers, yet they are just as important as each other. Like, you know when you're having a difficult conversation with someone, your mood like goes through a whole range of things. You can go under pressure, you can feel suppressed, you can feel under stress and then you can suddenly feel relieved when they say something then just cleared that up, so you can go through all of those in like a nanosecond and it's difficult to track..."

Putting it differently, when using a number, the layers of 'translation' needed are increased. Typically, although most of the output of the practices of self-quantification are quantitative or numerical, the QSers that I encountered did not think solely in numbers. For instance, on many occasions I would ask QS members who tracked their mood to talk me through the process. Often, I found that when prompted to give a number for their mood, QSers tended to first think about how they were feeling, then convert this feeling into a number which they felt best captured this mood. Tom, for example, recounted his method of tracking mood:

"I googled around a little on sort of what the framing models of mental state were, and I think I found the 'arousal/affect' on a blog post on the Quantified Self site - some guy wrote a very nice, thorough summary of this. Affect and arousal are somewhat independent - for example, if I'm very anxious about something I might give myself a 4 on arousal, but a 2 on affect."

Tom's account of his tracking of his mood shows that he first thought about whether or not he was very anxious, and then converted this into a '4' and a '2'. Once this number is brought into being, another layer of interpretation and translation is required to transform it back into a format which is comprehensible and meaningful, i.e. a description. I asked him, for example, what these two numbers referred to, and how they were independent:

"By affect I mean like happy - how happy are you? Whereas with arousal - 1 is exhausted, 5 is hyper...?"

Tom talked me through what the numbers meant. It was not obvious from just looking at the numbers what sort of mood they were referring to and therefore needed his explanation. Given that an extra layer of interpretation is required when using numbers rather than descriptions or words, why are numbers still favoured by the large majority of self-quantifiers? One reason may be that the extra level of translation is necessary to be able to see things about oneself in a different way, or that this translation is necessary to be able to see anything at all. By this, I mean, numbers may be important as a way of seeing the self (and others' selves).

Numbers as a Way of Seeing

The theoretical accounts discussed above do not focus on the use of numbers as a way of seeing things. They discuss the durability and mobility of numbers, they account for their capacity politically and socially to sway or inform decision making, but not about the way in which it can allow for the creation of 'knowledge' itself. In the case of numbers derived from activities of self-tracking, these numbers create knowledge about the self that is otherwise unknown. The most salient cases of this are when metrics are quantified which cannot be felt. In these instances, the improvement or deterioration of these things are not intuitively experienced through the body alone, but need external information (most likely in the form of numbers). A good example of this is change in average heart rate during exercise.

In my observations at QS Meetups, it became apparent that numbers were thought to allow people to 'graph' things and consequently better 'see' change. They seemed to enable 'knowledge' of things that may not otherwise have been felt. Beyond the extremes of heart rate, for instance, where one may be able to intuitively tell the difference between a very high heart rate of 160 beats per minute (BPM) and a very low heart rate of a 50BPM, the nuances between, say 110BPM and 118BPM are usually not able to be 'felt'. Consider this narrative of heart rate given by Dom:

"It will peak at 161 somewhere in that region but the average across the hour or so from the moment I start - at 80 BPM working my way up to a good working range and then peaking it up and then coming down - would be at about 145-ish. Most of the phase is actually around like 146 or 149... 145 is a decent average. I would certainly be disappointed if I got less than that..."

Dom tells me in a lot of detail the ups and downs of his heart rate during a workout. He tells me that 145 beats per minute (BPM) is a 'decent average' and that he'd be disappointed if he was to fall below that figure. When I asked him why he thought 145 BPM was decent, he told me that he'd searched Google and he read a couple of articles which pointed to this number as optimal for achieving weight loss for someone of his age. So he decided to make this his goal. Dom goes on to say that:

"I dislike numbers with a passion and I forgot the right word for it but I am convinced that I've got it. They call it number blindness. Basically it's dyslexia for numbers. The reason that I quantify my well-being in a number rather than a 'smiley face' or a 'not smiley face', for example, is that I can make a graph if I have a number. I can manipulate it, I can add it up, average it, I can do some basic mathematical things with it that might give me some sort of trend or demonstrate some change or movements."

So whilst it may be difficult for someone to 'feel' that their average heart rate was 145 (and to then feel good about it in relation to it being 140), charting this on a graph

would allow the change to be 'seen' and give them the 'knowledge' about whether they are improving or getting worse. Numbers thus allow people to get a sense of achievement or improvement about things that would otherwise be undetectable. Dom says that he would be disappointed if he got an average BPM of less than 145 - but it is doubtful that in the absence of using his Polar watch and heart rate monitor, that he would be able to differentiate between an average heart rate of 145 BPM and an average heart rate of 143 BPM. Yet, with the numbers to hand, he says he would 'feel' disappointed with the latter and be happy with the former.

It is also interesting to note Dom's use of the word 'manipulate' when describing why he measures in numbers despite 'disliking them with a passion'. It is interesting because the common parlance surrounding numbers is that they are more 'objective' which brings with it connotations of being more rigid and permanent (See Porter, 1992), whereas they are preferred here precisely because they are manipulable and because things can be done to them. Recall that for Latour (1986), numbers are seen as being immutable and durable. But it seems that a certain amount of 'work' (or manipulation) needs to be done to make them appear the way that they are eventually presented. This is then much closer to the Verranian reading of numbers. However, Dom does not seem to be talking about manipulating numbers for "political" ends, at least not in the political sense that Verran refers to. Rather, but he is manipulating them so that he can 'see' the data better. The numbers are manipulated so that they can fit into a 'graphable' format or a format that can be analysed in software packages such as 'R' or 'SPSS' or even just a basic excel graph - i.e. in a format that allows the numbers to be 'seen'.

By producing a graph from the numbers, not only are snapshot improvements knowable, but members of the Quantified Self believe that longer term changes can also be seen over a course of days, months, years or longer. And mapping these graphs on top of each other allows for mini-experiments to be carried out which can show the impact of changing certain behaviours, or missing workouts, etc. For example, Deborah talks about how the graph showed the impact of taking time off her training routine.

“So every time I do bench press I track like what the deal was that day. Okay, well the other day we did like five sets of five, and I was lifting like, six to eight pounds. So it’ll like graph it out for you, and kind of show like over time how you’ve been doing. And I always kind of liked this, so it really shows me the impact of like, taking three weeks off.”

Similarly, Nick told me about how the numbers were imperative for enabling him to see the ramifications of making a change to his behaviour:

“Once I have the numbers, it’s just very clear what the trends are. You get a very strong sense for, if you change something up, what’s going to be the consequences. So if you introduce a new food category, then what effect that might have on your exercise, and what impact it might have on your weight.”

Of course, the old saying ‘correlation does not imply causation’ still applies here, but some QSers are happy to make inferences based on the simple overlay of very basic graphs. Ultimately, this is done to increase self-knowledge - or at least this is what most of the people in the Quantified Self group claimed. But graphing also allows for easy communication with others. Increasing self-knowledge also increases the potential for presenting the self to others.

In a Quantified Self Meetup in January 2015, one of three speakers presenting that evening, Vulk, talked about tracking the 136,078 push ups of a group of around 12

people for the last year. His presentation included a graph showing these 12 individuals' push-up patterns. The y-axis indexed the number of push-ups, increasing in increments of 50; the x-axis indexed the 365 days of the year of 2014. The 12 lines on the graph, each a different colour, represented a different person. Within 5 seconds of this graph being shown on the projected screen, there were laughs, murmurs and sounds of disbelief from the rest of the group.

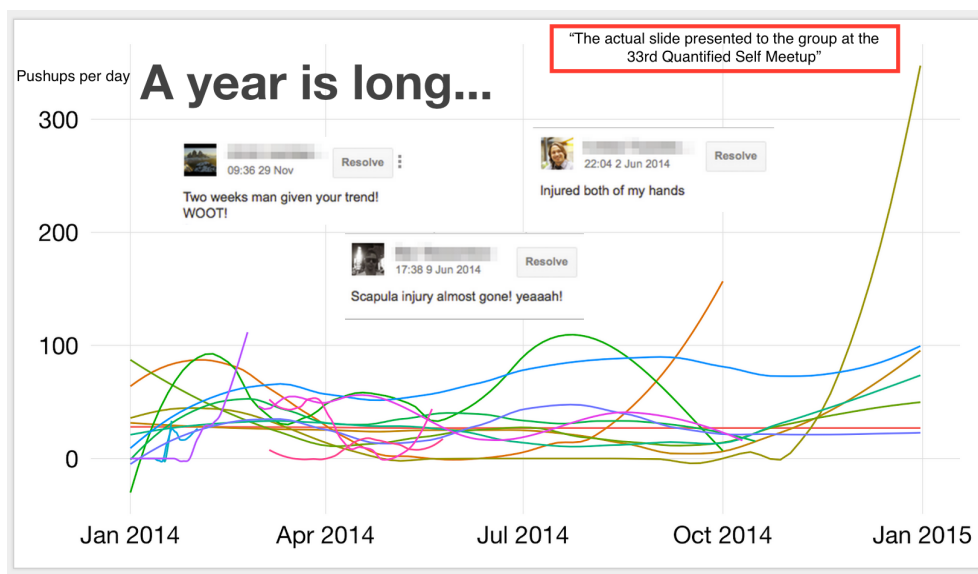


Figure 11: The actual slide presented by Vulk at the Quantified Self Meetup

Vulk had not even begun to speak, yet the audience already knew how the year's worth of push-ups had gone: the graph allowed them to 'fill the narrative gap'. It allowed them to see what had gone on throughout the year: some had steadily done around 30 push-ups every day to meet the target of 10000, whilst another lay dormant for the first 9 months and then frantically did over 100 a day to make up for it. Another individual had miraculously achieved over 450 push ups in the last month, whilst a few had seemingly given up within the first few months. All this could be "seen" in one short glance. In the absence of this graph (which was created by each user entering

their daily push-up amounts into a shared Google Spreadsheet), the progress and outcomes would likely have generated a very different reaction and certainly not such a quick one.²¹

Conclusions

What, then, is in a number? What is the effect of numbers on self-quantification and why are numbers so important to the processes and outcomes of self-quantification? From my interviews and ethnographic participant observations, it became apparent that there are three main points to consider when looking at the role of numbers in the context of self-quantification.

Firstly, numbers start to take on a meaning of their own. In many cases numbers are experienced as proxies by which to measure something else. So keeping an average heart rate above 145 when exercising is treated as a proxy for getting healthier through the exercise. Or numbers are sometimes used to keep track of eating healthier – for example, taking in a certain number of grams of protein and carbohydrate to maintain a healthy diet. Often, however, the number tended to supersede the original goal. The number became a goal in and of itself such that the aim of the self-quantification became to get ‘better’ numbers, rather than aiming to be generally healthier or have a more balanced diet. This phenomenon is similar to that documented by Ashmore et. al. (1989) in their exploration of the effect of QALYs. For instance, recall the example they gave of the benefit to be gained from coronary heart surgery being nothing other than

²¹ Incidentally, it may be similar to the difference between your reaction upon reading my initial description of what happened in the ‘push-up’ challenge and subsequently viewing the graph for yourself!

the number of QALYs it generates. In a similar vein, the point of exercising more or being healthier starts to be displaced by the aim of simply getting a higher average heart rate or a higher number of grams of protein.

Secondly, amongst people who self-quantify, there is a general acceptance that the numbers are not the absolute truth. What is seen as more important than obtaining the 'truth' is consistency. In fact, consistency was seen as so important that even if the data collected was wrong, as long as it was *consistently* wrong, this was seen as acceptable. Numbers are therefore valued because they are perceived to offer a level of consistency and reliability that is not obtainable by more qualitative methods of tracking and monitoring oneself.

Even for something like mood-tracking, where the input regardless of whether it is quantitative (a scale of 1 - 10, for example) or qualitative (a narrative description of how one is feeling, for example), relies heavily on self-reporting of how one thinks one is feeling at the time, it is largely the general perception amongst self-quantifiers that inputting quantitative data is somehow more consistent and reliable than writing an account of how one is feeling. But even then, there are doubts about this. As Dom puts it:

"Taking an emotion or feeling a soft measure and putting it into a hard measure like a number is always going to be completely subjective. When I wake up in the morning and say 'oh I'm feeling like a 3 today', there is no scale that says 'well I was a 3 yesterday and I did these things with the math and now I'm a 4 today'...it doesn't work that way."

Arguably, both methods of data collection for variables such as mood are equally subjective/objective/consistent. For example, it is just as likely to be the case that sometimes someone enters a 5 today when a similar mood yesterday was labelled as a

6 than it is that someone writes 'anxious' for today when yesterday was characterised as being 'overwhelmed' for a similar mood. Subjectivity is present in both.

Whilst the literature tends to point to the idea that numbers are less subjective than written descriptions, it is worth noting the extra layer of interpretive work involved in converting/translating from thoughts/intuitions to numbers and then back again to fashion a comprehensible narrative of what those numbers might mean. This makes it difficult to understand numbers as immutable mobiles since the meaning behind the numbers is highly contextualised. This is Verran's (2012) point in describing numbers as material semiotic devices: numbers are embedded in the present and inseparable from the practices which brought them into being. However, Verran does not account for the fact that the numbers need to be re-translated to make sense of them. This is especially the case if the numbers are not, as she argues, removable from the practices in which they were constructed, since there is thus more need to do translation work to be able to understand what the numbers were representing at the time of their construction.

Finally, I have shown that in the context of self-quantification, numbers can be regarded as having the capacity to construct knowledge about the self. They are vital to be able to 'see' things that are otherwise unknowable. For example, numbers allow self-quantifiers to relate to their heart-rate in a much more concrete way than relying on intuition. Or they allow them to 'see' how they slept during the night by looking at length of REM sleep and deep sleep, etc., and being able to compare this at a glance with the duration and quality of sleep in the past month or the past year. Relying on memory and comparing memory is much more difficult than comparing a chart or seeing trends on a graph.

Perhaps this has more to do with the way the data was presented or visualised rather than the numbers - after all, it was the graph, and not the raw numbers which provoked such a reaction. It is apparent from my research that data visualisation is also tremendously important in the process of self-quantifying. Whilst numbers may displace the thing it was originally intended to measure; whilst they may be vital for maintaining a sense of consistency; and whilst they may enable things to be seen which otherwise may have remained unknown, there are things that are 'done' with the numbers - they are made into graphs or visualisations, for example - which seemingly affect the way that they are interpreted/received. This phenomenon is the focus of the next chapter.

Chapter 6:

The Visualisation of Self

Introduction

Thus far I have discussed the role of agency and performativity in the context of self-quantification. I have shown how Karen Barad's concepts of 'intra-action' and 'agential cutting' help us move beyond 'naïve representationalist' accounts of self-quantification towards more 'performative' accounts. Through this lens, the self is seen as being performed in conjunction with the different technologies enlisted and involved in the ongoing 'project' of the self.

Chapter 5 highlighted that although many different 'self-quantification' technologies are available, their common feature is that they almost always result in the production of a 'number' of some sort, and therefore, it was pertinent to explore the role of number in self-quantification. Chapter 5 also showed how the numbers produced through the practice of self-quantification can often become the goal of self-tracking: rather than the numbers being a by-product of some behaviour. Activities are carried out just so that the number can be produced, added to, aggregated, etc. Further, I showed that in the context of self-quantification, numbers are not necessarily valued for their 'accuracy'. Instead, the numbers produced by the technology are seen as valuable if they are 'consistent'. As many of my informants put it, it doesn't matter if the numbers are 'wrong', as long as they are 'consistently wrong'. Of course, this doesn't mean that any random number is accepted, but as long as the numbers are within the realm of credibility, accuracy is not necessary to obtain value from the numbers. Finally, I showed how numbers are a way of 'seeing' things that are otherwise seemingly unknowable or intangible. They provide a way to chart and graph things which can show change and construct a sense of improvement or deterioration.

This final conclusion of the previous chapter led to yet another puzzle: numbers are almost always transformed into some sort of visualisation. In the Quantified Self 'Meetups' and in discussions, people rarely show a list of numbers, but they often show a 'visualisation' of their data. What, then, is the role of data visualisation in quantifying the self?

To answer this question, I first discuss what a data visualisation is for members of the Quantified Self, highlighting the important distinction made by them between 'infographics' and 'data visualisations'. I then examine some existing literature on data

visualisations that deals specifically with visualising the body or the self in some way. I find that the current literature misses some crucial points that are specific to the visualisation of the quantified self, and therefore, in the next section of the chapter, I investigate how data visualisations feature in the Quantified Self, and its role in the doing of the self. This involves analysing how a member of the Quantified Self introduces, uses, and communicates their data visualisations with others. I identify two key features of data visualisations in practices of self-quantification that the current literature does not address: that data visualisations are the tool by which people are enabled to 'see' things, and data visualisations are the basis from which to communicate one's self with others and include them in the process of self-making.

What is Data Visualisation?

Data visualisation is a way of showing data which makes that information purportedly easier to understand and digest. Data visualisation in the QS is no different: it is just that the data in question in this context is data about the self, and is most often collected by the self in conjunction with various self-quantification technologies. For example, a sleep-tracking application such as 'Sleep Cycle' advises the user to place their mobile phone underneath their pillow during the night whilst they sleep. Using the accelerometer on the mobile phone, the application tracks the frequency and vigour of movement during the night to produce a measure of the length and quality of sleep. It then converts this information into a visual form available to the user in the morning. Figure 12 shows how this particular application visualises data:



Figure 12: Screenshots of the 'Sleep Cycle' Mobile Application

However, there are also many instances where the data is visualised using programmes and software additional to the technology used to collect the information. Self-quantifiers with specific purposes for their quantification sometimes felt that the pre-made visualisations did not capture the information they required. For example, Ben (a member of the QS London group who was introduced in Chapter 4), when presenting his experiences of tracking his diabetes at a Meetup told the group that:

"Commercially available apps for Type 1 Diabetes are very useful...but they don't do everything...I used Excel to get a much more customisable view of my data".

The practice of exporting data from the original tracking device and then creating customised visualisations of that data is common amongst the more 'data literate' members of Quantified Self. In other words, it is common practice amongst those who know how to export data as 'CSV' (Comma Separated Values) files, and then how to 'clean up' that data so that it is in a format that can be imported into Microsoft Excel, or

other statistical packages such as 'R' or 'SPSS', or other platforms specifically designed for data visualisation such as 'Tableau'.

The apparent idea behind visualising data is that it is much easier to see in one glance the information about a week's, a month's or even a year's sleep, for example, if it is visualised in the form of a graph of some sort, than it is to make meaning from a large list of numbers. Data visualisations are often credited with making it easier, or in some cases possible in the first place, to see the 'bigger picture'. For example, Tarun, a member of the London QS, tells the audience of his talk at a Meetup:

"But if you change it from that type of chart to a heat map you can start to see patterns - so the red represents anger and you can see when you were angry, and the blue is depressed or sadness - you can see more of a pattern here and the bigger picture..."

It is important to note that participants are keen to distinguish between 'data visualisations' and 'infographics'. Data visualisations are the product of a function into which data is entered so as to produce a standardised visual at the end - a bar chart or a line graph for example. It is standardised so that hundreds of individuals' data can be visualised in the same way. Infographics, by contrast, are much more discreet and customized. They are created for a specific dataset to communicate a specific point to a specific audience.

Within the Quantified Self community, it became clear that data visualisations are preferred over infographics. In fact, it often seems to be a completely taken for granted assumption that data visualisations are inherently valuable, as can be seen in one of the opening remarks of a presentation given by Kieran, a frequent attendee of the London QS, at one of the QS 'unconferences':

"I'm going to talk about data visualisation. I'm not going to make an argument for data visualisation because I don't think that needs to be made."

And there is a common belief that infographics are more likely to be deceptive than data visualisations. At the end of Kieran's talk, Belinda, one of the main organisers of the 'unconference' reiterated Kieran's point:

"The thing is don't settle for infographics or faux-interactive visualisations. Before I started being involved with QS I thought infographics were great. I thought they were better than pie charts and spreadsheets but actually they're very deceptive and it's like a blind alley of data visualisation...ask for more - don't settle for what the company provides you, it becomes meaningless after a while..."

I further explored this preference for data visualisation during many post Meetup pub conversations. Why is data visualisation thought unquestionably to be better than infographics? On the face of it, it would seem as though the QS community, with their emphasis on personalised data collection, would prefer the less standardised and more customised way of visualising their data - and following this logic, infographics should be preferred since they are produced almost on a case-by-case basis. However, although infographics were regarded as 'cool' in certain instances, data visualisation is said to offer a greater degree of pliability and malleability. By this, people said that they liked the idea of not having to make their own infographic from scratch every time new data was added to the whole dataset. Since data visualisation required little more than a dataset in the same format, it was thought to be much easier to 'plug in' ever-changing and ever-growing data to get updated results every time.

Further, since data visualisation is experienced as producing similar kinds of visuals even for different people, it is thought to be much easier to be able to 'see' what is going on at a glance. It means that it is much more effective as a tool for

communication than having to explain the ins and outs of an infographic to each new viewer. Finally, and perhaps most importantly, self-trackers prefer data visualisation because it is widely accepted that the basis of data visualisation are numbers and statistics, and, as shown in the previous chapter, this is thought to be much more objective than the thoughts and ideas that are used in the creation of infographics, which can, as argued by Belinda in the quote just above, often be deceptive.

Why the existing literature on Data Visualisation is not sufficient

Literature on 'data visualisation' is plentiful. There is a plethora of literature which deals with the technical aspects of data visualisation - classifying the different kinds of data visualisations and commenting on 'best practice' (e.g. Lohse et al., 1994, Schwabish, 2014) and how to use data visualisations to support decision making (e.g. Tufte, 1990, Foil and Huff 1992, Morgan 1993, Eden and Ackerman, 1998, Rohrer, 2000).

Perhaps more pertinent to the questions of this chapter, though, is the growing body of research that deals with technologies which visualise the body. These technologies are referred to as 'new medical technologies' or 'personal medical devices' (Faulkner, 2009). The advent of medical imaging is often paired with the discovery of magnetic resonance imaging (MRI) and computed tomography (CT) scanning in the early seventies (Botha et. al., 2014). These technologies produce detailed images of the inside of the body. Since then, the technology has advanced to allow for ever more detailed images to be produced, including the visualisation of brain activity, using functional magnetic resonance imaging (fMRI) for example.

There is, however, an important difference between ‘medical images’ and ‘data visualisations’. The former purport to represent actual entities such as a brain, a bone, or a tumour. The latter are different in the sense that they are not trying to represent a given entity, rather they have a much more explanatory role. Annamaria Carusi gives a caveated distinction between the two as such: “if the visual images used in visualisations represent data, they do that by modelling rather than copying it, and what they represent is meant to be the mathematical ‘explanation’ of data rather than the appearance of data” (2008: 246). Her distinction is caveated because it comes with a footnote detailing the obvious issue with such a crude distinction: even medical images that purport to be straightforward copies of entities often have a lot of work done on them to make them appear as such (e.g. see Lynch, 1988), and also, although data visualisations are not meant to be copies of entities, they often do try to mimic some ‘reality’ - be that of heart rate or of blood sugar levels.

The medical imaging literature focusses heavily on technologies such as MRI scanners, PET scanners, x-rays and microscopy and on the images that are produced through their use. A common theme surrounding these technologies and the resultant images is one of biopolitics and power. Waldby (1997) for instance, uses Foucault’s ideas in *Discipline and Punish* (1977) to argue that medical imaging technologies engender new ways of instrumentalising and working the body in line with the logics of the machine. But *who* is working the body in these instances? In much of the literature regarding medical images, there is a clear sense of hierarchy with regards to who is able to say what the images show and how they are shown. In most cases, this is the role of medical experts. They are trained in how to use the machines, how to position the body in/on the machines, how to ‘see’ the images and then decide in which way to interpret

and explain to colleagues or patients what the images mean. Patients in this context are the passive recipients of the doctors' narrative about what the images of their own bodies mean.

Images and visualisations within the QS are rather different. Aside from the fact that in the QS the visualisations that people are dealing with are not images of given entities within the body, but of the 'mathematical explanations of data' as Carusi (2008: 246) puts it, there is also another notable difference: in most cases, the members of the QS are the ones responsible both for inputting the data and also for the interpretation of the resulting visualisations. Of course, this interpretation is not a 'view from nowhere' and all sorts of devices are built into self-quantifying visualisations which may already instruct or nudge a certain type of analysis (see Amann & Knorr Cetina, 1988 and Lynch, 1985). For example, the colours that are used in a visualisation may already evoke certain feelings about charts or affect the speed at which they are read (Lin et al., 2013) but, in general, no 'expert middle man' is involved.

Another way of putting this is that people in the QS are publicly, that is socially, accountable for their own visualisations. They are accountable for the collection of the data, and for the analysis of the visualisations. That is not to say that no other entities are involved in this process: in fact many others are involved (not least the self-quantifying technologies used to track the self in the first place) but in this case there is a very apparent shift in the locus of accountability from doctor to self. How, then, are visualisations collected *by* the self, *of* the self, and apparently *for* the self, different from visualisations of the body collected by experts?

In a study using the case of 'Tableau' - a data visualisation and analytics software intended for business and corporate use but often used by advanced users of the QS - Coopmans argues that visual analysis is a form of 'artful revelation'. She argues that "like such visualisation technologies as the microscope, the telescope, and the x-ray detector before it, software for visual analytics is associated with the capacity to reveal what has hitherto been hidden, to give access to what is otherwise inaccessible" (2014: 37). Coopmans compares a data visualisation software (Tableau) with technologies traditionally used to represent actual entities (microscopes and telescopes). Following Coopman, the question still remains as to how the performance of the resulting images/visualisations in these two different contexts may vary. Are the revelations the same when a doctor makes them about a patient versus when an individual has them about themselves?

In an ethnographic study of MRI scanners, physicians and researchers, Burri (2013) shows how the power of images differs in theory and in practice. In *theory*, she argues, clinicians are aware of the 'mediated' nature of images - that they are manipulated and constructed. But in *practice*, the images come to dominate the processes of diagnosis, justifications and explanations. She maintains that because of this mismatch in terms of their theoretical and practical utility, and since this mismatch seems to be commonly shared with others, images can be powerful tools for communication and justifying arguments and points. Once again, however, this study looks at physicians and researchers - people with positions that can be thought to be authoritative and expert. Is it the same among members of the QS? To what extent can the data visualisations used within the practices of self-quantification be seen as tools for communication and the justification of arguments?

There is much research in the literature on data visualisations (but not on data visualisations of the self) and much on the medical imaging of bodies (but not of visualising them through data visualisations, or of people visualising them for themselves). The obvious gap in the existing literature, therefore, is research that explains what is going on when people collect and record information about themselves and then visualise and interpret this data for themselves - an activity that is at the heart of self quantification. The next part of this chapter deals with this very gap by examining in detail an example of how data visualisations feature in the doing of the self, where the data has been collected and analysed by the self.

The Presentation of a Self-Quantifier

Below is the beginning of a transcript of the first seven minutes of a presentation given at a Quantified Self Meetup that I attended in London. The presenter is a young professional woman called Bonnie who is in her late twenties. Although she has participated in a few QS Meetups, this is her first time actually presenting at one.

The transcription gives a sense of what a presentation is like at a QS Meetup - it shows how data visualisations are often the 'main feature' around which narratives of the self and behaviour are constructed, and on which claims are given credibility and weighting. It also shows that it is an important mode of communication - it is the data visualisation to which the presenter points when uttering perhaps one of the most common phrases heard at QS Meetup presentations: 'as you can see...'. The common implicit assumption is that everyone in the room is 'on the same page' as the presenter

in terms of how they've interpreted what the visualisation shows is very common in this context.

"My mystery presentation is named 'Multitracking'. Creatively named because I'm tracking multiple things. Erm, I'm quite new to QS so I've been reaching out to the low hanging fruit. You'll probably notice that I'm going for things that are either [using] methods that are easily manipulated already or readily available...I'll give some examples and you'll be able to see."

Within the first 20 seconds, Bonnie has already made reference to 'seeing' and how she'll give examples that will allow everyone to see. It is still unclear at this point what the examples will be.

"So, I'm gonna start off with kind of how I think about QS, erm, I'll give you some examples of what I've done - some of it is intentional, some of it accidental, erm, but I'll kind of show you what I've done in graph, erm, how you can do it, and how long it's gonna take you, 'cause that's a big thing that's important for me, I don't wanna spend too much time trying to work something absolutely perfectly, because ultimately, it's secondary to life...I mean it should really inform that. And finally I have some ideas on where I can go from here, so I'll also share those with you guys with some closing remarks..."

Here she goes into further detail about what she's going to show the audience and the format that it will be in. In this case, she tells the audience that she will show them what she's done in 'graph' form. Bonnie also mentions that she'll include details about how other people can do what she's done and how long that it would take to do it - this point of 'replicability' is important, and one to which I shall return later in the chapter.

"...So one thing that I do is I like to 'keep things' and another thing I like to do is to 'organise things', so when you combine the two I essentially just have like a log of these things that I like to archive, which actually is quite good for QS and really enables you to track things, so that's kind of where I'm coming from."

The thoughts that I have behind it is that, erm, whilst I do love numbers and I think it's really helpful, erm, I don't want it to be reductive, I don't want me as a person to just be summed up in a few numbers - I want those numbers to be additive. I'm explaining this so that hopefully the rest of my presentation makes more sense. And it should be holistic, so I have quite a few different interests, erm, and would like to track quite a few things and it's kind of fun to make connections between all of those things as well, so, erm, the idea that when I am tracking stuff it is global, it is as multidimensional as a person is."

Bonnie remarks here that that she doesn't want her 'as a person' to be 'just summed up in a few numbers'. And more so, that she wants the numbers to be 'additive'. It is apparent here that, for Bonnie, the numbers alone are not enough. In the previous chapter it was shown that numbers are a crucial part of self-quantification, yet members of the QS rarely just showed a list of numbers when presenting and talking about their quantified selves. In this sense, Bonnie confirms the conclusion, that while numbers may be a necessary part of the self-quantification process, they are certainly not sufficient.

"And finally, erm, at first I just had the word 'easy' 'cause I want it to be easy, but the idea is that it's a cost benefit, so, if the actions that I might change with the data that I get, are gonna outweigh the amount of effort, then it doesn't need to be easy 'cause it's worth it, but if not, then it kind of has to net out for me. So these are the principals that I have in mind when I'm looking at what I want to do."

Bonnie makes a link here between the practice of self-quantification and consequent changes in action. Bonnie says that the change in actions spurred on by quantifying and tracking her self must outweigh the effort required to quantify the self in the first place. Again, 'ease of use' makes its way back into the trope of self-quantification. What is the relationship between data visualisations and 'ease of use'?

"So, diving into the examples, what I've realised is that whilst we are people, we are doing a lot of things as people. So here are some of the things that I've chosen to share

with you guys that I found easily and readily quantifiable. There's quite a few of them but they're each like one graph, so it'll be easy to zip through."

Having said that numbers were too reductive, Bonnie goes on to tell the rest of the QSers in the audience that each of her activities have been summed up by 'one graph'. What's the difference here between numbers and a graph? Why is *one graph* not reductive whereas *a few numbers* are? There seems to be something in a graph which is seen as inherently more holistic than numbers. The way she introduces that she will be showing some graphs is also indicative that she assumes that the rest of the group are comfortable in reading graphs and in understanding what they may show.



Figure 13: Screenshot of the visualisation of Twitter data.

"So, erm, starting with Twitter...Kind of new to that as well, but what I did is looked at when I Tweet, and so you've got 'time' down here and here it's just like a straight frequency. So you can see that when I first started, it was alright, and then kind of sporadic, not very good...this point here is like over the holidays, so like New Year's time you always end up doing more of everything, and then I picked it back up, and starting

here is when I decided I'm just gonna schedule stuff. It kind of lines up with another trend you'll see later about my reading. As my reading increases, so do my Tweets, 'cause essentially I just tweet about stuff I've been reading, mostly links to articles and things, and so I'll have these blitzes where I start scheduling things in advance and you can see that really works out and it's quite consistent and that last chunk right here is pretty much just, yeah, same thing over and over again." (Emphases added).

Bonnie explains what the graph is showing and tells the audience what they can see. Her narrative matches the peaks and troughs of the graph that she is showing. In this way the graph can be seen as showing the frequency of her Tweets on Twitter. At the very beginning, when Bonnie was telling the audience about her philosophy behind self-quantifying, she argued that tracking was secondary to life. However, when she is explaining what the graph shows, we could question to what extent the graph is restricting what she can or cannot say about her tweeting behaviour and why it was the way it was. Rather than the graph being there to add to an explanation about her Tweeting behaviour, is the graph constructing the story post-hoc? And therefore, rather than being 'secondary to life', is tracking (and the consequent data visualisations) actually much better understood as an active agent in shaping her ability to understand and present herself in certain ways?

"You can actually visualise this in a different way which is with quantity...[Bonnie clicks for the next slide but problems with the presentation arise: the graph she wanted to show doesn't load on the screen]...just needs to load...I can see it on my screen...O.K., well...well no graph for you guys...[fiddles around with the computer and finally comes out of the presentation mode and shows the slides in the edit mode instead so that the audience can see what she's seeing on her screen]...and so here's it visualised in a different way...."

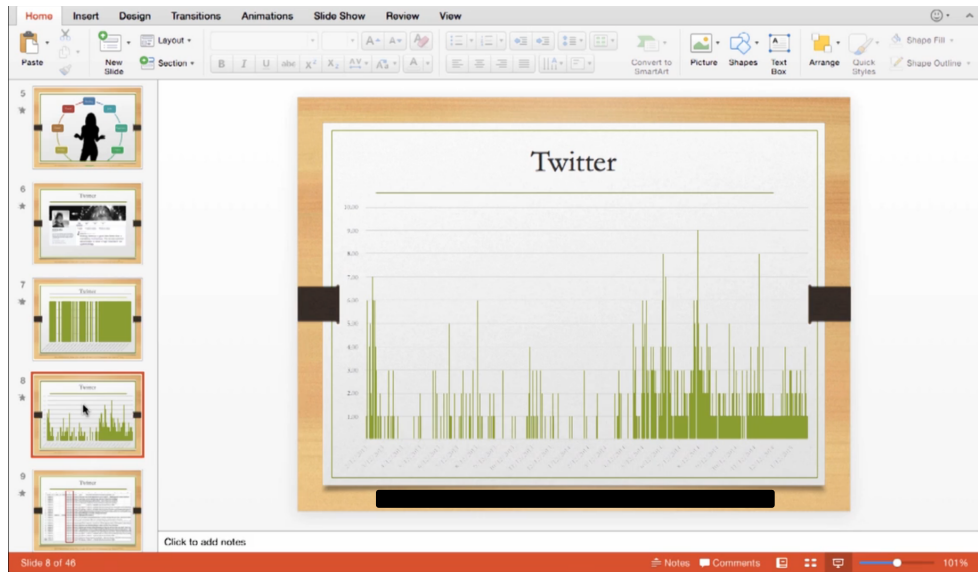


Figure 14: Screenshot of the Twitter data “visualised in a different way”.

“...You’ve got the number of tweets up here, so this is the same as before, what you see here is that steady base of one a day, which is what I was doing, erm, and then sometimes I get, I dunno, really into it, but that stable base is there, it’s kind of interesting to see. Erm, if you guys wanted to do that, it’s quite simple, so you can just download all your data as an archive from Twitter, and they’ll give you a CSV file like this...so you can just use that and directly graph something and it’s just kind of fun to see how it is and how it’s going...”

Two points are worth noting. First, when the graph didn’t load on the screen, Bonnie stopped talking about her self-quantification, and looked disconcerted. She started to tinker with the computer in search of trying to match what she was seeing on her screen with what the audience was seeing on their screen. At this stage it would not be too far-fetched to argue that without the data-visualisations on the screen, she would not have felt comfortable in continuing the talk. In fact, the whole presentation seemed to be based on showing these visualisations, without which, the communication of her self-quantification would have appeared a little bare. What does this mean for the role of data-visualisation in self-quantification? In the literature, it seems as though the visualisations are a way of representing something that already exists, however, it

seems as though in this context, the data-visualisation has a much more active part to play.

Second, Bonnie presents what she introduces as a different visualisation of the same data. What could be the reason for this? What is she trying to achieve by showing a different visualisation of the same data? This is not mere representation of something that has already happened - this is enacting something different from the data. For Bonnie, something else is gained by this additional visualisation - and that is a different way of understanding what is going on. Knowledge of the self, then, is in some parts dependant on the form of visualisation. The raw data is not a stable, fixed body of knowledge - it is the basis from which to enact certain aspects of the self and communicate this with others through the form of data visualisations. More so, the form of data visualisations and the enacted self are intimately linked - they cannot be divorced from one another.

This excerpt of a presentation at a Quantified Self Meetup raises some interesting issues and questions about data visualisation that have not yet been addressed in the existing literature. The excerpt highlights two things. First, it shows how data visualisations enable people to 'see' patterns and trends in their behaviours. Second, it highlights the fact that data visualisations are used to include others in this 'seeing', apparently on the basis that neither party needs to do much work. The liberal usage of the phrase 'as you can see' signals the claimed ease of interpretation, the self evidentiary nature of the display. Third, in doing this, the visualisations are made to invoke and enact the community around them, a community of which they are part and which they constitute at the same time. By declaring 'as you can see', the presenter enacts a community of people and visualisations who are, in fact, able to see and be

seen. In the following sections of this chapter, I explain each of these three points in more detail, using empirical material from interviews, observations at QS Meetups and conferences, field-notes and QS videos.

Seeing

In the previous chapter, I argued that numbers were a way of ‘seeing’ things that were otherwise thought to be intangible. However, when observing participants presenting at the QS Meetups, or talking to them about their tracking, rarely did they show a database or list of numbers. Instead, they showed graphs and charts: bar charts, area charts, line graphs, moving average graphs, pie charts, and so on. The way that people set about to understand what their data revealed, showed, or evidenced about themselves was to look at the data visualisations that had been created from the raw data that they had collected through their practices of self-quantification.

Looking at their data visualisations enabled self-quantifiers to ‘see’ things about themselves and give them the basis from which to interpret what it might mean. This is similar to the conclusion drawn by Minna Ruckenstein following her study looking at peoples’ experiences of tracking their heart-rate variability. In her paper, she argued that “data production through self-tracking can also frame the world in new ways which deliver a kind of structured uncertainty from which it is possible to detect new things. As they contemplate the value they supply to the curves depicting physiological reactions to various stimuli, people learn things of which they may have been previously unaware” (Ruckenstein, 2014: 71).

Whilst this certainly seems to be the case amongst members of the QS for less tangible things like changes in heart-rate variability and body temperature, it also seems to be the case for them in seeing small changes in more obvious things, like weight loss or gain. A member of the London branch of the Quantified Self illustrates this point well:

"Yes, I know you're only supposed to weigh yourself once a week, if that, [but] I weigh myself daily because I am impatient. I am also very OCD and I love the idea of weighing myself everyday and seeing a 100 gram weight loss from yesterday. Which is not meaningful but it made me feel good!"

'Seeing' or noticing a 100 gram weight loss in the space of a day is very difficult. It's almost entirely unnoticeable to one of the participants of the QS, Dom, except, that is, when he weighs himself and takes note of the change in weight on a daily basis. From this, in his own words, he is able to 'see' a 100 gram weight loss from the previous day and this consequently makes him feel good.

Seeing this change, and feeling good about that change consequently motivates Dom to continue to eat healthier and go to the gym. He told me that seeing his weight decrease on a daily basis gave him encouragement, since he could effectively see the difference his efforts were making. Seeing change, and thus becoming aware of change, is regularly said to be a great motivational tool for people who quantify themselves. As Dom, another member of the QS London, put it:

"So if they were unfit, they reduce weight as a measure of fitness. If I've lost two pounds I'm more fit, and that weight loss was an incentive, it was a boost to them. To say, look, that's great. I am really seeing an improvement, I'm happy. I'm going to keep up with this. It's the same thing with what I'm doing, right? I'm seeing these improvements, I'm seeing the benefits, although they might not be superficial. I mean again, it's just data at the end of the day and it might be incorrect. I recognise some data points may be incorrect. But at the same time, I think you can maybe overlook that to some extent, and

it's an element that pushes you to keep going. So yeah, I agree that it is a real driver to see those improvements, and it definitely helps."

Dom makes multiple references to 'seeing' and the impact that 'seeing' improvement has on the drive to continue with a certain behaviour. 'Seeing' in this context is not just gaining knowledge of what was previously unknown, but is an impetus to change or sustain a certain action. Seeing, here, is therefore not a simple and static accumulation of knowledge, but an active motivational force that pushes and drives behaviour. In the example given above, Dom's motivations still seem to be in trying to achieve his original goals of 'making improvements' to his self. However, it also seems to be the case that data visualisations can become the focus of an activity rather than being a way simply to show what has been done post-hoc. Similar to the conclusions drawn in the last chapter about numbers displacing the original activity, data visualisations, too, can become the focal point of an activity, where behaviour is changed to achieve a certain type of data visualisation or to make a specific type of data visualisation possible.

In a QS Meetup that coincidentally featured two speakers talking about their quantification of long-distance events, Bastian presented his experience of using an popular mobile application called 'Runkeeper' to track his runs and help him train for a marathon. He is another of those 'data-literate' Quantified-Selfers, who has the technical skills to tinker with the interfaces of apps or extract his data to run his own analyses on them. When he began to use Runkeeper, he was not impressed with the given interface and thought he could do it better himself. Consequently, he devised his own method of extracting the data from Runkeeper and then produced his own visualisations from that:

"You can see, this is the interface that I built...So you can see that as of today my marathon training has covered 370 miles...And I've gone ahead and colour coded this so that anything that is from 7-9 minutes [per mile] is red: so the darker the red, the faster the run is and the darker the blue, the slower the run is. So pretty straightforward there. And so this is really nice, and you can see that there are some gaps in the elevation there and that's because those are times when I'm pausing my watch - so it really helps me see how often I'm actually pausing my watch during my runs. And as I hover over an elevation point you can see up on the map that the dot is moving along the trail which is pretty cool.

It's allowed me to see a few things. One of things that I've been focussing on with my training is trying to slow down on my Sunday long runs, and you can see when I started my training I was going way too fast and then I started to learned how to slow down a little bit more. So all of my Sundays should be above 9 minutes probably, so I need to continue to work on that. And you can see that all of my Tuesdays and Wednesdays, those are my speed training days and those are usually dark red which means that I was faster on those days - except for June 16th and what happened there was that my watch got paused for an unusual amount of time and so the calculations got a little jacked up..."

Bastian tells us that he colour-codes his runs so that the faster he runs, the darker the shade of red, and the slower he runs, the darker the shade of blue. After he gave his presentation, there were the usual hands in the air to ask questions. I was curious about the impact of changing the form of visualisation and so I asked him if he had noticed any difference in his training or how he was feeling as a result of using his own custom visualisations. He smiled a little and told us all that he now found himself changing the pace of his runs so that his data would "look" better, and that he would run farther than he was meant to just so that his cumulative distance would be greater. He told us that the colour coding meant that the slower he ran the more blue his charts would appear, and so he found himself running faster just to avoid his visualisations losing their red-ness. Seeing, then, is not just a way to see that which was otherwise unknowable, and not simply what motivates people to achieve their goals, but is also

sometimes the goal itself - the goal of 'better looking' visualisations, whatever they may be.

Further, it appears that data-visualisations are not just a way of 'seeing' things that self-quantifiers may have previously been unaware of, but also of reinforcing things that they already had an idea about. In many instances, QSers told me of times when they already had an intuition about something that they were doing, yet it was only when they saw this represented through a visualisation that it became more concrete for themselves. This intuition was further reified when showing the visualisations to other people and gaining their acceptance or approval of them. It is as if data visualisations give the ephemeral intuition a solid form that can be seen, digested, and then dealt with.

Take the case of Deborah, for example. Deborah, a self-quantifier in San Francisco, told me that she tracks her Crossfit workouts: she tracks the types of weight-bearing exercises that she does, how many repetitions of these exercises she can achieve and what weights she uses for each of them:

"So it's basically tracking like over time. So like we did bench press the other day. So every time I do bench press I track like what the deal was that day. [Deborah takes out her phone and goes into the application that she uses on her phone to show me what she would do during her workouts]. So like, go there, oh where do you type it in. [Deborah navigates around the app to show me what she had input into it a few days ago] Okay, well the other day we did like five sets of five, and I was lifting like, six to eight pounds. So it'll like graph it out for you, and kind of show, like over time, how you've been doing. And I always kind of liked this one, so it really shows me the impact of like, taking three weeks off."

During our conversation, Deborah told me that she knows that taking three weeks off her routine workout will have the effect of somewhat diminishing her strength. One can follow that line of logic without needing Deborah to enlist any other 'allies': it makes sense to assume that taking significant time off from regular training may diminish someones ability to lift the same amount of weight. However, Deborah makes a point of 'showing' me this on a graph on her mobile phone app. She says that "*it really shows me the impact of...taking three weeks off*": although she already knew that there would be a negative effect from taking time off training, it is only when she looks at the graph that she 'really' sees what this impact is.

What is the difference, then, in the weakness intuitively 'felt' and the weakness 'observed' through a data visualisation? It is not the case that Deborah does not know that she has become weaker, however there is something that is achieved when she sees this weakness in the form of a graph and is able to show it to me. Her consequent 'weakness' achieves solidity for both herself and, in a sense, for me too (her audience): it achieves a place in space for both of us. Through this visualisation, she is able to compare her current self with her former self. Even more importantly, her 'self' (in the context of bench-pressing) is made communicable with others. The graph is not shown to me as evidence for her intuitions of losing strength over the period where she took a break, rather, it was shown to me because it is a direct way of communicating that loss of strength to me. As Lynch (1988:203) described his own methods of using images, "instead of using pictures as evidence for naturalistic claims about objective entities or relationships, I will use them as evidence of methodic practices, accomplished by researchers working together in groups, which transform previously hidden phenomena into visual displays for consensual 'seeing' and 'knowing.'" In other

words, by showing the graph to me, Deborah was able to allow me to see 'with' her. And when QSers show data visualisations in QS Meetups, they are inviting the rest of the audience to see with them too. It performs a community of QSers who are all 'on the same page' as each other.

But is something else going on here, too? Rather than simply being communicative and informational, is there something about data visualisations of the self that have a *transformational* aspect to them? In a paper about the science and religion debate, Latour (2005) tries to frame 'religious talk' through what he terms 'love-talk'. He argues that religious talk is not about verifying the facts about religion - it is not about figuring out whether or not Mary actually was a virgin - but actually about transforming the listener in some way. To bring them into the present and to bring them on board the same journey as the locutor - to convert them in the now and in the present to their way of faith and believing and understanding the world. Latour argues that religious talk is about communicating in a way that brings the locutor and interlocutor closer and more present. It is not about *informing* the person but about *transforming* them - about making them change their flows and tune into the long chain of the locutor's flows. Ultimately, Latour argues that this is about transformation of the person without transformation of the talk or idea or object (Latour, 2005: 29-32).

Given that visualisations of the self in the context of self-quantification seem to play a much more active role in motivating behaviour change, enabling things to be seen that were otherwise left unknown, and allowing intuitions to achieve solidity that can then be communicated, Latour's account of how religious talk can be transformational is well suited to explain the role of data visualisations. With the example of Deborah, there seem to be two stages to the transformational character of the data visualisations.

The first is transformation of the self - where the visualisation seems to take on the role of locutor and Deborah that of interlocutor. Through the visualisation, Deborah tunes in to the graph and what it depicts - the loss of her lifting ability after taking a few weeks off training. The second is transformation of the person that she uses the visualisations to communicate her self to - in this case, this was me, but more generally, and more often, this is the broader QS community. She invites and allows me to tune into the flow of her narrative of her 'weakened' self that correlates with her absence from training. This second point, about including me into her narrative of the self, is not specific to Deborah's case. In fact, the inclusion of others into the self is an important aspect of the role that data visualisations play in the context of self-quantification.

Including others

I have argued that at its base, visualising data about the self is a communication tool as much as it is a tool to learn more about the self. As Burri argued in her paper, "an image's visual power becomes even more explicit when it is used as a communication tool. The attractiveness of images and their seductive power are instrumentalized in communications to convince others and to empower one's arguments..." (2013: 377). However, Burri's conclusion is based on research done with experts such as physicians, scientists, researchers, and so on. In the context of self-quantification, though, when the individuals using the visualisations are relative lay-people, what is the 'attractiveness' of images? Who are they trying to convince?

Data visualisations within the context of the QS allow people to communicate their 'self', through an image or visualisation, with other people: they are a tool by which people are able to be included into the self. In at least one of the presentations given at any one QS Meetup, the presenter makes a switch in the way that they address the audience. At some point, usually near the beginning of the presentation just as the first visualisation is presented, the pronouns used switch from "I" and "me", to "us", "you" and "we". For example, with the aid of some form of a data visualisation behind them on a screen, participants of the QS commonly use the following phrases (in various forms):

A) "This chart tells *us*..."

B) "Here *we* can see..."

C) "*You* can see..."

This switch in pronoun is indicative of how the data visualisation seems to allow the singular personal pronoun of "I" and "me" to shift to a collective pronoun of "us", "we" and "you", and in the process include a whole room full of people, as well as all other potentially interested people, in a shared vision of the self as it is performed in that particular context of a QS Meetup. This is similar to Ruckenstein's (2014; 77) conclusion that data visualisations are better seen as "shared artefacts" that are used in collaborative knowledge creation rather than absolute representations of facts.

Of course, this not the case every single time and the inclusion of others is neither guaranteed nor automatic: just the act of showing a data visualisation of the self is not enough to be able to bring others on board and communicate the self with them. The inclusion of others into the self requires a lot of work. It requires a common

understanding and knowledge of what is accepted as a 'legitimate' visualisation. Goodwin and Goodwin make a similar point. Drawing both on Mike Lynch's (1985, 1988) work on the production of materials for seeing, and Lave and Wenger's (1991) work on communities of practice, Goodwin and Goodwin argue that the ability to see relevant things on a screen isn't a *natural* activity, but "very much a socially organised element of culture that is instantiated within, and sustained by, a community of practice" (1996: 69).

This is observed during presentations at the Quantified Self Meetups, where there is a routine that is played out time and time again in practice. Typically, a data visualisation shown within these QS Meetups follows a standard sequence:

1. The presenter introduces the aspect of self that they have been quantifying.
2. A data visualisation is presented so as to allow people to 'see' what the presenter is talking about and 'show' them their quantified self.
3. The audience gently nod their heads or release a small sound of approval/surprise at what they are seeing.

Recall Vulk and his yearly push-ups graph (Figure 11, p.135). The above sequence matches what happened in that instance:

1. Vulk began by saying he would be presenting data on tracking his and a group of friends' push-ups over the year.
4. A data visualisation (line graph) was then presented so as to allow people to 'see' what he was referring to and 'show' them the progress (or not, in some

cases) of the push-ups done by the various participants over the course of a year.

5. The audience let out an audible gasp at what they were shown. They saw that some people had been consistent in their pushups throughout the year, but could also see that some people had bundled in all their push-ups near the end just to make the target.

However, there are times when this sequence is not played out, and visible and audible signs of 'approval' or 'shared understanding' are absent: sometimes the metaphorical tumbleweed sweeps through the room. In these moments, those presenters who are aware of what has just happened start to defend their choice of visualisation or, in other cases, acknowledge that the visualisation is not quite up to the usual expectations or standards.

For example, In one QS Meetup that I attended, a man in his early thirties, Usman, was sharing the findings from the tracking of his own music listening habits to the rest of the group. He had collected his data using the 'Last.fm' website - a site that tracks metrics such as the frequency, genre and length of music that is listened to by the user. During his presentation, Usman showed a data visualisation on screen:

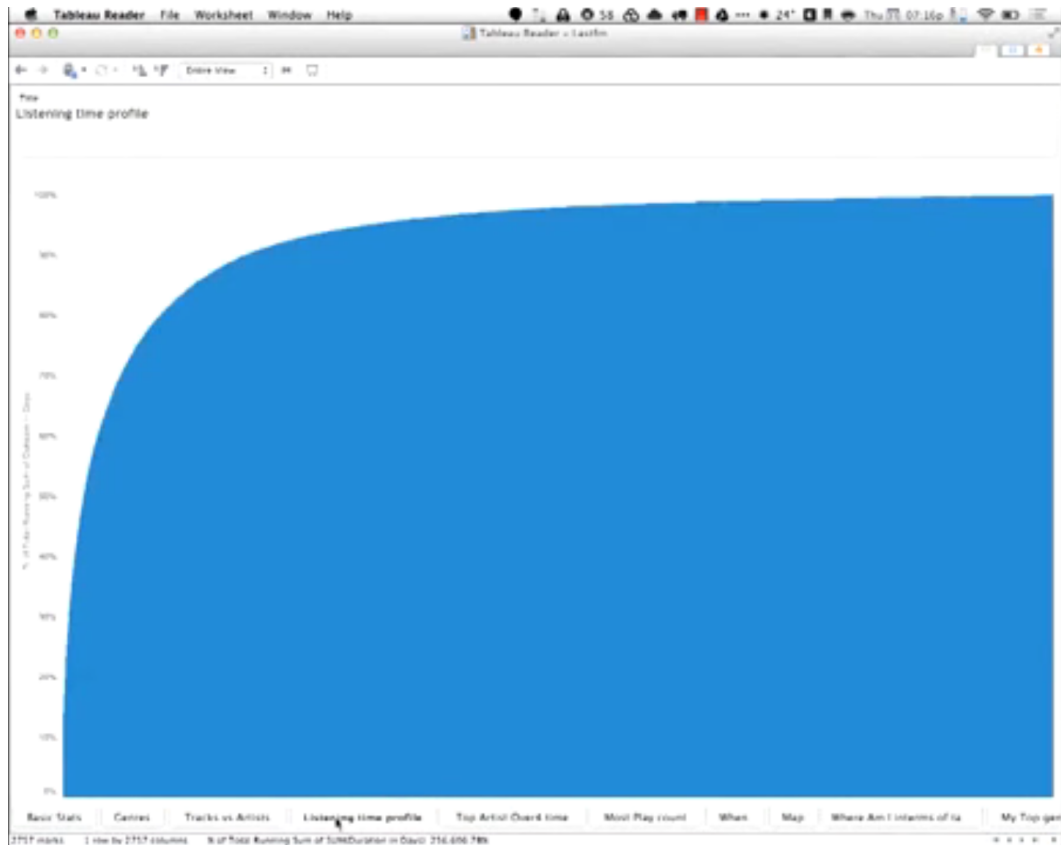


Figure 15: Screenshot of Usman's Pareto Chart depicting the amount of time he spends listening to certain artists.

Usman narrates over this visualisation:

"This is a Pareto Chart - are people familiar with Pareto charts? So basically this is a running total...you've got number of artists down the bottom. So basically, 80% of my listening comes from about 10% of the artists that I have in my library- that's what this chart is saying, so that's sort of the shape. So basically if I was stuck on a desert island, I only need to carry the first 10% and I think I'd survive.....erm.....it just looks like a massive blue dot, it's not really that interesting."

The ellipses just before the "erm" in this narrative is the moment where the audience would usually have let out some indication that they followed the data visualisation and understood its place in the presentation. However, this was not the case here. Instead, as I looked around the room, I saw a number of unimpressed faces that looked as if they had missed the punchline. Usman realised this and quickly acknowledged

that “it just looks like a massive blue dot” and that “it’s not really that interesting”. From his data, Usman drew a seemingly insightful conclusion about the variety of music that he listened to: the fact that he listened to the same 10% of artists in his library for about 80% of the time. However, judging by the reaction of the fellow QS members to whom he was presenting, either the chart was lacking in something, or Usman’s performance of it was lacking something.

Usman quickly moved on to another chart showing 'top artists by duration', which looked much more complex, with many more lines and labels. This chart was received by the audience in much more positive way: nodding heads and a palpably more receptive atmosphere filled the room.

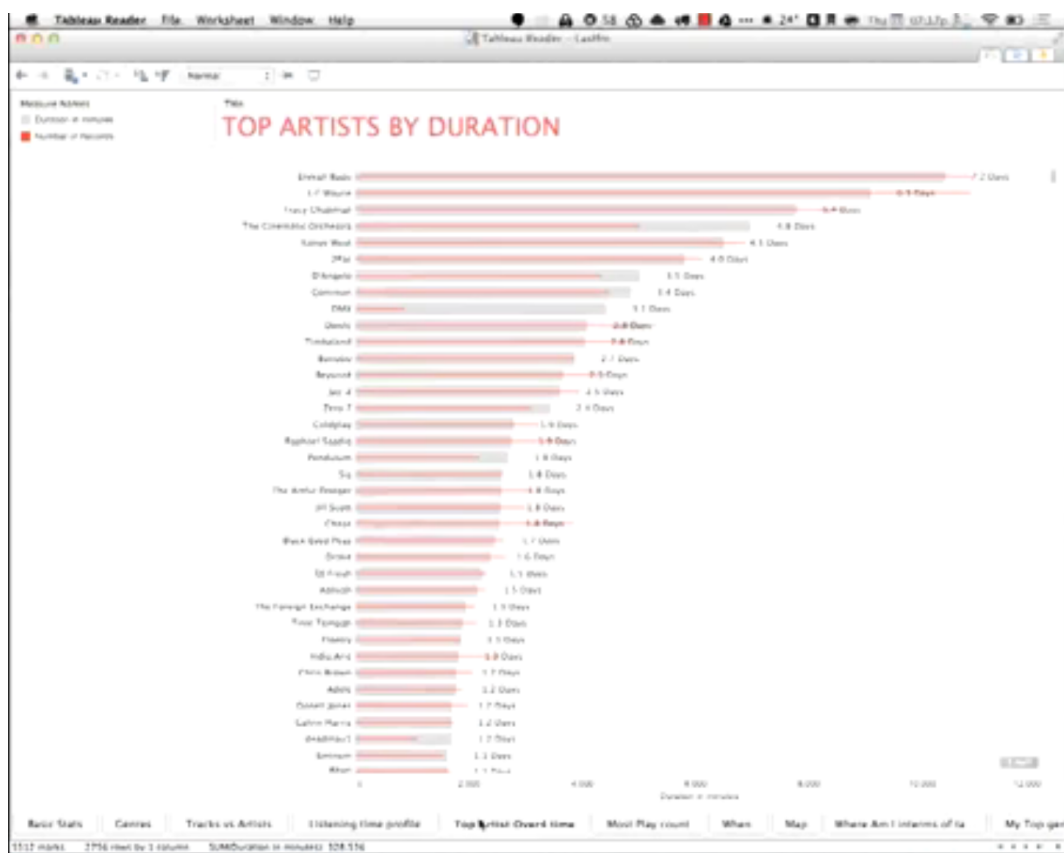


Figure 16: Screenshot of Usman’s chart showing ‘Top Artists by Duration’.

What, then, counts as a 'good' data visualisation in the context of self-quantification?

Does such a thing exist? During a presentation entitled "Data Visualisation of the Self"

at a Quantified Self 'unconference' in London, Kieran, put it thus:

"I think this engineering paradigm has locked data visualisation into accepted forms and patterns of graphs and lines. And I think there's room for artistic expression, surrealism, beauty, aesthetic engagement...so this is like a plea to say look, creative expression can help us, we don't have to stick to grids and lines and charts, especially when we're thinking of the self: we all think about ourselves in different ways..."

Kieran argues that an 'engineering paradigm' has restricted data visualisations to 'patterns of graphs and lines.' He maintains that these 'accepted forms' of data visualisations need not be the only way to think about the self: 'artistic expression' can help, too. He also makes an interesting final remark: 'we all think about ourselves in different ways'. This may well be the case, yet I have found that in the context of the Quantified Self, "artistic expression, surrealism, beauty and aesthetic engagement" are not well received, so it seems Kieran is in the minority with this view. Indeed, there appears to be an unwritten set of 'guidelines' as to what counts as a 'good' and 'acceptable' data visualisation. This is apparent from the fact that time and time again similar formats of data visualisations are shown, and similar looks of confusion or disinterestedness fall on the faces of the audience when deviations from these unwritten guidelines occur.

Take the example of Usman's Pareto chart above. Usman showed a graph which he, by judging from the reaction of the audience, thought to be uninteresting and so he quickly moved on from it. Despite the fact that the graph that he showed could be regarded as technically appropriate - it showed the data and made the point that he was trying to make about music listening habits - the QS audience did not take well to

it. This suggests that data visualisations within the QS are not solely for the purpose of finding out about some aspect of the self and showing it to others as 'accurately' as possible, but about displaying a form of data visualisation that is accepted within the community. And in this case, being accepted within the community means that people in the audience show audible or visible signs of approval or surprise. It is not that any 'patterns of graphs and lines' are acceptable. Rather, only very specific types of patterns and lines are approved: ones more 'interesting' than a Pareto chart that 'just looks like a massive blue dot'.

There is another reason that this is important: the data visualisations are not simply a way of showing others a self that has been quantified, but rather they are a way of negotiating what the (quantified-)self actually is. Data visualisations are a way of communicating a scaffold of the self, which then needs to be verified by the rest of the community in order to achieve validation or solidity as a 'quantified-self'. If the data visualisation falls outside the accepted forms of visualisations, then they cannot be successfully verified and solidified, since it then falls upon the presenter to explain her 'artistic' expression of an already solidified self. This renders the community somewhat useless in this matter - they no longer can play the role of collaborative self-'makers' and cannot contribute in the 'quantified-self' ritual and practice.

Data visualisation thus cannot be wholly personal or private - it must adhere to the community's accepted guidelines, and more so, be able to be replicated by other people quantifying similar aspects of the self.²² This point is evident in Bonnie's efforts to show people how they, too, could achieve similar data visualisations with their data

²² This speaks to the discussion earlier in the chapter about the differences between infographics and data-visualisations, with members of the QS preferring data-visualisations for their replicability.

and showing them the methods for doing it. At the same time, the data visualisation should not be too simple. It cannot simply 'state the obvious' - because then it is an affront to the whole project of 'quantifying the self' - it has to show something new, or be a new way of showing something of the self that is already known. This point is evident in Usman's Pareto chart - just a 'massive blue dot' simply will not do. The data visualization, and hence the self which is being performed, must traverse the fine line between being sufficiently effortful, yet seemingly replicable, to be an accepted and well-received data visualisation in the context of the Quantified Self.

This then is why similar types of data visualisations are shown time and time again in QS Meetups - they are the types of data visualisations that people intuitively seem to know how to read and interpret because they are the data visualisations with which, over time, they have become familiar. Within the community of the QS, these data visualisations usually come in the form of "patterns of graphs and lines", as Keiran described them. These are the visualisations to which people within the group have become accustomed in such a way that they can now 'see' what is going on at a glance - they are those visualisations that allow the presenter to utter with confidence that well-versed phrase: "as you can see". And with that utterance, people in the audience are invited into the making of the 'quantified-self': they are given the opportunity to actively contribute to the solidification of the self, in that particular context at that particular time.

At QS Meetups, in presenting their unique quantified 'self' to the rest of the audience, paradoxically, the presenter is asserting their place in the 'collective'. In trying to present their individuality, by having had to conform to the acceptable/legitimate forms of data visualisation, the self-quantifier is conforming to the collectively

negotiated self of the group. This somewhat paradoxical point is saliently made in a scene from the film 'Monty Python's Life Of Brian'.²³ The film follows the journey of Brian, the protagonist of the film, who is born in the stable next door to Jesus of Nazareth on the same day as him, and acquires a following of devotees who think that he is the promised messiah. In this scene, hundreds of devotees have gathered outside the place where Brian is, hoping to catch a glimpse of him. Brian comes to the window and tries to explain to them that they have got the wrong person:

Brian: Please, please, please listen! I've got one or two things to say.

Crowd: Tell us! Tell us both of them!

Brian: Look, you've got it all wrong. You don't *need* to follow *me*. You don't *need* to follow *anybody*. You've got to think for yourselves. You're *all* individuals.

The Crowd: Yes, we're all individuals.

Brian: You're all different.

The Crowd: Yes, we *are* all different.

Man in Crowd: I'm not

The Crowd: Shhhh.

The paradoxical resonance in the line "we're all individuals" captures the point perfectly. In accepting their individuality, the crowd speaks as one, in unison. Rather oxymoronically, the people in the crowd assert their *differences* by uttering the *same* words at the *same* time. And so it can be seen with data visualisations in Quantified Self Meetups. In trying to present their own unique selves to the others, the self-quantifiers present very similar looking visualisations measuring very similar metrics uttering

²³ Thanks to Steve Woolgar for bringing this particular scene to my attention. Up until only recently, I thought Monty Python was the name of a TV actor.

very similar phrases. The 'individuals' in The Crowd in the Monty Python scene also use the pronoun 'we' in much the same way as a presenter in a QS Meetup presentation switches pronouns seamlessly from 'I' to 'we', and from 'me' to 'us'. Data visualisations, rather than simply being the representation of an individual self, can thus be seen as performing a particular *community* of quantified selves. To be an individual, here, depends on being part of a collective, and the collective is made during the communal process of seeing the self through data visualisations.

Conclusion

This chapter has highlighted some important features of data visualisations in practices of self quantification. Through the close reading of a typical presentation at a QS meetup, as well as extracts from QS Show&Tell videos and interviews, I showed how data visualisations are a tool through which people who self quantify can see things that they may otherwise have missed - small changes in daily weight, for example, which may not have been immediately visible through simply looking in the mirror. I also discussed how this had the added effect of motivating certain people within the QS to continue in their efforts to achieve certain goals - seeing the weight loss for Dom, for example, made him feel good and therefore spurred him to continue in his quest to lose more weight.

I also showed how, in some instances, data visualisations not only revealed (or produced) aspects of the self that were unknown, but also reified already existing intuitions. The visualisations in these cases legitimised and reified certain conclusions that the self-quantifier may already have intuited. I found that this legitimisation was also useful in being able to communicate the self to others. Visualisations used within

practices of self quantification are as much tools for seeing things about oneself as they are tools for communication and including others in this notion of the self. In showing an accepted data visualisation in a Show&Tell presentation, others are invited into the making of the self by allowing them to partake in collectively enacting what the visualisation might be showing about the self.

In order for this to work, there are tacit conventions as to what does and what does not constitute an appropriate or an accepted visualisation. This involved striking a balance between being simple enough to be able to replicate and quickly make sense of, yet not so simple that it risks being seen as pointless or uninteresting.

Finally, I showed how in asserting the individuality of the (quantified-)self depends largely upon performing oneself as something very similar to others in the community - doing so enacts not only the self that is quantified but also the community in which the self is quantified. In other words, through data visualisation, the doing of the (quantified-)self is the upshot of a community effort.

Chapter 7:

The Constancy of Self

Introduction

The previous three chapters have all shown that the self is the substantiation of a number of different materialities and discourses, both within and beyond the traditional idea of the self: the technology (as discussed in Chapter 4), the numbers (as discussed in Chapter 5), and the data visualisations (as discussed in Chapter 6) are all invoked in the production of the self. In this final empirical chapter I discuss an altogether different problem: the problem of achieving constancy of the self when the self is being done and re-done on each occasion, as each of these different materialities and discourse re-enact the self every time. In other words, how is the 'self' made to be constant, when the self is seemingly changing and being done through different technologies, metrics and measurements?

The interesting observation here is not that *different* phenomenon result, but conversely that things are actually held together as the *same*. As we have seen so far, there is a vast array of different technologies that are used to quantify and track the self. There are hundreds of different metrics which are measured and recorded using these technologies - most commonly these are metrics such as calories, heart rate, blood glucose levels, and mood, but also these can be ketone levels, heart rate variability, vitamin D levels, and shades of white of teeth. And different versions of these data will be shown and discussed with people in different ways. Despite all of these different technologies and methods and metrics, there still appears to be some semblance of cohesion and 'same-ness' about the self that is maintained across the many different platforms, devices and audiences. As I will demonstrate below, despite the many technologies and numbers and visualisations - Ben Miller, for example, is still seen as being Ben Miller - people still recognise him as Ben Miller, and he still introduces himself as Ben Miller. What are the processes and mechanisms by which his constancy as 'Ben Miller' is achieved?

This is the focus of the investigation of this chapter: how is the constancy of the self achieved, and through what processes? I offer the neologism 'entractment' as one way of explaining this puzzle - a term which fuses together intra-action (the role of the technologies), extra-action (the role of numbers and visualisations) and enactment (the coming together of these parts in the context of a self quantifying community)

First, I briefly explain what I mean by 'extra-action' as the corollary of the previously discussed 'intra-action'. Next, I assess the value of the concept of 'enactment' for understanding how the self is done and achieved as a constant. Specifically I turn to the concepts of 'coordination' (Mol, 2002) and 'choreography' (Cussins, 1996) that

claim to explain how things are held together in the face of ‘multiplicity’ and ‘fluidity’. I explore the extent to which these terms (‘coordination’, ‘choreography’, ‘multiplicity’ and ‘fluidity’) help explain how the self is held together during practices of self-quantification, and also where they fall short. Finally, I discuss how the concept of ‘*entractment*’ might usefully encapsulate the many different processes involved in the practice of self-quantification and in achieving a constancy of the self.

Intra-action + Extra-action

In Chapter 4 I discussed the Baradian notion of ‘intra-action’. Intra-action was the term Barad gave to the process which brought about certain phenomena, which existed as a result of this process. The term is a way of overcoming the misleading connotations of the more commonly known ‘interaction’, which implies that the entities that are involved pre-exist their mutual production. Barad argues that intra-action *is* the phenomenon itself.

In the context of self-quantification I found that, on the whole, using *intra-action* as a viable replacement for *interaction* was helpful in articulating the enmeshed and entangled nature of entities and phenomena (as demonstrated in Chapter 4). However, upon further investigation of the term intra-action, it transpired that the origins of the word did not fully capture what I found to be occurring in the practices of doing the self. The origin of the prefix “intra-” is latin and means ‘*on the inside; within*’. Herein lies the problem. The conclusion of Chapter 4 was precisely that self-quantification was not a detached activity, and that the intra-action of the self and technology was only one

part of the story. Self-making with self-quantifying technologies is not done solely 'on the inside', nor does it come purely from 'within'.

Chapters 4 and 5 explored two different aspects of self-quantification: 'numbers' and 'visualisations' respectively. These two aspects of self-quantification were shown to be just as important a feature of the practice of self-quantification as the technology itself. Both of these aspects are not exclusively considered 'within' the self. In fact they are both traditionally things seen as 'without'. They are the *outputs* of the technologies and the intra-action with them. Paradoxically, the self is not made exclusively 'within': the process of self-making is done in conjunction with, as a result of, *is* both within and without - both intra-action and extra-action at the same time. It is not just that self-quantifying technologies are used, or that numbers are produced, or that data visualisations are created, but that they *all* come together in the practice of the doing of the self. Self-quantification is a product of all of these, but through which mechanism are they all made complicit in the achievement of the self, and how? In other words, how is the self *done*? The next section explores the usefulness of the concept of enactment as one potential response to these questions.

Enactment

For Pickering (1993: 3), the term 'culture' "denotes the field of resources that scientists draw upon in their work, and "practice" refers to the acts of making (and unmaking) that they perform in that field". I argue that enactment is similar. It is when something is brought into being by the *doing* of it; in its *practice*. To enact something is to *do* it. So whilst it may be possible to speak of intra-actions and extra-actions, both need to be

enacted to bring them into being. In fact, their very existence is a product and proof of their enactment. As Woolgar and Lezaun (2013: 324) argue, “enacting...emphasizes the generative power of the practices involved in the constitution of reality”. This reiterates the idea that this is a move away from the representationalist viewpoint that reality exists separately to our interaction with it, and that instead, practices are fundamental to the very constitution of that reality in the first place.

This is a theme which has run through this entire research, beginning with the discussions about intra-action in Chapter 4, to the performative nature of the numbers in Chapter 5, to the constitutive role of visualisations in Chapter 6. The argument against representation and towards a more performative, enactment-based account, continues in this chapter, with the following discussion of enactment as exploring how the self might be seen as being *done* in practices of self-quantification. For example, Law and Mol (2004: 45-46) argue that “we all have and are a body. But there is a way out of this dichotomous twosome. As part of our daily practices, we also do (our) bodies”.

The very title of this thesis is ‘Doing the Self’, and therefore it should come as no surprise that I take Law and Mol’s argument about the body being done, and argue that it extends to the doing of the self. I argue though, that there are slight nuances and differences in the way that they propose how the body is done and the way that I propose that the self is done. In this next section, I go into more detail about Law and Mol’s proposition, namely ‘enactment’, and delineate where perhaps something additional to ‘enactment’ is needed to explain how the self is done in the context of self-quantification practices.

In a number of my conversations with those engaged in practices of self-quantification, it was apparent that many different things were changing about themselves. People talked of loss of weight, increased blood sugar levels, decline in hours of sleep, and other changes that they had noticed or experienced through the course of their self-quantification. Throughout all these changes, however, it was curious to see that they still appeared to refer to their same self. They did not talk about being another person, but about their same self, only a little different or changed. How is this possible? That despite so many different changes about someone, they are still considered to be the same, by both themselves and others that they encounter?

This observation resonates with Mol's observations of the multiple enactments of atherosclerosis. Mol observed that this disease known as atherosclerosis was held together as being the same disease, despite it being diagnosed using many different methods which all produced different types of results. Mol argues that "the objects handled in practice are not the same from one site to another: so how does coordination between such objects proceed? And how do different objects that go under a single name avoid clashes and explosive confrontations?" (2002: 5). These are Mol's concerns. Things are not the same in one place as they are in another, yet they are held together and made to seem the same.

Consider this statement by Leo, the ultra runner who used a Garmin watch, whom I first introduced in Chapter 4:

"Two and a half years ago I just started to say, all right, look, I think of myself as being athletic because when I was a kid growing up I was good at sport... But when you see pictures of yourself and you really start to realise, oh actually, shit, I'm quite a bit overweight, you know. But you've gotten used to it, you know...I was unhappy with

that..."

Here, Leo compared how he looked two and a half years ago with how he looked now, and he noticed that he had put on a lot of weight since that time. He told me that he thought of himself as being quite athletic, but in reality, after seeing the picture of himself, he realised that he was now quite a bit overweight. What work is being done such that he is still able to refer to himself? He has, by his own admission, changed over the course of time, but despite all of these changes he still presents himself as the same person (albeit with some extra weight).

I came across many other examples of this, too. QSers often offered narratives which relate a time when they used to be different to what they are now. In another interview, Ella told me about the change in her heart rate and heart rate variability over the past four to five years. Ella also happens to be the oldest female member of the Quantified Self to whom I spoke - at the time of our conversation she was in her early seventies.

Me: Do you look at changes over time of things like heart rate and heart rate variability?

Ella: Yes I do.

Me: Have you noticed any significant changes since the first time you started using 'ithlete' to now?

Ella: Well, what's interesting about it is that my base weight is the lowest it is has been and hasn't changed much with age, but with the max heart rate (as you probably know there is an age decrement and I've been doing it for 4 or 5 years), I would say the amount of time I am spending above 140 or 150bpm is less than it was.

So Ella, much like Leo, is aware that she has changed. Her self-quantification practices have alerted her to the fact that she now is no longer spending the same amount of time at heart rates above 140-150 beats per minute as she was 4 or 5 years ago. Yet,

much like Leo, she still refers to herself, and not some other person. And more so, I (their audience) am still compelled to see both of them as the same people.

The interesting phenomenon here is that there is evidently something going on to ensure that Leo and Ella are both able to talk about themselves as being fundamentally the same person, whilst at the same time describing things that have changed about them. And I unquestioningly take them both to be the same people, too. How can people talk about and live through changes in themselves, whilst still being able to keep constancy and same-ness?

Multiplicity

Mol accounts for this paradox by arguing that it is because entities and objects are 'multiple' and 'fluid' that they can still be referred to as the same object despite seemingly different enactments rendering seemingly different objects. The concepts of 'multiplicity' and 'fluidity' go hand in hand with enactment. If, as discussed above, anything is only ever the enactment of it, then there needs to be a certain amount of leeway with enactments such that they are still able to remain constant in certain different situations.

As the examples above showed, how can we account for the fact that people within the QS change style, shape and form, yet are still able to be known as the same person and are still treated as the same person by the rest of the community, as well as by themselves? If they did not allow for such flexibility then they would not be able to talk about anyone or themselves repeatedly, as, according to the idea that things only exist through their enactment, they would always necessarily become a different entity

without any continuance or constancy at each enactment. This means that we are no longer able to presume that certain entities are universal objects, and it would be more fruitful to shift the way we think about them as being *enacted in practice*.²⁴

To allow objects and entities to retain some continuity, work needs to be done to maintain them as the same. This argument is similar to the ontological philosophy that underpins Actor-Network Theory, where nothing is seen as being absolutely fixed. As Law and Singleton point out, “the added ANT argument is that it takes effort to sustain stable networks of relations. This means that objects such as diseased livers or alcoholic liver disease have to be maintained if they are to sustain themselves and move between locations...nothing is fixed and for ever in the ANT world. Only some things are fixed, and for a time” (2005: 335).

Let us think about the implications of this on the concept of the self. Let us take it as given that nothing is fixed - that the self is constantly changing over time and through different contexts as it is enacted differently in particular situations. Even in this scenario, something does, at all times, still appear to remain constant for people involved in the practice of self-quantification. Seemingly, there is something like an essence, or a core, to the self that cannot be erased regardless of how much the context changes and how much time passes. How else could things hang together? In the QS, for example, Leo is still seen as Leo, regardless of many different self-quantifying technologies may justify or legitimise different aspects of Leo, no matter how much the

²⁴ We do not care at the outset whether or not entities are, in fact, universal objects. But we do need to shift the way that we have previously thought about them in order to highlight the processes that are involved in accomplishing them as seeming universal. Or in this particular case, to be able to highlight the processes that are involved in achieving the self as being constant.

community or audience that Leo finds himself in might differ. No matter how multiple the different enactments that render Leo may be, there appears to be a core to Leo that means that he still refers to himself as Leo and others still recognise him as Leo.

Fluidity

What does it mean to say that something has a core, or an essence? Might there not be something else at play that allows for things to change, yet remain the same? In their article about a Zimbabwean Water Pump, de Laet and Mol (2000) discuss an object that undergoes many changes - both in terms of the physical parts that make up what it is, as well as the discourse surrounding what is regarded as clean water, yet, throughout all these changes, the Zimbabwean Bush Pump is still known as the Zimbabwean Bush Pump - at least according to de Laet and Mol. However, rather than this being the basis for them to argue that entities therefore must have a rigid and stable core or essence to them, they conversely argue that there are mechanisms at play that allow for things to be seen as the same without the need for such a core or essence.

They argue that entities are fluid, and that they necessarily must be so if they are to survive and continue being able to be seen as the 'same'. There is no need, according to them, for identities to be fixed and rigid. They argue that "that is what we also mean to capture when we use the term fluid. If the Bush Pump may be called an 'actor' despite its fluidity, then 'actors' no longer (or not always) need the clear-cut boundaries that come with a stable identity. In short and to summarise: the Bush Pump is not a solid character. Not only can actors be non-rational and non-human; they can also – or so we hope to demonstrate – be fluid without losing their agency" (de Laet & Mol, 2000: 227).

This, therefore, is de Laet and Mol's effort to embrace contingency and yet at the same time, acknowledge constancy.

The example of the Zimbabwean Bush Pump is akin to the old philosophical thought experiment known as Theseus's Ship (Plutarch, 1914). The experiment concerns a famous ship sailed by Theseus which was meticulously preserved by the people of the city. As parts started to break or rot, they would be replaced by a part that was exactly identical. The thought experiment asks us to consider whether or not Theseus's ship can still be considered Theseus's ship at the point where every single part has been replaced with an identical part. It is a thought experiment that asks us to wonder about the persistence of identity and whether or not something can still be called the 'same' in a circumstance where seemingly everything about it has changed.

An important thing to think about here is who is the 'us' that is arguing whether the ship is the same or not. For whom is the ship the same and for what reason? Whether the ship is 'actually' the same or not is a side point, the interesting thing to consider is who benefits from it being considered the same, and who may benefit from it being considered as being a different ship altogether? For those who might still be convinced that it is the same ship, the thought experiment goes one step extra further in that it argues that each and every plank of wood that had been removed from the 'original' ship (let's call that 'Ship A') was then used to build another ship (Ship B) such that Ship B was built entirely with the parts originally taken from Ship A. Now, which of the two can be said to be Theseus' ship? Is there something about Ship A that is essential to it, and which enables it to remain 'Ship A' even if all of its parts have been replaced?

Again, perhaps asking whether there is an essential core to the ship is the wrong way of approaching this. Not least because the essentialism/non-essentialism debate has been going on for much longer than I have the space to go into for this thesis, but more so because there are many more interesting questions to be asking. For instance, to go back to the Bush Pump, Law and Singleton (2005:338) maintain that "it is a moot point whether this pump has, or is, a stable set of relations a la ANT at all. The argument can be made that there is a core of stability—perhaps something about the handle, the lever and the valve is invariant, together with the fact that it produces water. Alternatively it can be argued that there is not a core of stability (this is de Laet and Mol's own suggestion). But this does not really matter, because much more important is the general fluidity of the relations that make up the pump". So de Laet and Mol, as we have seen above, argue that the fluidity of the relations that make up an entity – which in this thesis is the "self" - are far more important than determining whether or not it has a stable core.

Fluidity is similar to the concept of multiplicity, except for one subtle difference in the emphasis of what it is referring to. Recall from the earlier discussions in this chapter that multiplicity is about the different situated enactments of entities and objects which are made to be the same: despite their multiple instantiations, they are held to be the same thing by those with an interest in doing as such. To look at the doing of the self in this way would be to say that there are many different situated enactments of the self: the self enacted through the technology, the self enacted through the numbers, the self enacted through the visualisations, the self enacted through the community, or the self enacted through a combination of some or all of these. Yet, through some form of work, which we are yet to fully grasp, the self remains the same in particular situations and

sites. There appears to be some form of constancy to the self for self-quantifiers, where, even through changes, it appears to remain the same to those in the Quantified Self community.

It could be argued that the difference between the two is that the direction of fluidity runs the other way. Multiplicity looks at the different enactments of an object or entity and then investigates how, empirically, they are pieced together again, whereas fluidity starts with the object (in this case, the self) and then allows for it to be changed and parts replaced or lost entirely, and asserts that this is part of the adaptation process and therefore the object is still the same object despite this.

This is reminiscent of Aesop's Fable 'The Oak and the Reed' (found in Ashliman and Rackham, 2003), a story involving a storm striking an area containing an oak tree and some reeds. The Oak tree is uprooted entirely, whereas the reeds are still firmly attached to the ground. When the Oak tree asks the reeds how they managed to retain their position in the ground, the roots reply that the oak's stiffness and stubbornness meant that it was uprooted, whereas the reeds bent with the winds and adapted to the gusts and therefore were able to stand unbroken. And so it can be said about fluidity and de Laet and Mol's (2000) idea that there was no sharp or solid boundary to the Zimbabwean Bush Pump - as that would have meant that it would not have been able to hold up under so many different changes, both in terms of its physicality but also in terms of the context and discourse surrounding it.

Interestingly, in the paper where de Laet and Mol discuss the concept of fluidity, they also mention Michel Serres' ideas of an object containing its environment and argue that similarly, "in each of its identities the Bush Pump contains a variant of its

environment” (2000: 252). For the notion of entractment, this is very suggestive. According to de Laet and Mol (2000: 252), Serres posits that “the nature of an object varies with the methods by which it is measured, assessed or appropriated. There is, for instance, no ‘length’ of the coast of Brittany, Serres argues, for the length of the coastline followed by foot is different from that covered by following the highway; from the water the coastal length is yet quite another matter. Not only is the distance different in each of these instances; each length, by including its specific mode of measurement, is a different thing”.

This argument is similar to those outlined in Chapter 4 where I discussed Bohr’s argument that each new measurement of something was the measurement of an altogether completely different ontological entity. This, however, only becomes a problem if we take the entity to be fixed and rigid. Seeing the entity as multiple and fluid allows us to move away from seeing similarity and difference as mutually exclusive (Mol & Law, 1994). In the practices of self-quantification that I have observed and in the examples above, we can see that they are not mutually exclusive at all, and in fact, similarities and differences often go hand in hand without much discomfort. The same technologies and measuring techniques can produce different enactments of the self - this does not mean that the self collapses, but that the situation and the context brings about different selves at different times.

Coordination and Choreography

But what work needs to be done for there to be apparently no discomfort in being able to have both similarity and difference co-existing simultaneously? For Mol (2002: 55), “atherosclerosis is more than one - but less than many. The body multiple is not

fragmented. Even if it is multiple, it also hangs together". When many objects are regarded as the same, despite different means of getting there or even different ideas of what the resultant objects look like, Mol (2002: 84) argues that different forms of coordination work is going on to achieve this: 'adding up' or 'calibration'.

In the instance that two objects are made to 'add up', if there is a discrepancy between the two objects then one of them is made to 'win' by establishing a hierarchy and explaining the other one away. 'Calibration' is when the different objects are made comparable with each other as "the threat of incommensurability is countered in practice by establishing common measures" (Mol 2002: 85). I have encountered examples of both 'adding up' and 'calibration' occurring within the practices of self-quantification. In Chapter 4, I introduced Ben who experienced a form of cognitive dissonance between what he felt his blood sugar levels were, and what his blood glucose monitor told him his blood sugar levels were. It could be argued that in this instance a hierarchy was established between the two competing narratives of his self in the context of his blood glucose. And, since he decided to 're-tell' his narrative about his day before he came to meet me, it could be argued that the reading on the device trumped his own intuition, which he promptly explained away.

I have also seen examples of 'calibration'. Again in Chapter 4, I explained how Leo chose to 'negotiate' with his watch. The recovery period that the watch suggested did not match up to how he felt and with his own experiences as a runner. So he found a way to 'calibrate' the watch's suggestion with his own feelings and did not wait the full recovery time before going out for his next run.

However, there still seems to be something a little unsatisfactory about these explanations. They seem only partial, and there are still questions left unanswered. For example, how was it decided in Ben's case, that the device won out over his intuitions? Why did Leo negotiate with his watch rather than listen to it fully, or disregard it altogether? Since I was directly involved in that particular enactment of Ben's blood glucose level - what was my role in it? There is still something a little unsatisfactory about coordination as being able to explain how multiple and fluid objects are held together, especially when that object happens to be, as in this case, the self.

Another way of explaining how the self may be explained as being 'more than one, but less than many' is through the concept of choreography. According to Cussins (1996), the work needed to hold seemingly disparate objects together is the creation of a '*functional zone of compatibility*' between the many different entities involved. In her study of the technologies involved in infertility clinics and their connection with the self, Cussins notes that "the objectified body must not lose its metonymic relation to the whole person, and neither must the instruments lose their acquired properties of personhood in virtue of which they fix, by-pass or stand in for stages in a woman becoming pregnant" (1996: 600). In other words, referential power must be maintained between objects of different kinds - a process that she calls 'ontological choreography'. As she puts it, "the choreography is the coordinated action of many ontologically heterogeneous actors in the service of a long-range self" (1996: 600).

So, according to this idea, in order to have similarities and differences held together at the same time in the context of the self, there must always be a metonymic relation to the whole person, whilst at the same time the technologies used must retain their acquired properties as, for example, 'self-quantifying technologies' rather than

becoming abstract 'technologies' detached from their use. This is basically advocating, albeit in different words, that things must be seen in the context of their use and that we must not abstract things from the practices in which they are found. A point which I do not disagree with.

The issue, however, with both 'coordination' and 'choreography' is that they both still seem quite abstract in and of themselves. In terms of coordination, there is an implication inherent in the concept that there is an underlying coordinator overseeing the coordination. Who, in this case, is doing the coordination? Who does the adding-up and the calibration? When is one more appropriate than the other? And similar issues arise for the concept of choreography, where the definition unfortunately also includes 'coordination' as a mechanism: which 'heterogeneously ontological actors' are enrolled in the 'service of a long-range self'? And who is overseeing this coordinated action?

I proffer the neologism 'entractment' to address these issues and attempt to answer at least some of these questions. I argue that the multiplicity and fluidity of the self that I have observed through my ethnographic engagements with people who actively participate in practices of self-quantification is reconciled through the largely routinised enactment of intra-actions and extra-actions, in other words, through the entractment of self. I unpack this a little more in the next section.

The Entractment of Self

The entractment of self is a term that I use to describe the processes involved in 'doing the self'. It is an ongoing process of enacting intra-actions and extra-actions. And one which goes some way in explaining how the multiplicity and fluidity of the self both

stem from the practices of self-quantification (different practices of self-quantification often result in highlighting different aspects of the self and elucidating changes that have occurred), as well as being *managed and reconciled by* these practices too (the use of similar number schemes, having standardised ways of visualising data, and the routinised way of communicating these with other members of the Quantified Self community allows the multiplicity and fluidity of the self to retain constancy and coherence).

Let me turn to some examples. I introduced Usman in the previous chapter. He was tracking his music listening habits and creating visualisations from them to better understand how his taste in music had changed over time and what his music taste said about him. In that same conversation that I had with him regarding his music listening, he told me that:

"In terms of the things that I sort of track and what I am interested in, I think fundamentally I am totally oblivious of who I am."

It is precisely in tracking his music listening habits that Usman is engaging in the entractment of self. By choosing to track music in this way, by engaging in those particular softwares and technologies, by producing visualisations and by talking about this to other members of the Quantified Self community, Usman is entracting a self-that-listens-to-music-and-tracks-it. In those moments, that is a different self to the self that is not interested in music, or to the self that is interested in ketones or calories or heart rate. This is not to say that he may not also be these things, but that the boundaries of the self that he is explaining to me and to others at this given time is *this* particular entractment of the self. This is the agential cut that he has made at this time.

These are the technologies and data and people and context that are constitutive of the self at this time that is important in this particular context. These are the intra-actions and extra-actions that are enacted in this situation. This is the particular self that has been entracted.

With this in mind, one can be sympathetic to the phrase “I think fundamentally I am totally oblivious of who I am” simply because with self-quantifying technologies one is *doing* oneself at all times. “Knowing who I am” in this context would be like trying to fix the engine of a plane whilst it is still in flight! Only, with the self, one cannot at any point *not* be doing their self: it is constantly happening, being done, doing, making, being made - there is no metaphorical grounding of the self to take it to a mechanic or a garage. Except, however, it could be argued that the entractment of self is precisely when the self can be seen as being metaphorically grounded for inspection. The practice of self-quantification arguably allows the self to be momentarily freeze-framed - it slows the process down a little for the agential cuts to become visible for a period of time, to allow for self-reflection and to allow it to be communicated with others. But even then, they are still *doing* the self - they are doing the self that is being reflective! The self that is communicating!

If the entractment of self could be described as a formula, it would read thus:

$$\textit{Entractment of Self} = \textit{Enactment} (\textit{Intra} - \textit{action} + \textit{extra} - \textit{action})$$

The ‘intra-action’ part of the formula refers to the direct use of self-quantifying technologies on/with/for/by the self. The ‘extra-action’ part refers to the resulting numbers and data visualisations. The ‘enactment’ part refers to where these two

actively come together (or are brought together) to form a narrative about the self that is produced in conjunction with the others in the Quantified Self community through Show&Tells, post Meetup pub conversations, blogs, and forum posts. It is a way of using the numbers and data visualisations and technologies to be able to talk about the self as if it were (at least for a very brief moment) stable.

In my two and a half hour conversation with Samuel, whom I first introduced in Chapter 4, he often talked about various different things all having changed, yet he was able to achieve a form of constancy where all of the different aspects of self-quantification and changes were brought together for him to be able to share a snapshot of that self with me in that moment, as well as to others who might have asked him about it:

“Yes. So here is the thing that everybody can do for about £10 on Amazon - you can buy a pedometer. And just put it in your pocket and you just have a target of 10,000 steps a day and just do it. And wear some soft shoes from work at lunch time and go out and do it for an hour. It is as easy as that. So Joe and Jane public can do it. That’s what I want. You don’t have to be a performance athlete. So that was my starting point... So I started my program here but over the period from April to December 2008 I went from 85 kilos to 65 kilos. And every day I was standing on the scale first thing in the morning. Get up, go to the bathroom and then you have to moisten your feet, pressed a couple of buttons, stand on the bars and it does all that for you. And that’s wonderful feedback. And people say you should not measure every day. But that’s what you’re to do if you’re trying to achieve a goal - it does help. In this period of my life it was absolute OCD. I was obsessive, I was compulsive, I was obnoxious, I was difficult to live with [Laughs] because I was obsessing about this. But look what I did, I moved from 85 kilos to 65 kilos. I got rid of a fatty liver. I got rid of high blood pressure. I dropped 2 waist sizes. And I got my BMI from above 25 down to about 22.5 during that period.”

In just a few sentences, in just under a minute’s worth of speech, Samuel was able to tell me about over a year of his self: a multiple self that moves from 85kg to 65kg, one who's BMI fluctuates from above 25 to about 22.5. It is also a fluid self that is

‘obsessive’ and ‘obnoxious’, and one that used to be a self with a fatty liver and high blood pressure, but is no longer those things. Yet, as he talked about the technologies he used, the numbers that they produced, and showed me the printouts of graphs depicting these changes, Samuel was able to hold all of these differing enactments of the self together as he enacted this particular self in front of me that day. And the holding together of Samuel, the constancy of his self, was not just an achievement for himself, it was also something that was achieved by the person he was communicating this self to - in this case, me, but more generally also by any future audience or community.

Samuel is not an isolated example of all of the different parts of enactment coming together. In another conversation, I spoke with Quinn, a self-quantifier interested in understanding his bodily response to stressful situations. He chose to look at his heart-rate variability and how this was affected by entering into a ‘stressed’ state:

Me: Why did you choose heart-rate variability as the thing to track as opposed to any other physical indicator?

Quinn: "I went into an environment which I knew caused me stress which is calling toll-free numbers. I knew that that got me very wound up. And I put on a heart-rate monitor because I wanted to actually test whether my heart rate went up when I got angry and there was no correlation. My heart-rate would not jump - I mean I didn't do a lot of mathematical work - but I could just see that there was no correlation. I recorded every session, have the heart rate monitor and downloaded it all onto Garmin express so I could actually look at the time maps and say ok this is what was going on when my heart spiked. And in every case where my heart spiked I was actually trying to be likeable. The pattern was more me trying to interact with the person which was very different to what I thought. But there wasn't enough randomness in the heart rate that I didn't see that as a path to get at stress.

Once again we can see the entractment formula at play. Quinn talks about the technologies he used, the numbers that resulted in terms of his heart-rate, and the visualisations that he looked at in the form of time maps and heart-rate graphs. The self that is entracted here is the self that tries to be likeable, not the self that gets 'wound up' when calling toll-free numbers, which is as he had originally thought and predicted. His telling me this story using these 'tools' for his narrative (self-quantifying technologies, numbers, and visualisations) invokes the community of the Quantified Self: he draws on assumptions that, as a fellow member of the Quantified Self and as someone who is interested in this area, I will understand the use of heart-rate monitors and follow the significance of looking at graphs to understand when the 'spikes' occurred. He takes it as given that I will trust in the numbers as he does, and in the technology's capacity to produce the numbers that are good enough for him to be able to draw these conclusions about the self. My complicity serves to reify this self, and becomes enfolded into this entractment of his self.

The diagram below (Figure 17), shows how the constancy of the self is achieved through the component parts of the process of entractment. The 'entractment of self' in the middle refers to a self that has achieved constancy, for however brief or long a period of time, as the result of intra-action, extra-action, and the enactments within and through the community that one is in.

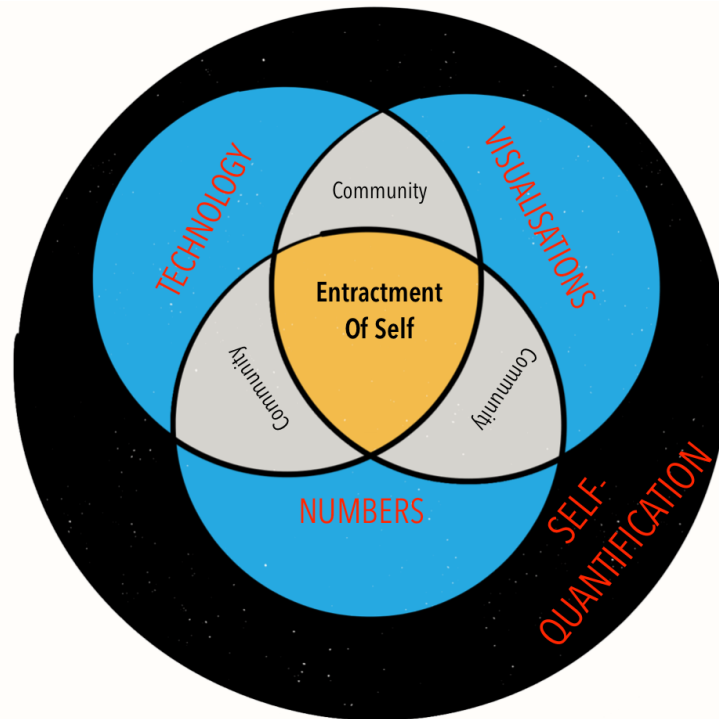


Figure 17: The Entractment of Self

Subjectivity

The concept of entractment as discussed above, however, entails a curious quirk, where the *subject* that is doing the self-quantification is also the *object* of that quantification. Another example will help to highlight this apparent paradox. I first introduced Dom in Chapter 5, where I discussed that he was engaged in practices of self-quantification in order to lose weight, and was interested in making the numbers work for him in terms of increasing motivation.

“Because everything I’ve tried in the past haven’t worked and it will probably take thousands of hours of therapy to get to the bottom of why I eat like a pig when I eat. So I don’t have thousands of hours and I don’t have the hundreds of thousands of pounds a week it would take to do it so am just choosing to park that and I’ll deal with what I can deal with, what I can quantify, and how I can influence that.”

In the quote above, we see that Dom is interested in his eating habits, he is interested to 'get to the bottom of why I eat like a pig...". At the same he believes that he cannot, without thousands of hours of therapy and thousands of pounds, know these deeper psychological reasons. He is, however, conscious of those things that he can quantify and deal with himself, and so he chooses to focus on those things. As we know from Chapter 5, Dom uses MyFitnessPal to track the calories he consumes and expends, and uses a Fitbit to monitor his steps. In all of this, Dom is both the object that is in need of being quantified, and the self that is doing the quantification. The table below (Table 2) explains this point further:

	Object	Subject
Self	Dom is the object of quantification	Dom is also the subject that is actively engaging in these practices of self-quantification
Self-Quantifying Technologies	MyFitnessPal and Fitbit are used to serve his purpose of losing weight	MyFitnessPal is able to track calories in and calories out if the food consumed is already in the database of foods, and the exercise done follows standardised calorie expenditure metrics. Fitbit tracks number of steps taken and approximates number of flights of stairs climbed. Weight loss, according to these self-quantifying technologies therefore, is quantifiable through net calories and steps taken.

Table 2: The Subjectivity of Self I

The table shows how the self and the self-quantifying technologies used are both simultaneously object and subject in practices of self-quantification. As discussed above, Dom is both the object of self-quantification, yet at the same time he is also the subject that is doing this self. And the same point is also true of the self-quantifying

technologies that are used. They are both the ‘object’ that is used, but also the subject of the practice of self-quantification. The table below (Table 3) makes the point more generally for the ‘subjective’ nature of both the self and self-quantifying technologies in practices of self-quantification:

	Object	Subject
Self	The entity that is being quantified	The entity that is doing the quantification
Self-Quantifying Technologies	The entity that is used to do the quantification	The entity that ‘determines’ what is quantifiable in the first place, and how this thing can be quantified

Table 3: The Subjectivity of Self I

This idea of the ‘subjective’ self follows from the discussion of ‘queering the self’ in Chapter 4. There, the discussion centred around the self-quantifying technologies being both without and within the self. They are *without* in the sense that these technologies are, for all intents and purposes, on the outside and objectifying the self by being able to measure it and imposing certain ideas of what is quantifiable and how. Yet, they are also *within* in the sense that it is the self that is using the technologies to quantify, track, and monitor itself, using the data that results and enveloping these into the narrative of the self. The self is therefore simultaneously ‘being done to’ and ‘doing’ at the same time, in much the same way as Barad described how the electron both emits and absorbs its own photons (Barad, 2013).

The Entractment of a Self That Never Was

Sometimes, the practice of self-quantification can lead to the entractment of a self which has negative consequences for the self-quantifier. So far, I have discussed

examples where the self-quantification has led to surprises or revelations which resulted in the adaptation of the self in some way - for Ben, his narrative about his day needed to be changed to be able to corroborate his story with the device, for Tamara, her view of her ride to work was adapted in some way to account for the relative calories burned versus the amount she consumed in her morning snack, and so on.

But what about those instances where self-quantification leads to an entrainment of self (seemingly held up by all parts of the formula - the technology, the numbers, the visualisations, and the community's reactions/negotiations), that turns out to be based on a 'falsity' that then has negative consequences? Such a thing happened to Ed, a self-quantifier from the London Quantified Self. He had started to use a blood glucose monitor to track his blood sugar levels and was surprised by the outcome:

"So when I bought my blood sugar machine, I didn't read any of the instructions. So I plugged it in, pricked my finger, put a bit of blood on the measurement device, electronic... I don't really know how you would describe it actually. But you essentially draw a bit of blood onto a little filter paper and it gets measured. What I didn't really like is, you have to calibrate the machine first. Now without the calibration obviously the measurements are inaccurate. I was performing these tests, and my blood sugar was quite high. It was within the diabetic range, and this really panicked me. I was like, what am I doing wrong? Why am I diabetic? I don't have any of the sort of the typical symptoms, or I don't really fall into the category physically, of someone who is at risk of diabetes. So this again really worried me, and I couldn't get an appointment with my doctor for three days. So it's like, three days of me thinking, I'm diabetic, what am I going to do? Sort of chewing over it for three days, reading up online what diabetics can and can't eat, all this type of stuff.

And then I went to the doctor to get it checked out and they were like, everything's fine. They did the blood test and that nothing is wrong. Your blood sugar levels are normal, that was it. Obviously they told me that I'd probably want to calibrate my machine as well. I think that's a danger, right? Because I have had no medical training, I have no real affiliation academically to medical professions...so I spent three days, probably very negatively to my health, worrying over what I had found. And you know, I think that's

the negative experience to me, and it really opened my eyes to, okay, quantified self is a good thing, but it is also a very dangerous thing if people aren't doing it right."

Ed's entractment of self was a self that was diabetic. The reading on his device, he tells me, repeatedly indicated that his blood glucose levels were in the diabetic range, and this panicked Ed. He was sure that he did not have any diabetic symptoms (other than the reading on the device) or the physique of someone who may be at risk of diabetes. Nevertheless, for the three days whilst he waited for his doctor's appointment, Ed thought that he was diabetic and looked up what this meant online. For three days Ed's entractment of self was a self that had diabetes, which he later found out not to be the case.

The example of Ed highlights the point that sometimes the practice of self-quantification leads to an entractment of the self that is later seen as being 'false', or may even have negative consequences precisely because of the performative nature of self-quantification. Chapters 3, 4 and 5 have all, in one way or another, pointed to the idea that the technologies, numbers, and visualisations are not 'mere' representations of an already existing self, but performative of the self that is enacted as a result. In a case such as Ed's, where the technology was not used correctly, the consequences can be the entractment of a self that, it turns out, never was!

Self-awareness

In this chapter so far I have discussed how the practices of self-quantification result in the entractment of a particular self tied to certain technologies, numbers and visualisations, and how, through this process, some semblance of the constancy of the

self was achieved. However, there is also a paradox involved with the entractment of self. The motto of the Quantified Self is 'self-knowledge through numbers', yet, on many occasions I found that the deliberate entractment of self that resulted from the practice of self-quantification actually made people aware of how *little* they actually knew about themselves, or of how little self-awareness they had.

Take Tom, for example, another self-quantifier that I met with in a coffee shop, this time in Downtown Berkeley in California. As in the case of Usman's proclamation that he is completely oblivious to who he is, Tom had a similar realisation that he was not as self-aware as he thought he was:

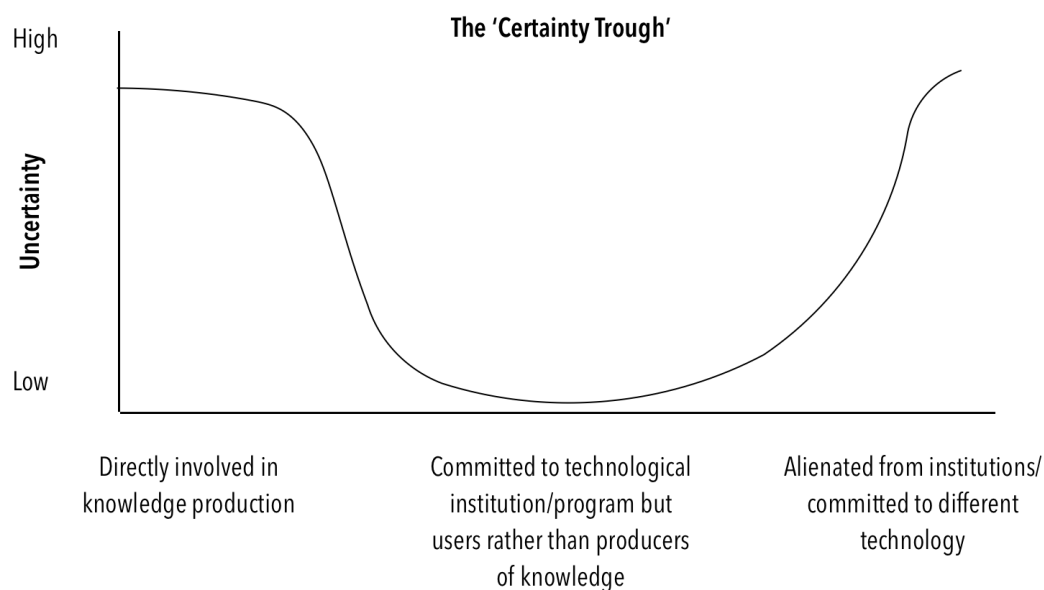
"I think I have a self-image of being relatively self-aware, but the process of doing morning review and just looking at what you actually did, even if you are self-aware, in certain respects makes you aware of blind spots and the likelihood that there are many other blind spots."

Here we see someone who thought that he was relatively self-aware, but through his practices of self-quantification realised that there are aspects to himself that he is not even aware of, and that his knowledge of himself contained blind-spots. And this notion of being surprised by oneself - whether it be because someone has become more aware of their *lack* of awareness about themselves through the process of self-quantification, or because the practice of self-quantification has revealed something about themselves that they were not aware of before - is a common feature of self quantification. Bryony, another self-quantifier from Berkeley, also commented on her lack of self-awareness:

"I mean, maybe I'm just really not self-aware, but it's been interesting for me to] kind of connect, you know, number of steps to how my body's feeling at the end of the day."

These examples highlight how self-quantification can sometimes reveal more about what someone does *not* know about themselves than what they do know. And since they did not know what they did not know before engaging in self-quantification practices, it can be argued that awareness of lack of self-awareness can be a product of self-quantification.

This is similar to the ideas conveyed by MacKenzie's (1990: 372) 'certainty trough' (see Figure 18 below). In his study of strategic ballistic missile guidance technology, MacKenzie discusses the levels of uncertainty felt by those who are directly involved in the production of the knowledge/technology, those who have bought into the institutions and discourse surrounding the technologies/knowledge but are users rather than producers of the knowledge, and those who, for one reason or another, are both alienated from the institutions involved in the production of the technologies and knowledge, and perhaps even committed to a different technology altogether.



Source: Mackenzie (1990:372)

Figure 18: The 'Certainty Trough'

I argue that a similar thing can be seen with with practices of self-quantification. However, rather than uncertainty, the y-axis corresponds to levels of awareness of lack of self-awareness. Here, those who don't engage in practices of self-quantification but do subscribe to the idea of learning more about the self have little awareness of their lack of self-awareness. They trust in the idea of self-knowledge and believe that it is a worthwhile pursuit, yet they do not engage in practices of self-quantification. They go about their lives feeling as though they know what and who they are - guided by 'experts' such as doctors or scientists or others who have already experimented on themselves or self-quantified.

There are also those who do not subscribe to 'self-quantification' and who are not interested in this particular pursuit of self-knowledge. They are the disenfranchised and the 'sceptics', who, either do not have the capabilities or resources to self-track (either in terms of having the disposable income to afford the technologies or having the language or community in which to discuss their practices), or who are simply unconvinced about their utility and benefits. This group of people, I argue, may well be described as having a futile attitude to self-awareness in the sense that they believe that although there is much that they are not aware about, they are unconvinced that the practices of self-quantification will change this, or if self-quantification is a worthwhile pursuit in the first place.

Although my research did not set out to interact with people who may be placed in this last category, I nevertheless encountered a few people who I believe would have fallen into that description. There were some who, when I would describe the research that I was involved in, told me that they were not interested in the practices of self-

quantification - they preferred to 'just go for a run without worrying about how fast it was' or 'eat what I feel like without worrying about calories'. They seemed unconvinced that the technologies were good enough to capture what they claimed to capture, and felt as though it was too complicated to even try. They seemed relatively aware of how little they "knew about themselves" (regarding things like why they might over-eat, or why they might have particular sleeping patterns, or why they may feel sad/happy sometimes) and did not think that the practices of self-quantification would solve that.²⁵

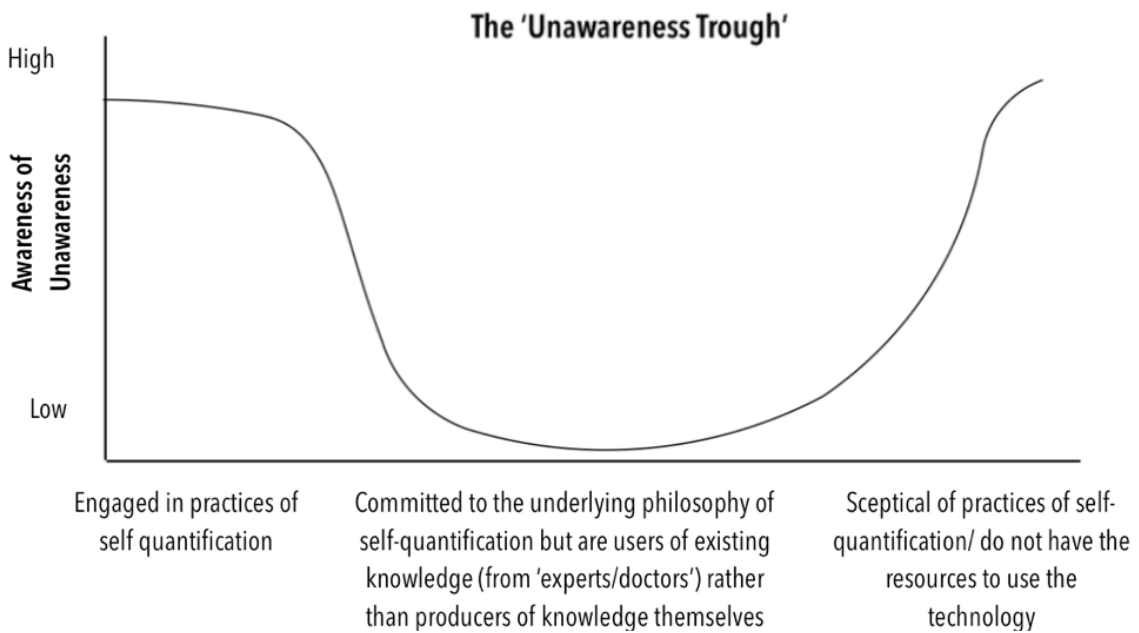


Figure 19: The 'Unawareness Trough'

²⁵ What counts as 'knowing' about the self here is primarily defined by the QS community, i.e. those configured users who fall on the left-hand side of the 'Unawareness Trough'.

Finally, there are those who actively participate in the practice of self-quantification. Through this practice, they realise how much it is that they don't know about themselves and also potentially how much more they may not be aware of. Usman realised this after tracking his music listening habits, Tom after his 'morning review', and Bryony after realising that she had no idea about how much she was walking each day and how this might affect her. The 'closer' they got to themselves, it seemed, the further they realised that they actually were from knowing who they were, if this was even a possibility at all. The practice of self-quantification, therefore, may counterintuitively lead one to the conclusion that they are not as self-aware as they had originally thought.

Conclusion

This chapter began with the observation that the practice of self-quantification often produces many different parts of the self: heart rates, mood graphs, weight fluctuations, ketone levels, etc. More so, these often change over the course of time, or may be different in and of themselves if different ways of quantifying the metric are practised. Yet, despite the many differences, there appears to be some constancy to the self.

I argued that the multiplicity and fluidity inherent in the quantified-self is reconciled through the process of 'entractment'. Entractment is a way of conceptualising how the self is done in practices of self-quantification. The concept of entractment builds on the existing concepts of enactment (Mol, 2002) and intra-action (Barad, 2007). It combines these concept with the addition of extra-action (which I argue to be the corollary of

intra-action), which together make for a more complete picture of what is involved in practices of self-quantification. To recap, entractment is the process by which the intra-actions and extra-actions (the technologies, the numbers, and the visualisations) are enacted within a community to achieve a constant self, despite it being so fluid and multiple.

As the self is constantly being done, the practice of self-quantification serves momentarily to freeze-frame the self so that it can be reflected upon and communicated with others. Sometimes this reflection might be a self that has improved/deteriorated, other times it might be the production of a self that, it turns out, never 'actually' was, or sometimes it may even be the realisation that one is not very self-aware at all. Despite this, in each and every one of these scenarios - there is a self that has been entracted. Even in the case of a self that turns out to be otherwise after all, as in the case of Ed and his entractment of a self that had diabetes for three days until he found out that this was not the case, a certain self had been entracted. There is no escaping this: one cannot simply stop *doing* the self at any point.

In sum, therefore, self-quantification is a productive process of self-making from within and from without, and one that is situationally enacted. And in this chapter I have argued that the term 'entractment' is a useful way of conceptualising the different elements involved in this.

Chapter 8:

Conclusion

I began this research at a time when ‘wearables’ and ‘self-quantifying technologies’ were starting to make appearances in news articles, magazines, sports shops, electronics departments, and online mobile app stores, and they still continue to occupy these arenas. It was clear that this growing phenomenon deserved attention in order to understand the processes involved in their use and the implications that these entailed, especially for our understanding of the notion of the self. Upon assessing the current literature, some key questions emerged: How, for example, do self-quantifying technologies and the self relate? What are the key features of self-quantification? How do practices of self-quantification bear upon the ‘doing’ of the self? These were the guiding questions of this research.

In the last seven chapters, therefore, I have explored various aspects of ‘doing’ the self in the context of self-quantification. The literature review that I conducted in Chapter 2

highlighted where there was still work to be done: first to understand how self-quantifying technologies and the self relate, and second, to understand the processes through which the self is 'done' through the practices of self-quantification. As discussed in Chapter 3, the empirical work of the thesis involved over four years of ethnographic engagements with members of the Quantified Self in various forms - from participant observations, to one-on-one conversations, to watching videos of 'Show&Tell' presentations. A closer analysis of these engagements through coding the transcriptions and field notes suggested that there were four main issues which were imperative to understanding how the self is done through the practice of self-quantification: agency, number, visualisation, and enactment. These issues became the core of the thesis.

In the four empirical chapters of the thesis I have systematically deconstructed and pieced together the practices of self-quantification. The structure of the four empirical chapters was guided by my empirical work and the gaps that I found in the literature. Conveniently, they also followed what I observed to be the most crucial aspects in the typical cycle of how self-quantification was approached: someone used a technology to quantify themselves (Chapter 4: The Agential Self), this most often resulted in the production of some numerical data (Chapter 5: The Quantified Self), and these numbers were then turned into visualisations which were used to see and communicate the self (Chapter 6: The Visualised Self). These different processes resulted in a self that was necessarily both fluid and multiple, and the final chapter (Chapter 7: The Constancy of the Self) discussed how, in light of this, constancy of the self was achieved through what I have termed the 'entractment' of self: a process by which the technologies, numbers and visualisations are all enacted within a

community to produce a self that appears to be fixed and stable in a given moment in time, so that it can be reflected upon by the self, and communicated to others in the community.

In this conclusion, I first outline the key findings of the thesis. I then discuss the contributions to the literature of each chapter, and also of the thesis as a whole. Next, I highlight some future issues to consider - important questions which I did not set out to explore in this thesis, but which are pertinent for guiding future research in this area.

Key Findings

By conducting a literature review in Chapter 2, I found that much of the existing literature in the STS domain focuses on conceptualising the relationship between technology and society, and relatively little is focused on the relationship between technology and the self. In that literature, concepts of agency and performativity are discussed in a way in which the very nature and being of entities are not questioned: the existence of entities is presumed before the analysis has even begun. I found that approaching the issues of agency and performativity through the lens of Karen Barad's theory of agential realism allowed for an investigation into the ontological nature of entities.

Barad's notion of intra-action posits that no entities exist prior to their interaction with each other. Since *interaction* implies the relation between two already existing entities, and this is precisely what she is arguing against, Barad offers the term '*intra-action*' to overcome this difficulty. In Chapter 4, I used this notion of 'intra-action' as a way of

investigating how the self is done in the context of self-quantification, without presuming the *a priori* existence of either. I found that it was useful for articulating the difficulties of separating out 'technology' from the 'self', and highlighting how, in practice, any separation of the two would be making a false distinction. After all, what is a 'self-quantifying technology' in the absence of the 'self'?

I analysed my empirical material through the lens of agential realism - discussing how the practice of doing the self might be better understood by using Baradian concepts of 'intra-action' and 'agential cutting'. Recall that, similar to ontological gerrymandering - a term used by Woolgar and Pawluch (1985) to describe the instance where many beliefs are held at the same time but only one is held in focus at one time - agential cutting describes the process whereby certain explanations are excluded or included from a phenomenon, where boundaries are created and temporarily maintained in certain contexts.

In the practice of self-quantification, certain aspects of the self are included in the agential cut, whilst others are excluded. For Ben, as a diabetic, his blood glucose level was included within the boundary of his self for the context of his self-quantification, whereas his propensity for the colour violet or his favourite rap artist, for example, were excluded. The main conclusion from this chapter was that agential-cutting helps us to think about how boundaries are continually formed around the 'self': the technology cannot be divorced from the self and from the practices of self-quantification because they are one and the same thing at that precise moment of intra-action.

At the end of Chapter 4, I pointed towards the need to question the role of numbers in the processes of self-making vis-a-vis self-quantification. During my field-work, I found the technologies that were being used for self-quantification were not homogenous - in fact there were numerous technologies that were being used for multiple purposes, and even numerous technologies being used for the same purposes. Yet, the one thing that seemed to be common amongst most practices of self-quantification was that they resulted in the production or generation of some numerical data: sometimes different technologies produced different numbers and at other times they produced the same numbers, sometimes the same technologies produced the same numbers and at other times they produced different numbers! What was going on? What role did numbers play in the doing of the self?

First, I found that the numbers that were produced through practices of self-quantification started to supersede the original goal of the self-quantification. The achievement of a lower resting heart rate, for example, became the goal in and of itself rather than simply being a way to measure one's overall level of fitness. Secondly, I showed how, although the literature tends to point to the idea that numbers are more objective than written accounts, there is an extra layer of translation required to understand numbers. Rather than inherently knowing that one's mood is a '6' on a mood scale, translation is needed to go from the felt mood, to a number that best resembles this felt mood, and then this needs to be translated back again into a narrative format so that is comprehensible by others. Finally, I discovered that members of the Quantified Self often talked about the numbers allowing them to 'see' things that were otherwise unknowable.

Chapter 6 picked up on this point of 'seeing things' and started with the observation that numbers, in and of themselves, are rarely what is presented when talking about the quantified-self. These numbers are, in almost all cases, transformed into a graph of some sort. Analysing how these visualisations feature in practices of self-quantification highlighted that self-quantifying technologies enabled a new way of 'seeing' the self, and sometimes provided motivation for certain people to continue their self-quantification practice. I also found that there were implicit standards for acceptable data visualisations, and that a transgression of these standards led to the audience becoming disinterested or disengaged from the process of doing the self.

The inclusion of the audience in the doing of the self is one of the most important aspects of data-visualisations in practices of self-quantification. Here, others are enrolled into the doing of the self by allowing them to partake in collectively enacting what the visualisation may be revealing about the self. Through data-visualisation, the doing of the self becomes a community achievement.

Paradoxically, in trying to show the nuances and uniqueness of their self, the person engaged in practices of self-quantification presents similar visualisations measuring similar metrics using very similar language as others in the group. As I argued in Chapter 6, data visualisation, rather than simply being the 'representation' of an individual self, can therefore be seen as performing a particular *community* of quantified-selves. To be an individual, here, depends on being part of a collective, and the collective is enacted during the communal process of seeing the self through data visualisations.

In the final empirical chapter, I discussed how the constancy of the self is achieved in the face of multiplicity and fluidity. I showed that whilst the concepts of coordination and choreography went some way in explaining how things are held to be the same, the implication of a central coordinator or choreographer meant that they could not be used as adequate explanations for how the constancy of the self is achieved. As Hacking (2004: 284) remarked, “there are too many battling selves of which no one can be conscious, for there to be a single self who is choosing and judging”.

I offered the term *entractment* as an attempt to overcome some of these issues. *Entractment* is a term that describes the processes involved in doing the self where many of the potential causes for the fluidity and multiplicity of the self (different practices of self-quantification using different technologies resulting in different numbers and visualisations) are managed and reconciled through standardised ways of using the numbers to produce familiar graphs and visualisations, routinised ways of talking about the visualisations (the phrase ‘as you can see’), and enacting them within a community to accomplish a self that is stable for a given period of time.

Contributions from a ‘Privileged Case’

Whilst it may seem as though the “Quantified Self” is too narrow a case to generalise from, as I pointed out in Chapter 3, the choice of the Quantified Self should be viewed in much the same way as Mialet (2012) viewed the choice of Stephen Hawking as a case from which to make broader comments about agency and knowledge construction. She argued that Stephen Hawking was “an exemplum - a type. If there are differences, they are not in essence, but in degree” (Mialet, 2012: 191). Given the uptake and diffusion of technologies that have the potential to quantify (and record,

monitor, measure, and track) the self, the degree to which people are using technologies as part of the practice of 'doing' themselves is also growing. The Quantified Self, therefore, represents one extreme end of the degree to which the self is done in this manner, and their particular practices give us insight into the processes that are involved in the doing of the self.

In any case, I have not set out in this thesis to uncover, once and for all, *what* the self is, but instead investigated *how* it is done and made in the particular context of the Quantified Self. And I have described the processes which contribute to the achievement and maintenance of constancy. In doing so, I have contributed to existing literature on agency, performativity, number, visualisation, and enactment. I have shown that whilst some literature is useful in aiding our understanding of the doing of the self, in its current state, it can only take us so far. Whilst Barad's theory of agential realism for example, was a useful theoretical starting point, I set out to investigate the concepts of intra-action and agential cutting in practice (Chapter 4) to show how self-quantifying technologies were implicated in the production of a boundary around that which we may call the self.

I also showed how existing theories of the apparent immutable mobility of numbers did not hold in this context (Chapter 5), and that rather than representing an existing phenomenon, data visualisation is vital for enabling a communal 'seeing' and enactment of the self (Chapter 6). Finally, I showed how although the concepts of coordination and choreography are crucial for explaining that there is a lot of work to be done in the face of fluidity and multiplicity to enable phenomena to retain some stability, their implication of some central coordinator or choreographer doing this work diminished their explanatory power. Therefore, in order to understand how the

constancy of the self is achieved, we need to see the process of the doing of the self as a communal entractionment, that is, as the enactment of the technologies, numbers and visualisations, rather than the outcome of the deliberate actions of some overruling controller (Chapter 7).

Future Issues to Consider

Throughout this thesis I have argued that we need to expand the way that we understand the self if we are to grasp how the self is done in practices of self-quantification. Given this, a pertinent question to consider is whether the practices that I have observed in the Quantified Self will continue to increase in popularity and gradually expand into the wider society. And what might be the conditions for this to happen? Conversely, what might be the conditions that lead to it falling out of favour?

In any case, whether the widespread uptake of the Quantified Self, or its demise, this new way of understanding the self as a communal entractionment is important. It emphasises that the self is not a static entity that pre-exists our curiosity about it. It highlights that our dealings with the self are productive of it; that it is never a settled or completed account, but is a phenomenon that is perennially in-doing. Consequently, it becomes really important to consider the technologies that are used in these self-quantifying practices, the implications of attributing numbers to aspects of the self, what it means to 'see' ourselves through data visualisations, and with whom we see these visualisations.

These are important issues to consider because if, as I have argued, the technologies cannot be separated from the self, then that technology becomes an integral part of the

self. And in that case, the choice of the technology also needs to be considered. This is not to ascribe some deterministic capabilities to the technology, but to emphasise that they have an important role to play when it comes to the doing of the self. The other aspects involved in the processes of self-quantification - the numbers that result from self-quantifying practices, and the resulting data visualisations - are therefore also pertinent as they are all complicit in the doing of the self. And finally, the community that one finds oneself in - the community that this self is both done *with* and *in* - also needs to be taken into account, because if, as I have argued, the self is a communal entrenchment, then this community also becomes an integral part of the self.

What, then, are the consequences of the expansion of self-quantifying practices beyond the Quantified Self? To come back to the rationale for my MPhil research, if self-quantification practices come to be seen as a solution to alleviate stress on overburdened health services, then what are the consequences for the general health of the population? If the neoliberal scenario outlined by Lupton (1995), where citizens voluntarily take up practices of self-quantification in an effort to be more responsible for themselves and their health, becomes widespread, what might we need to be aware of when thinking about policies to do with patient care and health care funding? For notions of community and solidarity? Whilst my thesis has not set out to address these questions, the arguments that I have made about doing the self and of the entrenchment of self offer a way of framing these important future questions, and highlight the crucial aspects of self-quantification that ought to be considered.

In this thesis I have explored the processes involved in the practices of doing the self through self-quantification. Whilst Foucault (1983; 1988b), Rose (1996), and Hacking (2002) have made clear cases in the past for understanding the self as soul, brain, body,

or social construction, I have shown that in the context of self-quantification, we must understand the the self as a communal entractment. That is, we must understand the self as a collective enactment achieved, at least in part, through the use of self-quantifying technologies that produce numerical data which facilitate visualisations that are imperative to the doing of the self.

Appendix A:

‘Matters of Agency and Performativity’: A Dialogical-Seminar with Karen Barad and Trevor Pinch

‘Fairy Stories’ vs. ‘*Serious Academic Studies*’

The form of this section is slightly unconventional, but still more conventional than one may think. It is unconventional in that it departs from the traditional monological format of writing and instead uses a fictional seminar and a semi-fictional dialogue to make the arguments. It is more conventional than one may think because it is a form of writing which has been used several times before with great effect. For instance,

Woolgar's (1989) response, in the form of a 'coffeehouse conversation', to a paper published in *Social Studies of Science* (SSS) by Slezak (1989) that supposedly refuted the 'strong programme' within the sociology of scientific knowledge (SSK). The conversational style works remarkably well - within the guise of this coffeehouse conversation, Woolgar outlines Slezak's arguments and works in his own responses to it. It allows him to be visibly reflexive about his own commentary through the responses by the interlocuter. This is a form of reflexivity that often gets missed in traditional monologues - or, at the very most, is relegated to the footnotes.

As well as the reflexivity that it engenders, this dialogical literary form also promotes further actual dialogue in the discipline. In the same issue of SSS, for example, Myers (1989) published a paper which responded to both the article by Slezak, as well as to Woolgar's choice of literary format. Calling it a 'Conversation over Dinner' rather than a 'coffeehouse conversation', Myers uses a similar technique of two people having a conversation with each other to get his points across. This dialogue between two papers in dialogical form is thus a powerful way of building on existing ideas and fostering new ones.

These are not the only examples which leave behind the traditional monologue. For example, Ashmore is well known for using novel literary techniques to make important points about reflexivity and SSK. 'The Reflexive Thesis' (1989) combines many different modes of writing, of which the dialogue is just one. He also constructs an encyclopaedia of 'reflexivity' as well as a mock lecture - all of which help to make his points in an interesting and engaging way. Ashmore also co-authored 'Health and Efficiency' (1989) alongside Mulkay and Pinch, where two of the chapters are in dialogical form.

Mulkay is not new to innovative forms of writing. In the introduction of his book 'The Word and the World' (1989), he brings the 'reader' into the text. He uses this potential reader to make the point that dialogues are often equated with 'fairy stories' rather than being a part of a 'serious academic study', and that readers expect authors to provide them "with a single, coherent, understandable story about a particular segment of the world" (1985:2). Therefore, whilst the suggestion of a dialogue between potential reader and author is interesting, he writes that he'll "return to the comfort and safety of the conventional monologue" (1985:2). Of course, by responding to this potential reader at all, the text has necessarily and deliberately already become a dialogue...

His tongue-in-cheek remark about the 'comfort and safety of the conventional monologue' turned out to be, unsurprisingly, rather insightful. A few years after *The Word and the World* was published, Mulkay wrote an article called "looking Backward" (1989) for *Science, Technology & Human Values* (ST&HV). In it, he presented the transcription of a speech by a woman speaking about the state of the STS discipline from 100 years in the future. She comments how the old culture of STS (which is the current one since she is speaking as if she were 100 years from now and so her past is our present) was dominated by language that promoted "unitary, internally consistent, definitive accounts" regardless of whether they were dealing with the social or the natural worlds (1989: 453). This is the reason, we are told, that her own speech is given in a unified and coherent matter - so that we can engage with this dominant language of the past (our present).

Although this article was accepted in ST&HV, the editor added an appendix to it where he printed some reviews that the paper had received. The reception to the article was

mixed. One reviewer commented that they “see this piece as nothing more than a jeu d’esprit” and “there might be a serious article buried within this” but this would require the author to “return far more to the premillennium discourse worlds” than he might care to (1989: 458). It seems as though Mulkay was not wrong in threatening to quash his potential reader’s voice in *The Word and the World* for fear of it not being seen as *serious* enough!

Another of the reviewers, however, described the piece as “an artistic and rhetorical success” that is both “affecting and effective” (1989:459). That is to say that there will always be naysayers to novel literary forms, but they are not the only opinion. There are great merits to using different techniques to critique and communicate arguments both old and new: they can be engaging, insightful, and provocative in ways that traditional monologues cannot be. They can help to deconstruct difficult material and help to make meaning of it. They can allow forms of reflexivity not obtainable otherwise. They certainly do not work in all cases, but in the context of reflexivity and epistemological discussions about the sociology of scientific knowledge, they are, as the reviewer put it, both affecting and effective. And faced with Karen Barad’s theory of Agential Realism, with its firm roots in quantum mechanics, I assure you, dear reader, that my choice of dialogue is in both of our best interests.

The form of dialogue that I present in this section differs slightly from the above dialogues in that the main interlocutors, Karen Barad and Trevor Pinch, are real people, rather than fictional, and much of the dialogue between them comprises direct quotes from their writings. In particular, the dialogue draws upon an interaction between these two academics when Trevor Pinch published a review of Barad’s book *Meeting the Universe Halfway*, and Barad published her reply. Amongst the other characters is

myself in various forms (or should this be my various selves?) and Steve Woolgar who was at a conference with Barad in Oxford in 2010. Nor is the technique of mixing direct quotes with analysis new. For example, this was how an infamous debate between Gabriele Tarde and Émile Durkheim was created by Vargas et. al. (2008). That paper also consisted of actual quotes by the two protagonists but with added dialogue to make the narrative flow and make sense.

Matters of Agency and Performativity: A Dialogical-Seminar with Karen Barad and Trevor Pinch

COUNTING DIFFERENTLY

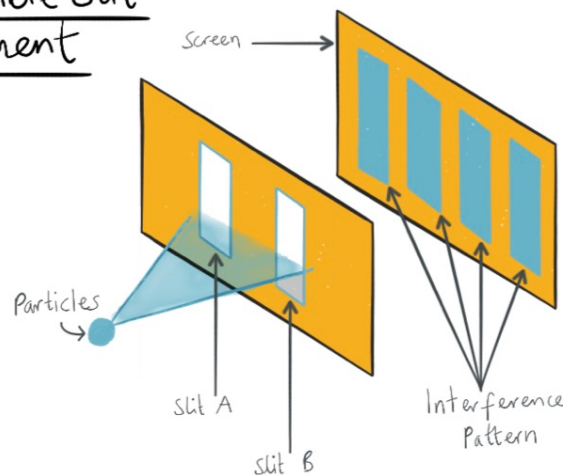
INTERDISCIPLINARY SCIENCE AND TECHNOLOGY STUDIES
WORKING GROUP AT THE UNIVERSITY OF OXFORD



"Matters of Agency and Performativity"

A dialogical seminar with Karen Barad and Trevor Pinch where they discuss the usefulness of Quantum Physics in understanding the nature of the world

The Double Slit Experiment



Join the Oxford Science and Technology Studies: Counting Differently group at the Saïd Business School for a special 'dialogical-seminar'. We have Professor Karen Barad from UC Santa Cruz and Professor Trevor Pinch from Cornell University discussing the use of quantum mechanics in furthering our understanding of the nature of the world.

7th November 2011, 5pm. Saïd Business School, Oxford University, Seminar Room B.
Drinks and light refreshments will be provided

InSIS at Saïd Business School and the School of Geography and the Environment



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To register your interest, or if you have any questions, email:
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Last Thursday, the Oxford 'Science and Technology Studies: Counting Differently' group invited esteemed physicists-turned-philosophers-of-science, Professors Trevor Pinch and Karen Barad, to discuss the use of quantum physics and the double-slit experiments in rethinking concepts of agency and performativity. This special dialogical-seminar, appropriately called 'Matters of Agency and Performativity', centres around Barad's new book about the quantum entanglements of the 1940s and how that matter may come to matter for advancing thought and theory in our own field of STS.

Below is a summarised account of the seminar as it happened. Whilst I was quick enough to jot down some direct quotes as they were said, this is largely a reconstruction of the events since I was too busy trying to follow the arguments. Consequently, some parts derive from my own thinking and interpretation of the arguments.

Thomas Turnbull: Welcome to this very special occasion. We're delighted to have these two eminent speakers here with us today to discuss Karen Barad's book 'Meeting the Universe Halfway' (Barad 2007). It's a fascinating book which explores the quantum physics entanglements.

May I first introduce Professor Karen Barad. Karen "is an American feminist theorist, known particularly for her theory of Agential Realism. She is currently Professor of Feminist Studies, Philosophy, and History of Consciousness at the University of California, Santa Cruz. She is the author of *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (2007). Her research topics include feminist theory, physics, twentieth-century continental philosophy, epistemology, ontology, philosophy of physics, cultural studies of science, and feminist science studies. Karen earned her doctorate in theoretical physics at Stony Brook University. Her dissertation presented computational methods for quantifying properties of quarks, and other fermions, and in the framework of lattice gauge theory".

I'd also like to introduce Professor Trevor Pinch. Trevor "is a British sociologist, part-time musician and former chair of the Science and Technology Studies department at Cornell University. He has a degree in Physics from the Imperial College London and a PhD in Sociology from the University of Bath. He taught sociology at the University of York before moving to the USA. Together with Wiebe Bijker he started the movement

known as Social Construction of Technology (SCOT) within the sociology of science. He is a significant contributor to the study of Sound culture, and his books include a major study of Robert Moog (Pinch & Trocco 2002). Trevor's book, 'Confronting Nature' (1986) is widely considered the definitive sociological account of the history of the solar neutrino problem, and was mentioned by Raymond Davis in his 2002 Nobel Prize acceptance speech".

Now, with those rather modest introductions, I leave it to them to start their discussion of quantum physics. Although Karen and Trevor will be leading the session, this is meant to be an open dialogue, so please feel free to interrupt them and ask any questions that may come to mind.

Trevor Pinch: Thanks for the invitation, it's a pleasure to be here, and also it's wonderful to be sat with Karen herself to discuss her latest book. I have to say, it's a terribly interesting book - full of insights and as is to be expected with Karen's work, many provocations too.

Karen Barad: Thanks Trevor, and of course to Oxford for hosting this discussion. It was a long flight from the West Coast, but that gave me plenty of thinking time to distil my thoughts on the book. Perhaps I can start by just giving a brief overview of the purpose of the book and what I sought to achieve through the writing of it?

Thomas Turnbull: Sure, that's a great idea. I think many of us would appreciate a refresher and for those among us who snuck into the discussion without any prior knowledge, this will at least give them some idea of the philosophical underpinnings of your work, and what relevance quantum physics has to the discipline of Science and Technology Studies (STS)...

Karen Barad: Okay, great. Well let me start by saying that the quantum physics that I am interested in absolutely has relevance to STS. By taking Niels Bohr's philosophy-physics as a starting point, I use the case of the double-slit experiments in the 1940s and the debates around them to show that "there are no...independently existing objects with inherent characteristics" (2003:816). For me, reality is not somewhere out there, waiting to be discovered. Rather, it is dependent upon our own dealings with it, and made apparent through the material consequences of making some cuts, whilst

excluding others, in the world. These *agential cuts*, as I call them, are part of the material-discursive practices which bring our reality into focus at any given time. And this whole process is what I refer to as my theory of '*Agential Realism*'.

Audience Member 1: Sorry to interrupt, Professor Barad, but, just to clarify, do you mean to say that agency is not something that someone has or possesses as a property, but that actually agency only becomes apparent after the fact?

Karen Barad: Yes, that sounds about right.

Trevor Pinch: Can I just jump in here, Karen? It's just that there's something that has been baffling me. It's all very well that you have this theory, but is it not odd that the metaphysical position you hold in science studies depends on the outcome of experiments in physics? (Pinch 2011:432)

Karen Barad: What do you mean?

Steve Woolgar: I think what Trevor's trying to say, Karen, is the same point that I made at an Oxford workshop in 2006 (the workshop which later provided the impetus for the edited collection by Bruce Braun and Sarah Whatmore (2010) entitled *Political Matter: Technoscience, Democracy, and Public Life*) that suppose Bohr's experiments would have had a different outcome, would your particular philosophy of science be different too?

Trevor Pinch: Yes, precisely, Steve. Suppose those experiments had turned out differently, would we then have to do away with your whole notion of '*Agential Realism*'? (Pinch 2011:432).

Karen Barad: Well, I want "a philosophy that [is] responsive and responsible to our intra-actions with the world...a strength of my approach is that it offers a way to take empirical data seriously, without embracing either a naïve empiricism that elides important social factors or a social constructivist approach that excludes natural factors or agencies" (Barad 2011:447).

Trevor Pinch: So you're saying that you're happy to have your "work in science studies stand or fall alongside the best work in physics"? That's very surprising indeed! In that case, I'm interested to know your thoughts on "what can and should

the relationship be to our subject matter in science studies - especially when we increasingly work on the same sorts of topics as the people we study - and especially when we happen to have been a practitioner of that very discipline?" (Pinch 2011:432–1)!

Karen Barad: I'm not sure what it is that you are getting at...?

Trevor Pinch: I guess what I'm saying is that there is a paradox of mutual exclusivity between science and science studies...(Pinch 2011:440).

Karen Barad: So let me get this straight, you believe that the practices of doing and writing about science as a scientist *and* doing and writing about science as a science studies practitioner are mutually exclusive? (Barad 2011:443).

Trevor Pinch: Yes! It seems to be entirely at odds to be, on the one hand, advocating a view of the world which asks us to question the very ontological nature of all phenomenon whilst taking entirely for granted a set of experiments in the field of quantum physics to rationalise this new way of thinking. In other words, you cannot "call for a more situated account of science and at the same time fail to situate the very part of science that [you are] talking about" (Pinch 2011: 438)!

Karen Barad: Of course I situate the science - my whole account is based in history and the intense debates between Einstein, Bohr and Heisenburg. This is most certainly not a view from nowhere.

Trevor Pinch: I didn't mean it like that. Let me rephrase. It's "not so much a view from nowhere as a rather Whiggish account." In your account of them, "the experiments all lead up to what we know today: namely, the truth about quantum entanglements... with none of the messy history, the lacunae, or the grasping and stumbling in the dark, and absent most of the social and historical context" (Pinch 2011:433–4).

Karen Barad: Once again, Trevor, you've jumped the gun. These disagreements amongst the physicists who are the protagonists in my account of the double-slit experiments were very much foregrounded and the philosophical and historical accounts were taken very seriously.

Trevor Pinch: Karen, you are obviously a formidable physicist and I've no hesitation in saying that your account of the foundations of quantum mechanics and the famous debate between Einstein and Bohr, Whiggish or not, is crystal clear. However, when outlining your theory of *Agential Realism* your writing becomes incredibly dense, especially when discussing "matters as agency, intra-actions, becoming, phenomena, causality, dynamics, materiality, and the role of the post human". (Pinch 2011:433)

Karen Barad: It seems as though you think "my account starts to lose its clarity...just at the point where I seriously engage with feminist and queer poststructuralist theories. Admittedly, these theories are difficult...[and you are] not the first one to complain that clarity and poststructuralism are mutually exclusive, thereby begging the question of clarity for whom, by whose standards?" (Barad 2011:448)

Idiot-figure Fuz: (Whispering to neighbour in audience) Clarity for *me* would be nice, I'm entirely lost in this post-quantum mess!

Karen Barad: And to your earlier point about the mutual exclusivity of writing about science as a scientist, and doing and writing about science as a science studies practitioner, I'd just like to emphasize that "my project departs from science studies approaches that place science at a remove. In my account, the study of science and the study of nature go hand in hand" (Barad 2006:248).

Trevor Pinch: So what you are arguing is that "the entanglement experiments and Bohr's take on quantum mechanics, when properly interpreted, have implications for how we in science studies should think about issues like agency and our relationship to the material world"? (Pinch 2011:436). However, it seems to me that "by drawing upon the results of physics not as a metaphorical enterprise but as having direct implications for science studies, [you] also court a form of scientism. Using science - and a highly prestigious form of elite science at that - to bolster a view in science studies is a dangerous game". (Pinch 2011:440).

Karen Barad: That's a bit of an overstatement. In fact, I warn against the use of physics as a mirror metaphor or to 'bolster' a view in anything. What I do in 'Meeting the Universe Halfway' is actually a method of diffraction rather than reflection. "I

proposed what I called a *diffractive methodology* - a practice of reading insights through one another while paying attention to patterns of difference" ... (Barad 2011:445).

'Idiot-figure' Fuz: I'm very sorry to interrupt, Karen, but I was just wondering whether you could tell us what is this thing called quantum mechanics? What are these physics experiments to which you keep referring and what do they have to do with agency and performativity? I know you mentioned in the introduction that Niels Bohr's philosophy-physics is your starting point, but what do these experiments have to do with anything?

'Show-off' Farzana: Surely everyone knows this. It's the famous double-slit experiments! Professor Barad has already told us that she uses a 'diffractive methodology' to use the insights of quantum physics to think about the nature of the world through a different lens and this has led her to think about agency and performativity in an entirely novel way. Her journey through physics starts with an experiment designed to determine whether a given entity exhibits a particle-like pattern or whether it exhibits a wave-like pattern when passing through a piece of apparatus with two slits in it.

This 'double-slit experiment' is designed in such a way so as to be able to see the projection of the entity that is fired through it on a screen. If the entity is a particle, then it can only enter through one of the two slits and the projection on the screen will be directly opposite the slit that it passed through. This is because the nature of a particle is such that it can only occupy a certain space at a certain time - it cannot be in two places at once. If, however, the entity is wave-like, then it is not bound by space and time since it travels in such a way that it can occupy a greater space through time. Therefore the projection will reveal an overlapping concentric wave-like pattern.

When doing this same experiment with an electron, one would expect (given the commonly held view that an electron is a particle rather than a wave) that the projections would be in two discreet places opposite the two slits. However, the experiments actually showed that firing electrons through the slits resulted in projection that showed an overlapping concentric wave-pattern! To understand how this is possible, Albert Einstein argued that we could devise an experiment to observe

which slit the particles went through. He put one of the slits on a spring which would account for movement if the entity went through it. If it went through just one slit (like a particle would) but had a diffraction/wave pattern (like a wave would) then he argued we would show the contradiction of quantum physics and that we needed a new way to think about the entities in the world.

However, Niels Bohr (the physicist at the heart of most of Professor Barad's work) argued that Einstein was mistaken in his assumptions. Bohr argued that in adding the spring, Einstein changed the apparatus that was fundamental in the production of both the entity and its projection. In other words, he argued that the results of any experiment are the entanglement of the apparatus used and the observed object. In effect, "the very nature of the entity – its ontology – changes (or rather becomes differently determinate) depending on the experimental apparatus used to determine its nature" (Barad 2009:42). This interpretation of events has since become known as the 'Copenhagen Interpretation'.

The third character in this story is Werner Heisenberg. He was dissatisfied with Bohr's interpretation and argued that, in fact, the reason that the pattern changes from a wave to a particle pattern is because the change made to the apparatus is intervening in the experiment and thus disturbing the entity. This, he argued, constrains what we can know about the entity, because each measurement disturbs what it is that is being measured - so trying to measure the disturbance includes within it its own disturbance and so on. Since it would always be uncertain what the precise disturbance was, he called this the 'uncertainty principle'.

Yet again, Bohr was unconvinced. He argued that Heisenberg was mistaken in characterising the events as being to do with uncertainty. Instead, Bohr argues that the issue is one of 'determinacy'. When we make a measurement, it is not that we disturb the 'true thing' that is being measured and so that our knowledge is consequently uncertain with regards to the 'objective truth'. It is that *there are no such 'true things' to begin with*. There is no measurement-independent 'stuff' waiting for the right experiment to uncover it. The intra-action of the apparatuses and the conditions of the experiment *are* the things-in-being. They do not exist outside of this.

That is, Bohr argues that things are ‘indeterminate’: there are no things before the measurement, and it is the very act of measurement that produces determinate boundaries and properties of things. So, whilst Heisenberg is dealing with what he considers to be an *epistemological* problem, Bohr is working with an *ontological* problem.

‘Idiot-figure’ Fuz: Thanks. I think. But it is still very confusing. I mean, I don’t even know what this *apparatus* looks like - I can’t even begin to conceive of how it would work in practice. Are you a physicist too? Is that why you know how it all works?

‘Show-off’ Farzana: No, I’m just a sociologist and I don’t have a science background. I’ve just read Professor Barad’s work very closely. Alongside ‘Meeting the Universe Halfway’ (2007), I also read “Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter” (2003); “Nature’s Queer Performativity” (2012); “On Touching - The Inhuman that Therefore I Am” (2013) and also her interview with Adam Kleinman in Mousse magazine (“Intra-actions”, 2012).

‘Idiot-figure’ Fuz: Well, I read those too, but I’m still not clear as to exactly what this is all about. Perhaps it’s just me not being smart enough. Sorry, maybe you should continue the discussions and I’ll see if there’s another way of making this easier to understand for myself.

—Discussions continue—

‘Idiot-figure’ Fuz: (Says to herself) I think I’ve finally got the hang of this quantum world and the double-slit experiments! I just *Youtubed* ‘double-slit experiments’ on my iPhone and got this great cartoon to explain it all. It’s narrated by the fictional character ‘Dr Quantum’ and he explains exactly what’s going on. But I can’t tell Karen and Trevor and that show-off in the audience that it took a cartoon for me to understand this! They all just ‘got it’ the first time from reading the articles! I wonder if I’m actually cut out for this academic life or not. I mean, if it takes a cartoon for me to understand this then something is clearly not right with my ability as an academic, right...?

So there we have it. The debate, as it happened, between Professors Karen Barad and Trevor Pinch. And with an added bonus of having Show-Off Farzana explain what the double-slit experiments were. As mentioned above, these debates made me think about my own doctoral research into the relationship between self-quantifying technologies and the self. From the literature review in Chapter 2 it was clear that there was still work to be done around the issues of agency and performativity with regards to using technology on/for/by the self. In particular, there was little, if anything, in the literature which explored the role of agency in the use of self-quantifying technologies. Further, the literature did not us to help to understand to what extent there is a performative aspect to the use of these technologies.

Given these gaps in the literature, and given that Barad's theory of 'Agential Realism' offers an account of agency and performativity that seems to differ quite starkly from others, can we learn something new about how the self is *done* through the Baradian discourse surrounding agency and performativity with respect to self-quantification?

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