A Quantified Past: Fieldwork and Design for Remembering a Data-Driven Life

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A thesis submitted in partial fulfilment of the degree of
Doctor of Philosophy in Computing Science

School of Computing Science, Newcastle University
March 2018

Acknowledgements

For such an individual pursuit, there are a remarkable number of people who have contributed to the writing of this thesis.

My first thanks must go towards my wonderful supervisors, David Kirk and Abigail Durrant. They granted me the freedom and confidence to explore this topic, and the intellectual guidance to do it justice. They supported and challenged every idea, every analysis and every publication up to the small hours. From my perspective, it has felt like the most fruitful collaboration and I can only hope it will continue.

Of course, I would never have been connected with them were it not for a meeting with Patrick Olivier in the library at the University of York, and his insistence that I visit Newcastle the very next day. I won't forget his enthusiasm, or the excitement I felt visiting Culture Lab in July 2013. The Digital Interactions Group, across its various incarnations, was such a stimulating place to work, full of curious, clever and caring individuals. These are too many to mention, though some honourable mentions include: Diana Nowacka, Diego Trujillo-Pisanty, Tom Schofield, Seb Mellor, Roisin McNaney, Gerry Wilkinson, Ed Jenkins, Tom Nappey, Kevin Marshall, Anja Thieme, Vasilis Vlachokyriakos and the inimitable Clara Crivellaro for their excellent company. My thanks also to Rob Comber, Madeline Balaam, Kellie Morrisey, John Bowers and John Vines for their wise words and support at critical moments. I count myself privileged to have worked and studied in such a collaborative and ambitious environment. I am also grateful for the financial support of the group and the School of Computing throughout my doctorate, and in particular for the opportunity to publish, travel and become a part of the international academic community. I am also thankful to colleagues beyond Newcastle. To Mark Selby and especially Chris Speed from the Design Informatics group at the University of Edinburgh for their open doors, hot desks, and enriching conversations. I also want to thank Sian Lindley and the HXD group at Microsoft Research, Cambridge who were so welcoming in my brief time as an intern with them.

I am also deeply grateful to my examiners, Alex Taylor and Pete Wright, for their insightful reflections, dedication and personal warmth throughout my examination.

I must also thank all of the participants who gave their time, and whose personal stories flow through this thesis. In particular, I want to thank couples Annabelle and Calum, and Rowan and Julia, for their invaluable roles in the Quantified Wedding project. I continue to be humbled by how generous and candid people can be in participating in unusual research projects.

There are a few colleagues to whom I owe a particular debt of gratitude. Andy Garbett and Bettina Nissen were wonderful co-conspirators in the Metadating project, and a constant source of inspiration and reflection throughout. David Green was ever generous with his time and creative media skills, especially during the Quantified Wedding project. Lastly, David Chatting, who I had the misfortune to 'share' a desk with, but who was so frequently the first person to listen to an idea, and the last person to check over a final piece of work. Professionally, the contribution of his critical voice cannot be underestimated; personally, I remain grateful for his friendship and hospitality that made it possible for me to live in Edinburgh, and commute to Newcastle for a large part of my PhD.

Many friends and family outside of academia have also supported me immeasurably up to this point. Foremost my younger brother Tom, whose hard-work and dedication in everything he does, and in achieving his own doctorate, has been such a source of pride and inspiration.

Liz and Will; I could not have wished for kinder, more loving or more supportive parents. It gives me such pleasure to make you proud, and to be able to share my successes with you.

Lastly, for my partner Claire, who has, more than anyone, been on this journey with me. Your heartfelt kindness, thoughtfulness and encouragement truly inspires the best in me, I cannot thank you enough.

Abstract

A ‘data-driven life’ has become an established feature of present and future technological visions. Smart homes, smart cities, an Internet of Things, and particularly the Quantified Self movement are all premised on the pervasive datafication of many aspects of everyday life. This thesis interrogates the human experience of such a data-driven life, by conceptualising, investigating, and speculating about these personal informatics tools as new technologies of memory.

With respect to existing discourses in Human-Computer Interaction, Memory Studies and Critical Data Studies, I argue that the prevalence of quantified data and metrics is creating fundamentally new and distinct records of everyday life: a quantified past. To address this, I first conduct qualitative, and idiographic fieldwork – with long-term self-trackers, and subsequently with users of ‘smart journals’ – to investigate how this data-driven record mediates the experience of remembering. Further, I undertake a speculative and design-led inquiry to explore context of a ’quantified wedding’. Adopting a context where remembering is centrally valued, this Research through Design project demonstrates opportunities and develops considerations for the design of data-driven tools for remembering. Crucially, while speculative, this project maintains a central focus on individual experience, and introduces an innovative methodological approach ‘Speculative Enactments’ for engaging participants meaningfully in speculative inquiry.

The outcomes of this conceptual, empirical and speculative inquiry are multiple. I present, and interpret, a variety of rich descriptions of existing and anticipated practices of remembering with data. Introducing six experiential qualities of data, and reflecting on how data requires selectivity and construction to meaningfully account for one’s life, I argue for the design of ‘Documentary Informatics’. This perspective fundamentally reimagines the roles and possibilities for personal informatics tools; it looks beyond the current present-focused and goal-oriented paradigm of a data-driven life, to propose a more poetic orientation to recording one’s life with quantified data.

Publications

Aspects of the research presented in this thesis have been published in peer-reviewed conferences and journals prior to the submission of this thesis. These are listed chronologically below:

Elsden, C., Kirk, D., Selby, M., and Speed, C., 2015. Beyond personal informatics: designing for experiences with data. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems* (pp. 2341-2344). ACM.

Elsden, C., Kirk, D. S., and Durrant, A. C., 2016. A quantified past: Toward design for remembering with personal informatics. *Human–Computer Interaction*, *31*(6), 518-557.

Elsden, C., Durrant, A. C., and Kirk, D. S., 2016. It's Just My History Isn't It?: Understanding Smart Journaling Practices. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (pp. 2819-2831). ACM.

Elsden, C., Nissen, B., Garbett, A., Chatting, D., Kirk, D. and Vines, J., 2016. Metadating: exploring the romance and future of personal data. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (pp. 685-698). ACM.

Elsden, C., Selby, M., Durrant, A. and Kirk, D., 2016. Fitter, happier, more productive: what to ask of a data-driven life. *interactions*, *23*(5), pp.45-45.

Elsden, C., Durrant, A.C., Chatting, D., Green, D. and Kirk, D.S., 2017. Abacus Datagraphy: A Speculative Enactment. In *Proceedings of the 3rd Biennial Research Through Design Conference*.

Elsden, C., Chatting, D., Durrant, A.C., Garbett, A., Nissen, B., Vines, J. and Kirk, D.S., 2017. On Speculative Enactments. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 5386-5399). ACM.

Elsden, C., Durrant, A.C., Chatting, D. and Kirk, D.S., 2017. Designing Documentary Informatics. In *Proceedings of the 2017 Conference on Designing Interactive Systems* (pp. 649-661). ACM.

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Chapter 1. Introduction

1.1 Overview

"For a long time, only one area of human activity appeared to be immune. In the cozy confines of personal life, we rarely used the power of numbers… The imposition, on oneself or one's family, of a regime of objective record keeping seemed ridiculous. A journal was respectable. A spreadsheet was creepy. And yet, almost imperceptibly, numbers are infiltrating the last redoubts of the personal. Sleep, exercise, sex, food, mood, location, alertness, productivity, even spiritual well-being are being tracked and measured, shared and displayed."

(Wolf, 2010)
'A Data-Driven Life'
New York Times

The term 'data' is used to discuss all manner of information. In this thesis, I focus on *personal data* – information which pertains to individuals and their activities. Furthermore, the crux of this thesis relates to fine-grained data resulting from technologies and cultures that render all manner of human activities *quantifiable*. As Wolf remarks, while quantified data – "*the power of numbers"* – has been long recognised in the world of work, the possibility of a data-driven *life* is a new and quite different proposition.

Once the preserve of 'extreme users' (Choe et al., 2014), a confluence of low-cost, unobtrusive sensor technology, smart phones, and cloud technologies now offer unprecedented opportunities for people to collect, store and share quantified data about their everyday lives. It is proposed that by achieving 'self-knowledge through numbers', these 'Personal Informatics' tools (Li et al., 2010a) can make us fitter, happier and more productive. The development and design of, for example, wearable fitness trackers, smart thermostats, baby monitors and time-management tools has thus tended to be entirely utilitarian. A simple, rational relationship with one's data is assumed. In Wolf's words – *"Once you know the facts, you can live by them".*

But human relationships with data are more complex than simply living by the 'facts'. This position presumes the entire gamut of human experience is something to be captured and represented by data. Taken to an extreme, what kind of life is one that is painted entirely by numbers? However efficient, a data-driven life risks becoming machine-like; lifeless even.

This highlights the need to reconsider the design of technologies, driven by data, which underpin many contemporary visions; the smart city and smart home; the Internet of Things; Quantified Self. The field of Human-Computer Interaction (HCI) is replete with such visions, and of late has been fundamentally motivated by concerns for the human experience of interacting with technology (Wright and McCarthy, 2004). Recent work in HCI has called for the design of "*Lived Informatics",* prioritising individual's lived experience, and a recognition of how quantified data becomes inevitably *"enmeshed in everyday life"* (Rooksby et al., 2014).

This thesis takes this seriously by considering the distinctly human experience of remembering. Whatever else they achieve, these personal informatics tools also document novel records of everyday life, and inevitably come to represent the past in certain ways. Hence, I propose a 'quantified past' as an emerging socio-technical phenomenon and describe this in the forthcoming chapters conceptually, through fieldwork, and through speculative design. The studies in this thesis all address how this anticipated phenomenon might meaningfully mediate remembering of one's life.

While quantified data is often portrayed objectively and determinatively, the act of remembering is dynamic, subjective, reconstructive and *essentially* human. Hence, a study of *the experience of remembering a data-driven life* speaks directly to the complex relationships that emerge as our lives become suffused with data.

There are twin motivations to this inquiry. Firstly, to better inform the design of technologies and services for remembering a data-driven life. This follows a long history of work in HCI and Memory Studies concerning 'Technologies of Memory' (Sturken, 2008; Van House and Churchill, 2008). While considering particularly photography, social media, lifelogging and other burgeoning digital traces as meaningful 'digital

possessions' there is little prior work that has addressed quantified data in terms of remembering.

However, by considering the design of personal informatics tools for an experience such as remembering, I am also radically reimagining the roles and possibilities for a data-driven life, beyond the current paradigm, focused nearly exclusively on rational utility. In so doing, I hope to demonstrate the need and value of experience-centred design of data-driven tools as they become a pervasive feature of contemporary living.

1.2 Research Questions

There are two central research questions addressed by this thesis, which are broken into a number of sub-questions. The first of these is broadly empirical, concerned with inquiry about the experience of a data-driven life; the second addresses the translation of these findings towards design.

RQ1: What is the experience of remembering a data-driven life?

Though broad, this primary question has helped direct my thesis throughout its development. The question retains a focus on personal *experience*, and on *remembering* as a situated human activity. Amidst much ambiguity and hyperbole around the term 'data', Wolf's formulation of a *'data-driven life'* offers some clarity by remarking the socio-technical nature of the emergence of self-tracking and quantification. Furthermore, the term 'data-driven life' entails a diverse range of technologies and activities, rather than being tied to particular devices or domains. As such, this thesis is a primarily human, rather than technological inquiry. Question 1 has been subsequently broken down and is addressed through the thesis as the following four sub-questions:

1A) What are current experiences, practices and values in remembering and long-term recording of everyday life with data?

Though an emerging phenomenon, it is possible to find and describe examples of the ways in which individuals' everyday lives are already being recorded and remembered through data. What aspects of people's lives are recorded in such data? What forms do such records currently take? How aware are people of documenting their lives with data? While some people may be deliberately lifelogging, for many, a quantified past can

accumulate over time, without clear intentions. Do people share these records or make any special efforts to reflect on or preserve them?

Though these may necessarily be on shorter autobiographical timescales (over a few years, rather than a lifetime), they are indicative of characteristics of a quantified past, and the nature of people's interactions with it.

1B) How can quantified data become a meaningful, personal, digital possession?

Understanding how data becomes situated in people's lives is a significant undertaking in this thesis. Data is collected, considered, valued and shared in particular contexts, for particular aims. A great deal of prior work in HCI considers how burgeoning personal digital content is not only managed or navigated, but becomes a meaningful possession, and as such, an 'extended self' (Belk, 1988). Facebook photos, old emails and defunct social media profiles have all been found to be both highly valued, treasured even, but also to be problematic on occasion if they represent unwanted or challenging aspects of a past self or experience. While we are increasingly familiar with these challenges, especially on social media, quantified data is rarely considered in terms of remembering the self. What are the reasons and occasions when such records could be valued and engaged with for remembering? And how does this compare to other autobiographical media? These questions relate firstly, to identity, performance and self-expression with historical data, and secondly, to the curation and legacy of that data.

1C) How is remembering mediated by a 'quantified past'?

This question positions quantified data as an emerging form of personal media, expression and record, with particular characteristics and qualities. Much as photographs, video, diaries and objects can all be said to mediate and relate to the past in particular ways, so can data.

Remembering is in part situated through such mediation. As each instance of remembering is a reconstruction, this begs the question of the particular processes, techniques, organisation and interaction which structure remembering and make certain pasts seem as memorable and meaningful as they are. The core concern here is

developing an understanding of the particular mechanics, roles and action entailed in remembering with quantified data.

Responding to this question requires threading together extant research in Memory Studies on objects and mediation, across a number of empirical and design inquiries about remembering with data. This then offers implications for developing the quantified past as a design material – its affordances, opportunities and challenges.

1D) How can empirical research be undertaken for anticipated phenomena - such as remembering a data-driven life?

There is a temporal challenge throughout this thesis, concerning records which are only just coming into view, but anticipating the vast accumulation of future records. Radley (1990) describes how objects which mediate remembering evolve in their use and meaning over the course of a lifetime. The relatively short timescale of this thesis demands that interactions with participants are essentially snapshots, in the context of remembering over a data-driven life. We do not know in advance what will be important to remember, and any view of the future, is necessarily coloured by one's present standpoint.

That said, HCI and design are inherently future-oriented fields, geared towards creating and inquiring about alternative technological futures. These fields have ably incorporated and innovated methods to generate dialogue about those futures. However, as this thesis takes experience as its core concern, how can these methods be adapted to involve participants more closely, and generate compelling experiences related to speculation about the future? Specifically, how can speculative design research be harnessed as a source of empirical inquiry with participants, in order to approach anticipatory research questions?

RQ2: What are the design considerations for services and technologies to support data-driven remembering?

The previous set of questions is broadly theoretical and empirical, inquiring about people's relationships, present and future, with a quantified past. However, both reciprocal aims of this thesis speak to the design of data-driven services and technologies.

Broadly, I seek to uncover characteristics and qualities of the quantified past as a design material, emphasising the opportunities to design for longer-term, meaningful interactions. Subsequently, I consider designing explicitly for the experience of documenting and remembering one's life with quantified data.

1.3 Research Approach

The prior research questions seek a broad phenomenological, experience-centred, design-oriented understanding of a quantified past, as a present and future phenomenon.

The research approach I have adopted in this thesis is therefore threefold: conceptual, grounded in current practice, and speculative. Conducting both fieldwork and design-led inquiries, I aim to approach the prospect of a quantified past from a variety of angles, each offering a different lens, pulling different aspects of the subject into focus.

What I seek to achieve, is a tapestry of rich or 'thick descriptions' (Geertz, 1973; Ryle, 1949) of people's experiences – past, present and future – with a quantified past, which offer multiple considerations and new directions for the design of data-driven technologies.

1.3.1. Conceptual Approach

The conceptual basis for this work is forged in a close reading of extant literature in Memory Studies, Critical Data Studies, and HCI. The study of human memory remains a deeply contested subject, touching many disciplines. However, the growing field of *Memory Studies* proposes to address this and *"mobilize scholarship driven by problem or topic, rather than by singular method or tradition. Yet divergence in backgrounds and assumptions must be highlighted and deliberately negotiated, not wished away."* (Hoskins et al., 2008)

My research questions address remembering as a reconstructive, situated action, which is socially and culturally mediated, particularly by 'technologies of memory' (Van House and Churchill, 2008). As such, it is the socio-cultural study of remembering that is of most relevance here, as it localises memory "*within a broader framework of social and cultural practices and artefacts"* (Brockmeier, 2010).

This thesis also has a phenomenological commitment to understanding 'lived' experience. Middleton and Brown's *'The Social Psychology of Experience: Studies in Remembering and Forgetting'* (Middleton and Brown, 2005) charts a path between the classic works on memory by Frederick Bartlett (1932), Maurice Halbwachs (1925/1992) and Henri Bergson (1896/2004). They present a perspective on remembering that locates the typically interior, psychological study (such as memory) within *"the broader sets of relationships people share"* (Middleton and Brown, 2005, p.223*)* – with each other, and particularly the objects that mediate their interactions and experiences of the world. This is therefore a foundational text, both conceptually and methodologically.

Data, like memory, also has many contested interpretations. This thesis is grounded in 'Critical Data Studies' (CDS) (Iliadis and Russo, 2016). With origins in Science and Technology Studies (STS), this emerging field charts the rise of so called 'Big Data' (Boyd and Crawford, 2012), 'datafication' (van Dijck, 2014) and 'Metric Power' (Beer, 2016) as an increasingly dominant mode of knowing and representing the world. CDS hence emphasises the 'social shaping' of data, as both a cultural and technological phenomenon. Contesting 'dataism' (van Dijck, 2014), CDS pays particular attention to how data is constructed, contextualised, situated and generative of new forms of knowledge. The work of Lupton on 'self-tracking cultures' (Lupton, 2014a) and HCI researchers (Taylor et al. 2015; Pine and Liboiron, 2015) begins to apply this developing discourse and criticality towards the personal experience of a data-driven life.

This prior work in Memory Studies and CDS establishes two important positions. First, the situated and present-focused nature of remembering, mediated by the materiality of different records and objects. Second, the emergence of a data-driven life as a distinct and powerful transformation in the representation of reality in everyday life. In terms of HCI and interaction design, this provides a footing to reconsider self-tracking tools as 'Technologies of Memory' and quantified data as a new kind of 'digital possession' (Lindley, 2013a; Odom et al., 2014a)

1.3.2 Fieldwork of Current Practice

The heart of this thesis is qualitative, empirical fieldwork. The departure point for my empirical approach is treating remembering as lived experience, rather than simply

instrumental to achieving other tasks and goals (e.g. remembering how to get to work, or where you left your car keys). While many people are most aware of occasional embarrassing lapses in their memory, this overlooks how essential remembering is to one's sense of identity, sociality and as Middleton and Brown (2005) urge, any sense of continuity of experience from one day to the next. Psychological frameworks such as Sellen and Whittaker's '5 R's' (recollecting, reminiscing, retrieving, reflecting and remembering intentions) can be useful to grapple with the vastness of the subject or to offer heuristics for designers (Sellen and Whittaker, 2010). However, they risk being too prescriptive and reductive of the felt experience and significance of remembering.

In seeking a more holistic view, this thesis is, in a sense, underwritten by Wright and McCarthy's 'Experience Centred Design' (2004). Their approach seeks to account for the emotional and sensual aspects of an experience, as much as the cognitive or rational. This 'felt life' turns on "*continuous engagement and sense making"* as each experience is shaped by one's own personal history, cultural sensitivities and anticipated futures. Finally, the approach is "*relational and dialogical"* as one's lived experience is situated, and constructed through dialogue between different centres of value in the interaction. Understanding these processes and centres of value through individuals lived and everyday praxis then offers a foundation and inspiration for design.

My empirical studies therefore seek to describe the *experience of remembering a data driven life* by understanding the personal sense-making people undertake in relation to and in dialogue with their quantified past, as it exists now, and as it might exist in the future.

This qualitative work adopts two lenses, discursive and phenomenological. The discursive approach is favoured as a means to study remembering in action. Middleton and Brown found the empirical basis of their work on discursive psychology, arguing that thought is "*best approached and studied as a public, action orientated process" (p. 225)*. This seeks to undertake psychological inquiries "*in the flow of ordinary experience"* (Middleton and Edwards, 1990). Like ECD, this attention to action is sympathetic to pragmatist and phenomenological approaches.

Harper et al. (2008) have demonstrated how understanding remembering as an action bears importance for HCI and the study of technologies as mediators of memory. In the context of the automatic wearable camera SenseCam, memory is approached *"as-a-resource-for-action"* rather than "*something-in-the-mind"*. This focuses attention on what people do and achieve in remembering (especially socially) with technologies of memory, and treats these necessarily situated and social actions as a basis from which we can understand individual experience.

Such an approach is echoed in Taylor et al.'s study of 'data-in-place' (2015). Their work emphasises how data is *situated* - it is not produced, or interpreted in a void. As such we need to understand what work data does 'in place' and what sort of action (and remembering) it affords. This invites typically sociological questions about how and when data is mobilised, how it is interpreted, how it comes to matter, by whom, and for what purposes.

All of the studies I undertook in this thesis involved participants sharing some kind of data and remembering with me or in-situ. Interviewing was the primary research data-gathering technique but these interviews were structured to demand interaction with, and generate discourse around individuals' personal data. These moments of talking through or communicating with one's data were some of the most insightful.

These studies were also designed to support Interpretive Phenomenological Analysis (IPA) (Smith, Flowers, and Larkin, 2009). This analytic method has an idiographic focus, and is well suited to understanding individual sense making, especially as it relates to important life events. Rather than testing hypotheses, IPA seeks to describe and carefully interpret the experience of the participant. It is as such apt for the exploratory, experience-centred focus of this thesis.

1.3.3. Speculative Approach

Lastly, this thesis engages in speculative and design-led inquiry, to confront the emerging and anticipatory nature of a quantified past. As a practice of 'Research through Design' (RtD) (Frayling, 1993), this final mode of inquiry intends to extend prior conceptual and fieldwork towards design. RtD distinctively claims that the best way to understand design is by doing design. It sees knowledge created throughout the design process, through the

designer's reflection before, during and after design, and within the resulting design artefacts themselves.

Speculative design research encompasses a number of design practices and positions, but in its broadest terms, it can be described as the design of materials and narratives which speculate about near-future or alternative present technologies (Auger, 2013). Dunne and Raby's 'Speculative Design' (Dunne and Raby, 2013) favours highly finished design of speculative objects, while Bleecker's 'Design Fiction' relies more on fictional narrative and context to provide a 'diegesis' or 'story-world' within which speculative technology is proposed. Both approaches primarily intend to provoke questions and discourse about the futures presented - between designers, and with critical and public audiences.

The speculative approach in this thesis stands on the same philosophical ground as the prior conceptual and fieldwork inquiries. That is: idiographic, experience-centred and generative of rich discourses with personal data. However, Candy and Dunagan (Candy, 2010; Candy and Dunagan, 2016) note a fundamental challenge in engaging participants with speculation: the future, however compelling, is inherently abstract, in comparison to the real concerns and activities in their lives. In response, they theorise a speculative practice of 'Experiential Futures' which seeks to "*bridge the experiential gulf between inherently abstract notions of possible futures, and life as it is apprehended, felt, embedded and embodied in the present and on the ground.*"

Throughout the thesis, I sought an orientation to speculative design research that did not set aside or abstract away individual experience, but instead generated action and consequence for particular participants. This resulted in an innovative approach I have termed 'Speculative Enactments'. I will argue that these prioritise participant experience in speculative inquiry, and create the opportunity for further empirical analysis of the discourse and action with speculative artefacts. These 'Speculative Enactments' therefore produce both design artefacts and empirical findings. Primarily, these directly reveal design considerations and opportunities for remembering a data-driven life. However, they also refer back to and offer new interpretations of previous conceptual and empirical inquiries.

Hence, while these three approaches (conceptual, fieldwork and speculative) to understanding the experience of a data-driven life are presented in a chronological order here, they should be understood as mutually informing and in dialogue with each other.

1.4 Thesis Structure

This research approach is reflected in the overall thesis structure of a thesis in three acts.

1.4.1. Conceptual

In Chapter 2, I introduce three strands of key extant work highlighted in the previous section. The first strand describes the phenomenon of a data-driven life through critical data studies and extant work in HCI on self-tracking tools. The second strand describes approaches to the study of memory, using the work of Middleton and Brown (2005) to develop in great detail Bartlett's (1932) conception of remembering as an *"imaginative reconstruction"*. The third strand considers a rich history of research on 'technologies of memory', remarking on a contemporary turn in HCI going "*beyond total capture"* promoted by much lifelogging research. It also considers the role and design of digital possessions over the life course. Finally, weaving these strands together, I build the concept of a 'quantified past' and motivate its study as extending research and design perspectives on both technologies of memory and self-tracking tools.

I continue this conceptual work in Chapter 3, the primary methodology chapter. This sets out my discursive and phenomenological approach to studying interactions with data throughout the doctoral project. Interpretive Phenomenological Analysis (Smith et al., 2009) is introduced as an idiographic and experience-centred approach to analysing interview data.

1.4.2. Fieldwork of Current Practice

Chapter 4 documents the first fieldwork study – an interview study with 15 long-term users of different personal informatics tools that were then available. This offers an initial orientation to the emergence of a quantified past, and responds primarily to research question (1A) about the current experiences, practices and values in long-term recording and remembering of everyday life with data. The study findings furnish some initial characteristics of a quantified past; a close look at the discourse of remembering with data reveals considerable 'data-work' to make personal accounts from the data.

In Chapter 5, I describe further fieldwork undertaken by interviewing users of 'smart journals' – smartphone diary applications (apps) which are used to create and curate a diverse range of personal media and data into a record of one's life. Understanding this contemporary form of lifelogging responds particularly to research question (1B), recognising how quantified data and other documentary media become meaningful digital possessions.

1.4.3. Speculative Research and Design

Chapter 6 is a second brief methodology chapter to introduce the Speculative Enactments approach pursued in the concluding design-led study. This chapter introduces the value of Research through Design, and the development of speculative methods in HCI. It describes the rationale and process of Speculative Enactments, which is demonstrated through a case study of a related collaborative project that I led called Metadating.

In Chapter 7, I describe a design-led inquiry by speculating about a service 'Abacus' which offers a 'quantified wedding' to record and remember data about a couple's special day. The speculative service was enacted with two engaged couples, who met a 'wedding datagrapher' and discussed the data they would record about their wedding. Their stories were then represented in an Abacus brochure, in the style of a wedding magazine. The design work in this final study is informed by prior empirical findings, but also serves to give them form, and to demonstrate the opportunities and challenges in design for remembering a quantified past.

In Chapter 8, I present a closing discussion, primarily advocating the design of 'documentary informatics' tools which prioritise documenting one's life with data. I also consider limitations of the thesis, future work and methodological reflections in this discussion.

I present conclusions in Chapter 9, responding to the research questions, aims and proposed contributions of the thesis.

1.5. Thesis Contributions

In answering the research questions outlined above, I endeavour to make four significant research contributions:

1) A *conceptual contribution* in establishing the concept of a 'quantified past', through a close reading of related work in Memory Studies, Critical Data Studies and Human-Computer Interaction. This is a foundational concept that outlines a new, emerging and previously unstudied phenomenon – remembering a data-driven life.

2) An *empirical understanding* of a 'quantified past' is contributed: first, through two in-depth qualitative studies – examining the long-term use of personal informatics tools; and journaling and diary-keeping technologies – and then second, through the design-led quantified wedding study. These studies extend HCI's longstanding interest in technologies of memory, digital possessions and identity, but also speak to wider debates on digital memory studies. This work also contributes further studies of the lived experience of self-tracking tools, and their evolving use in the longer term.

3) A *methodological contribution* through the development of 'Speculative Enactments'. This is an approach I have pioneered during my thesis as a way to approach the experience of anticipated phenomena, such as remembering with quantified data. This approach involves participants more directly in acting amidst speculation, and affords a more empirical analysis of their interaction. Notably, this builds on a further methodological contribution of the thesis in outlining IPA as an idiographic and experience-centred approach to understanding lived interactions with personal data.

4) A *design contribution,* primarily through the Quantified Wedding project. This project undertook the speculative design and enactment of a service for documenting a wedding with data. This design-led study, informed by the prior fieldwork, explores how a quantified past can be made meaningful, and the way data can be captured, curated, and materialised. Combining this with implications from the earlier fieldwork, I propose the design of a new class of data-driven tools as 'documentary informatics'.

Chapter 2. Literature Review

This literature review aims to lay the conceptual foundations for the thesis, and develop terms upon which to discuss a quantified past. It is in four parts.

In Part 1, I introduce a data-driven life as a socio-technical phenomenon. The initial focus here is on self-tracking tools and the evolving cultures of their use. However, this thesis also requires a clear understanding of 'data' and its ultimately situated nature. From here, we can chart studies in HCI concerning data, and the evolution of personal informatics research, towards a 'lived' informatics perspective.

In Part 2, I develop an understanding of remembering. I begin by discussing the work of Frederic Bartlett, and developing his definition and explanation of remembering as an *"imaginative reconstruction"*. This supports an understanding of remembering as a situated and present-oriented action, mediated by the "organised settings" around us. Personal records and possessions, and their particular materiality, as physical and digital things hence mediate remembering.

In Part 3, I focus on the mediation of remembering by 'technologies of memory'. I begin with sociological work in 'digital memory studies' which describes a 'new memory ecology' emerging from a life lived online. I then introduce the related history of research in HCI, which began with visions of the 'total capture' of one's life through lifelogging, and that is now focused on the experience of accumulating and remembering one's life with a mass of digital possessions and traces.

In Part 4, I combine this prior work to introduce a 'quantified past'. This characterises self-tracking tools as technologies of memory, and quantified data as an emerging and distinct kind of digital possession. Drawing on contemporary examples of self-tracking platforms and the work of artists, I illustrate the intriguing potential of a life documented by quantified data.

2.1 The Data-Driven Life

The emergence of a 'data-driven life' as a socio-technical phenomenon was, recognised by journalist Gary Wolf as a confluence of technological and cultural trends. The first: ubiquitous personal technology, which affords the tracking and measuring of features of everyday life. The second: a rationalist, culture of 'dataism' (van Dijck, 2014; Ruckenstein and Pantzar, 2015) and self-optimisation, which promotes numbers and data as superior forms of knowledge with which to better oneself.

2.1.1. Self-Tracking Technology

A number of technologies combine to produce the effect of ubiquitous and increasingly effortless self-tracking. Primarily, these are accurate sensors – for example, accelerometers, gyroscopes, GPS, piezometers and cameras. These basic measurements of movement, location, light, pressure etc. become 'data' about human activities through 'activity recognition' algorithms. Such analyses can largely be undertaken and displayed in real-time. Typical examples include step-counting, biometric measures, exercise, travel and sleep tracking (exemplary applications explicitly studied in this thesis are shown in Appendix A). These are often supplemented by data entered manually (such as dietary intake or mood), or gleaned from connected services, such as social media, email, calendars or device usage data.

This data is overwhelmingly quantitative. Even qualitative data, such as one's mood or dietary intake, is subject to rigid categorisation, which affords a quantitative analysis. Even if occasionally inaccurate, the data is precise: you walked 9,923 steps today; your average heart-rate was 82.3 bpm; you have had 83% of your recommended daily sugar intake.

The data that one can ostensibly collect is so vast that the significant challenge for an individual is in making any sense of it. Competing applications emphasise the tantalising quality of 'insight' (Choe et al., 2015). As such, the 'raw' numbers can take a multitude of forms. There are graphs, pie charts, percentages, averages, targets, progress bars, achievements, maps, comparisons, correlations, clusters – a whole gamut of statistical tools and tricks. With larger datasets, combining multiple measures, one can construct visualisations, to 'delve into' and explore the data to make sense of it. Crucially, the data

can be stored and reviewed. It can be reworked and visualised alongside new forms of data. Data is especially malleable, much more so than even a digital photograph (photo). As such, it is clear that what we come to understand as 'data' is achieved through a number of levels of abstraction and interpretation – some human, some algorithmic.

It is important to note however, that such quantified and 'scientific' self-tracking is not as new as it might seem. Self-tracking itself is of course not an entirely new phenomenon: Neuringer (1981) reports examples of self-experimentation and weight tracking in the 16th century; in 1726, Benjmain Franklin foreshadowed a Quantified Self by fastidious daily recording of how he performed according to his '13 Virtues'; WeightWatchers was founded in 1963; today Withings[1] offer a hyper-connected, digital scale. But the scale, prevalence and automated ease of self-tracking is remarkable. All of the functionality described above can be accomplished by a modern smartphone. Most now already contain dedicated software and 'dashboards' to collect, manage and review one's data. Wearables and connected home devices are additions proposed to make data collection essentially less cumbersome and more accurate. Recent innovations have made wearables more durable (i.e. longer batteries, waterproofing), accurate, fashionable, connected and multi-faceted. Once collected, the data can be stored and shared across devices; through cloud storage it is accessible on the go, shareable with friends, family, employers and medical practitioners. The fundamental proposition is one of more data, more accurately, more of the time, wherever you go.

Lastly, it is worth reflecting on how individuals' lives can be *driven* by data. The basic premise of the 'Quantified Self' movement, summarised by Li et al.'s (2010) stage-based model of personal informatics, is that we prepare, collect, integrate, reflect and finally act on such data, as a means to become fitter, happier and more productive. But this is no longer the only way one's life can be data *driven.* Personal, quantified data can increasingly be used as not just an output for reflection, but an input to all kinds of automated systems. There are prompts and reminders; to do more exercise, to take medication, to stand up. There are anticipatory services: to make coffee as we wake up; to recommend travel routes; to control the lights at home. There is personalisation: of shopping experiences, of healthcare, of insurance and, of course, of advertising. While the

[1] https://withings.com

Quantified Self movement represents those most motivated to examine a data-driven life, many people now experience a variety of systems like these acting in concert and in response to quantified data collected about them. Crucially, quantified data is visible and understood not only as numbers and charts on a screen, but through interaction with systems which rely on and reflect a history of that data.

2.1.2. Self-Tracking Cultures

Wolf's own article highlights that the radical feature of a 'data-driven life' is the transition and acceptance of numbers and measurement from the professional and commercial arena into personal and home life. How is this so? Analysing a wide range of self-tracking discourse, Lupton (2014), offers three broad sociological rationales for the rise in 'self-tracking cultures'.

First, is a trend towards self-optimisation – that is, emphasising the importance of self-awareness and self-improvement. Lupton argues that in a neoliberal society, the 'ideal' and 'responsible' citizen is one *"willing and able to take care of her or his self-interest and welfare"* (Lupton, 2014; p.79). In this way, the citizen becomes an asset, rather than a burden, to the state. Rather than narcissism, interest in oneself – precisely and intimately – becomes necessary to be successful; we are each expected to take care, and make the best of ourselves. Importantly, people undertake such action willingly, even playfully; this is 'sous-veillance' rather than surveillance (Mann et al., 2002). Such individualisation and privatisation of risk are encompassed in Bauman's analysis of 'liquid modernity' (Bauman, 2000).

Taking this further, self-knowledge, and hence self-tracking, promises the means to determine one's destiny in an uncertain world. Lupton notes that as fixed social structures and ties dissolve, people have far greater individual freedom, but as such, greater responsibility for their own decisions, successes and failures. Self-tracking is then a means of taking control of one's life – especially in relation to external pressures of health, time, money, family life etc. Other STS scholars however, remind us that the agency and independence of modern living entails more than a sense of responsibility. Both Sharon and Zanderberger (2016), and Nafus and Sherman (2014) describe a theme of 'soft resistance' in their ethnography of the Quantified Self movement. Some of the most enthusiastic self-tracking projects are for example resisting the categories, traditions

and limitations of modern healthcare provision. In so doing, self-tracking is not just 'taking control' or acting responsibly, but is, in practice, a way of communicating and generating alternative narratives about oneself.

Second, in tandem with a desire for self-knowledge and self-optimisation, is what Lupton calls the 'valorisation of data' (Lupton, 2014). In recent years, quantified data has become an elevated, primary way of knowing about the world. As Wolf (2010) suggests *"If you want to replace the vagaries of intuition with something more reliable, you first need to gather data. Once you know the facts, you can live by them."* This thesis is focused on the personal domain, however the rise of metrics and an 'audit culture' (Craig et al., 2014) attest to this as a broader, societal phenomenon. As Taylor et al. (2015) note, data has become *"a proxy for the facts".* In the context of Big Data, boyd and Crawford (2012) describe this as a 'mythology', noting the "*widespread belief that large data sets offer a higher form of intelligence and knowledge that can generate insights that were previously impossible, with the aura of truth, objectivity, and accuracy."* (p.663*).* Even more forcefully, Beer (2016) describes this as 'metric power'.

What has become so powerful and dominant in industry, government and science has perhaps inevitably translated into the personal domain. As Wolf (2010) again notes, cold hard numbers appear to trump fuzzy human intuition. Amidst Wolf's rhetoric, proponents of the Quantified Self, and the deep criticisms offered by social scientists, it would be easy to believe that numbers and the 'objectivity' of data are both undeniable and have proved utterly seductive. However, Sharon and Zanderberger (2016) are again instructive in qualifying this somewhat. There is clearly at least an attraction to the idea that data can be 'objective' and many self-trackers do subscribe to this. Nonetheless, many are also constructively sceptical, always asking themselves what their data means, and in many cases taking apart and trying many different modes of self-tracking. We should hence be careful to view claims about the discourse of self-tracking, in the context of its actual practice. Here, people are evidently doing a lot more than simply taking the numbers as given.

The third and final point contributing to the rise of self-tracking plays further on this belief that even if at times questionable, data offers a further, higher, previously unobtainable form of knowledge. Lupton notes that advances in digital self-tracking

"render visible elements of one's self and body that are not otherwise perceptible". Like an x-ray, we may believe we can really look under the hood, and see in, to the otherwise ineffable 'human machine' (Lupton, 2013). Indeed, there is a frequent belief in underlying patterns, habits and indicators, which the right sensors and data can divine. As with lifelogging, which aims to augment memory, so there is a belief in augmenting the body with such sensors. Sharon and Zanderberger (2016) describe the way self-trackers talk about data as 'signals' or further 'layers'. Self-tracking's premise is to offer a new, compelling way of seeing and imagining the body.

These technologies and cultures which distinguish a data-driven life should not be thought of as separate; they are clearly 'mutually shaping' (Lievrouw and Livingstone, 2002). As noted previously, the focus of this thesis is on the experience of this data-driven life. In particular, how people see themselves, the world, and their pasts through data.

As such, before considering different perspectives on the design of interactions with data, it is vital to critically understand the nature of the relationship between data and experience of the world. How is it that data obtains a mythologised status as a 'fact' and what transformations are undertaken in representing the world through quantified data?

2.1.3 Understanding Data

This thesis will argue that quantified data is a new means of mediating experience. To understand what this means, first we need to understand the constructed nature of data. As I'll show below - there is considerable academic consensus from sociological perspectives on the necessarily constructed and subjective nature of data, but it's worth unpacking this fully, in four parts. Having established this, we can recognise how what data means is not constant, neutral, or independent, but deeply situated. Data has to be interpreted, and applied in a context to give it any meaning – for it to gain purchase as a representation of some reality.

A) Data is not raw

Firstly, 'data' is not simply out there in the world, a raw resource, waiting to be mined. On the cover of 'Raw Data is an Oxymoron', Gitelman (2013) suggests "*we shouldn't think of data as a natural resource but as a cultural one that needs to be generated, protected, and interpreted."* In boyd and Crawford's (2012) take on Gitelman's work;

"*data needs to be imagined as data in the first instance…and this process of the imagination of data entails an interpretative base: every discipline and disciplinary institution has its own norms and standards for the imagination of data."* (p.667).

This makes clear that interpretation, and hence subjectivity, "*is at the center of data analysis"* (p.668), even from its very conception. The counting of steps depends upon a prior interpretation of what constitutes 'a step', and that steps effectively represent activity. Conveniently, and not uncoincidentally, steps are also easier to imagine and measure as a unit of activity. And so, they can become a dominant metric for measuring daily activity. To emphasise this inherent constructivism, Drucker (2011) argues that we should talk about *capta* – that which is *captured* – rather than *data* – that which is simply *given*. Rather than a mere reflection of reality or any 'facts' about the world data is instead actively constructed

More critically, beyond simply the imagination of data - authors have highlighted the politics of measurement (Beer, 2016; Pine and Liboiron, 2015) and the way data is constructed. Bowker and Star (2000) show historically how 'sorting things out' – any operation involving categorisation, and classification to scaffold 'information infrastructures' (i.e. databases) – requires imaginative interpretation, and frequently admits bias and politics. Classification requires choices about categories; what counts, and what does not. Further, there are all kinds of 'work' people undertake to make these categories mutable or to fit better within them. As Bowker (2000) has argued, *"the database will shape the world in its image".* In the context of healthcare, Pine and Liboiron (2015) show how such politics are rendered visible, or invisible, in the user interface of interactive systems. The implication is hence to question what kind of memory self-tracking tools will shape, and how this will manifest at the interface.

B) Data is reductive

As it models, and abstracts, from experience, data is essentially reductive. Steps, become a proxy for 'physical activity', occluding many other movements which might otherwise count towards being physically active. Indeed, data is a powerful tool *because of* its reductiveness. Borges (1946/1996) illustrates the point in an absurd single paragraph short story "*Del rigor en la ciencia"* (or "On Exactitude in Science") where to create a

perfectly exact map of an empire the map must be of the same scale of the empire itself. This echoes an earlier short story by Lewis Carroll, (1894) remarking the uselessness of a map on the scale of 'a mile to the mile'.

Sharon (2017) expresses the concern about the 'reductionist effect' of viewing the world as data, where the scale is not properly acknowledged, or its fidelity and granularity overstated.

> *"Self-tracking works on the basis of categories or indicators that act as proxies for what are commonly very messy and rich phenomena, from 'mood' to 'health' to 'productivity'. When devices are described as giving users a 'dashboard' or a 'perfect picture' of their health, these data have a tendency to come to denote what health is."*

A central issue is that as rough edges are smoothed, outliers are removed and the rich messiness of everyday life is cleaned up, a model of reality is produced that is average, idealised or normative – "*thereby pushing users to think about their own behaviors in accordance with predetermined standards and to conform to them in practice."* Lupton (2014b) demonstrates this viscerally in her analysis of a huge range of 'Quantified Sex' apps, which she argues reinforce gender stereotypes and *"specific limited types of sexuality"*.

This reductive nature can be understood further as the process of 'commensuration' described by Espeland and Stevens (1998).

> *"Commensuration can be understood as a system for discarding information and organizing what remains into new forms. In abstracting and reducing information, the link between what is represented and the empirical world is obscured and uncertainty is absorbed. Everyday experience, practical reasoning and empathetic identification become increasingly irrelevant bases for judgment as context is stripped away and relationships become more abstractly represented by numbers."* (Espeland and Stevens, 1998, p.317)

Many of the contemporary concerns about 'dataism' are present in a careful reading of this above description – that '*uncertainty is absorbed'* and that empathy and everyday experience become '*irrelevant bases for judgment'*. Commensuration is the essence of quantification, and the ability to represent and model reality numerically. Things that are essentially different are stripped down until they share some essential or defining characteristics, rendering them available for comparison, numerical manipulation and representation. Reducing my physical activity to steps, allows me to count the number of steps I take each day, and compare them. Even though those steps were at different times, to different places, for different reasons; for the purposes of tracking physical activity, they can be commensurate. The qualitative difference between my steps yesterday and today has been reduced, as they are deemed to be insignificant to the question of physical activity. And indeed, this may very well be the case.

In this light, it is clear that the construction of data is about choosing how to abstract, reduce and model phenomena in the world. So, the core questions then concern how people account for and interpret these reductive models of reality. When is data 'too reductive', and how is this made sense of? When or why does it matter that I know that my steps were taken on a trip to Paris, rather than a commute to work? To reiterate, data is necessarily reductive. The matter of interest lies in how real-world phenomena are reduced, and then interpreted.

C) Data displaces other ways of knowing

Bowker (2005) has described archives – be they data or other kinds of records – as 'jussive' exercising judgment, precisely because they exclude, or preclude, other ways of remembering.

> *"[B]y remembering all and only certain facts/discoveries/observations, [it] consistently and actively engages in the forgetting of other sets. This exclusionary principle is, I argue, the source of the archive's jussive power."* (Bowker, 2005: 9)

Much the same could be said for data. As Rettberg (2014) notes, data often appears 'beyond argument' and presents an authoritative representation of the world. The proposed precision of data makes it seem especially determinative, and certain, especially in the face of seemingly subjective argument, or as Wolf (2010) disparages, human

intuition. Often, uncertainty is abstracted out; the constructed nature of data, or the numerous assumptions on which it turns are often left unacknowledged.

It displaces other ways of knowing by prioritising what can be easily or accurately categorised and counted. Especially as infrastructures are built on the basis of particular measures, data is institutionalised and becomes routine, and easy to hand. It can become the 'objective' and established basis for making decisions and other approaches can be marginalised. Sharon (2017) summarises sentiments that *"As one's trust in numbers grows, it is feared, one's trust in subjective, embodied, and intuitive knowledge decreases."*

One novelist argues we risk losing *"the sensory connection to our lives… all the raw materials of life, which by their very nature are disorganised"* (Feiler, 2014). This fear might be felt most acutely in relation to parenthood. Numerous 'Quantified Baby' applications now exist (Kane, 2016), primarily pitched at easing the anxieties and burdens of new parents through monitoring of, for example, vital signs, sleeping and feeding. In short, according to one CEO: *"You can look at your smartphone and know that everything is OK"*. Gaunt et al. (2014) consider how to design such technologies to avoid an unhealthy dependence on numbers, perceived to hinder the development of a parental intuition.

By contrast, however, the most active and reflective users at Quantified Self meet ups have described how self-tracking for them is not a window onto some inner truth, but instead a mirror which prompts reflection on the mundane and easily overlooked. The act of self-tracking itself – becoming attentive to something through the act of recording it – can be conveyed as a form of mindfulness (Sharon, 2017). At its most extreme, some have described heightening or training new senses – for example, learning one's compass orientation (Stone, 2013), or how to better recognise different symptoms and their causes.

This body of scholarship demonstrates the construction of data: which is not 'raw', which is necessarily reductive, and which can displace other ways of knowing. These critiques are essential to understanding data. However, Sharon's work (2016; 2017) in particular offers more than criticism. Examining self-tracking practice, she suggests barbed terms

such as 'data fetishism' can discount the nuance and mindfulness people can apply to their data, and a diversity of practice that extends beyond the pursuit of self-optimisation:

> *"…the relationship between so-called objective data and so-called subjective experience is hardly a zero-sum game for many QSers, but rather a tension and a negotiation that produces meaning, a process that QSers are often aware of partaking in."* (Sharon, 2017; pp114)

It is precisely this tension and negotiation that this thesis is interested in. boyd and Crawford (2012) highlight the importance of how the relationship between the 'objective' data and its 'subjective' context is maintained – "*data out of context loses meaning"*. Beyond the technical and epistemological limitations of data, what matters most is the terms on which data is interpreted and applied. In broader terms, how data is situated, and the stories it can plausibly tell.

D) Data is Situated

The idea of understanding how data is situated is captured by Taylor et al.'s (2015) concept of '*data-in-place'*:

> *"Data, from this viewpoint, doesn't by itself assert things in the world; rather, it helps to surface, assemble, cement and (at times) unravel forms of knowing, ideas, controversies, and so on. Also, it combines with and is entangled in wider forms of life, not always simplifying and narrowing in on the facts, but often further complicating what is at stake and introducing new and different forms of trouble."* (Taylor et al., 2015; p.2863)

In the context of street-level data collection on issues such as traffic, air quality and noise levels, Taylor et al. (2015) bring focus to how data of one kind or another actually comes to *matter* to those collecting it and living with it. Drawing from Wilson's accounts of street-level data tracking (Wilson, 2011) they show how data can gain legitimacy and be put to work, for example in petitioning the council or raising awareness about an issue. Crucial here, is a gentle push against the implication (from critics and technologists) that data, by its own technological clout and sophistication, is self-explanatory and automatically legitimised and powerful. 'Mattering', in Taylor's terms, is not an inherent

feature of data – not all data matters – instead, it is intimately tied to the social-geography of the community. As such, there are structures and boundaries to the data that is collected and how it is shared. Mattering has a dual meaning: both the data itself that *matters*; and how and when it is materialised, brought up, and made visible.

In this respect, data-in-place suggests *"a reconceptualisation of data, one that accounts for the ways in which it is contingent on very particular circumstances."* In so doing, it does not "*presume an intrinsic generality",* which is neutral, objective and abstract from its context. Instead, it *"acknowledges precisely its place in and amongst other worldly things."* In such a way, Taylor et al. (2015) suggest their approach (like this thesis) is about small and particular rather than big and general data.

'Data-in-place' therefore invites analysis of the social process of data. Ethnomethodological approaches (Crabtree and Mortier, 2015; Tolmie et al., 2016) are acutely attentive to the interactional qualities of this social process, emphasising the potential of data as a boundary object, and the 'collaborative work' that goes into making accounts of it. Drawing from Star and Griesemer (1989) this "*turns upon 'a mutual modus operandi' involving 'communications' and 'translations' that order the 'flow' of information through 'networks' of participants. This, in turn, creates an 'ecology' of collaboration in which data interaction becomes stable."* (p.338)

This work concerns how data 'coheres' as a boundary object across settings. How do you and I agree upon and interpret data in the same way, so that it is a reliable mediator? Or, returning to Taylor's terms: how does data settle in place, becoming stable in a particular context – in its meaning, interpretation and use? For example, Fiore-Gartland and Neff (2015) report that consumer health and self-tracking data is mostly unstable and fails as a boundary object in many interactions between doctors and patients. The meaning, interpretation and the resulting action are not at all stable. Instead, they argue that the doctors and patients have different *data valences*, which may rarely overlap. A clinician is looking for data that offers a definitive diagnosis, while a patient may see their data as a way of evidencing symptoms or a mode of self-discovery.

Turning specifically to self-tracking, this thesis asks broadly how quantified data comes to matter to people, particularly over the longer term. How does data gain purchase on

reality and the way people can account for the past in their lives? What is the context in which a quantified past "*helps to surface, assemble, cement and (at times) unravel forms of knowing, ideas, controversies"* about the past? (Taylor et al., 2015; p.2863*)*

These are questions I will return to. However, from this more nuanced understanding of data, its construction and situated nature, we can now reflect on extant work, especially in HCI, on the design of self-tracking technologies.

2.1.4. Personal to Lived Informatics

The data-driven life has been addressed in HCI largely under the banner of 'personal informatics'. Li et al. (2010) define personal informatics (PI) as a class of tools that *"help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge"* (p.558).

Through a survey and interviews with early-adopters of self-trackers, Li et al. (2010) developed a model which describes five different stages of interaction with PI tools – preparation, collection, integration, reflection, and action. The model, reminiscent of other stage-based cognitive models, is intended as a means to highlight the challenges in moving through each stage, and in particular, technological barriers that designers can hope to address. The proceedings of several successive CHI and Ubicomp workshops[2] organised by Li and colleagues demonstrates the range of work related to personal informatics in HCI (Li et al., 2010b, 2011a, 2012, 2013, Rapp et al., 2015, 2016).

There are some common values and approaches to the research and design of most PI tools. Like earlier related sensor-based work, (e.g. Consolvo et al., 2008b, 2006; Klasnja and Pratt, 2012; Lin et al., 2006) PI are envisaged as individual tools, to be understood psychologically (Li et al., 2011b; Rapp and Tirassa, 2017). They are often employed as 'persuasive technology' (Fogg, 2002) or to support behaviour change (e.g. Campbell et al., 2008; Consolvo et al., 2008a; Froehlich et al., 2009, 2010; Li et al., 2010) – towards more active, healthy and sustainable lifestyles. The technology and data supports the systematic setting, achievement of, and reflection on, goals. This assumes a directed and rational relationship with one's data. Good design is supposed to make self-tracking

[2] http://www.personalinformatics.org/

easier, more efficient, more motivating and lead to more 'actionable insights' in new domains. This might be achieved for example through better visualisation (e.g. Choe et al., 2015; Epstein et al., 2014) , capturing new types of data (e.g. Cohn et al., 2010; Froehlich et al., 2009), or adding social features to share one's data with a community (e.g. Epstein et al., 2013, 2015). There is a strong thread throughout that data can be a tool to solve any manner of human problems. This instrumentalist view, present in many commercial applications too, raises critiques of 'solutionism' (Morozov, 2013) and 'function creep' (Lupton, 2014c).

Within HCI, the most significant critique is provided by Rooksby et al. (2014), who describe Li et al.'s model as "*technology-centric".*

> *"The problems that users experience are technical problems to be resolved firstly by selecting the correct technology. Only once the technologies are in place, and the datasets transformed and integrated, can things like reflection and action take place"*

Li's approach assumes an abstract and rational human actor, at the expense of understanding more everyday experiences with these tools. In their own interview-study Rooksby et al. (2014) present (rather than stages) five different '*styles of use'* - **directive, documentary**, **diagnostic**, **collecting rewards** and **fetishised tracking**, to emphasise the ways in which people make trackers their own. Following McCarthy and Wright (2004), they suggest design implications based on a better understanding of the *'felt-life'* and experience of '*lived informatics'* as they become *"enmeshed in everyday life"* (p.1163).

This work makes a significant contribution because it allows us to take a step back from the technology in play, and consider more broadly the significance of self-tracking and data in people's lives.

> *"…the interviews began with a vague request along the lines of: "I'm interested to hear what trackers you use, what you like and dislike, and so on." This request was not met with a naming of what apps and devices that person had, or what kinds of thing they wanted to measure, but something more akin to a life story."* (Rooksby et al., 2014, p.1171)

Just as Sharon (2017) remarks that that the sociological critique of self-tracking is "*to an important extent detached from the actual, everyday experiences of users of self-tracking devices";* so too Rooksby et al. (2014) expose a similar distance between cognitive and technology centric approaches in HCI and the lived experience of PI tools. The need to bridge this gap has been particularly felt in recent years. Self-tracking has moved beyond early-adopters and enthusiasts in the Quantified Self movement. However, there has also been a reported lack in dedicated, long-term tracking (Clawson et al., 2015; Epstein et al., 2016; Lazar et al., 2015). Together, these trends underlined the extent to which a purely instrumental view and design of data-driven tools is only ever one part of the appeal and actual use of these technologies.

Rooksby et al.'s (2014) argument is not just that people track data for reasons beyond their ostensible purpose – Li et al. (2010, 2011) also make clear that people use their data to reminisce, to aid memory or to manage their affairs. The more fundamental point is that self-tracking takes place over a series of 'lived activities'. When this broader context has been considered previously, it is only as a further potential source of data in aid of a central goal like physical activity.

The most recent work in HCI has tended to straddle these two 'psychological' and 'phenomenological' streams (Ayobi et al., 2016). In particular, Epstein and his colleagues have developed a body of work (Epstein et al., 2015b, 2016) which seeks to address Rooksby's criticisms, and add more nuance to Li's (2010) model, moving beyond the somewhat exclusive focus on behaviour change goals. This is encapsulated in a new 'Lived Informatics Model of Personal Informatics' (Epstein et al., 2015b). The model is circular, to account for lapsing and resuming use of PI tools. However, it is still broadly stage-based, with focus on the transitions and barriers between stages. Elements of Li's original formulation remain, as a concentrated inner circle. In broad terms, they seek to account for 'lived informatics' by enlarging and acknowledging in the model to include lapsing, deciding and selecting as stages of use. These are useful for the technologist – and in particular suggest ways to help users resume tracking. Like Li's model, it also provides some focus and vocabulary to summarise and direct future research. Nonetheless, this psychological model still presents a somewhat impoverished view of the potential lived experience of self-tracking.

Indeed, such a model is arguably somewhat antithetical to the phenomenological roots of Rooksby's work. Phenomenologists tend to reject such theory and instead seek to *" go back to the things themselves"* (Husserl, 1900). 'Lapsing' provides a nod to the way that when *"enmeshed in everyday life*" (Rooksby et al., 2014), personal informatics can fall short of expectations; but this also abstracts the situated, specific and rich reasons that someone is no longer tracking, and assumes tracking as the default, normal position.

Epstein's model (2015b) is refined and well-researched. However, it highlights a degree of incompatibility between general models of use, and phenomenological accounts of lived experience. The model offers summary, and directive uses, but is less apt for appreciating the broad experience of a data-driven life. In this respect, like Li's work that precedes it, this model offers a somewhat narrow view on the role of personal informatics and the diverse, idiographic experience of living a data-driven life. Both models essentially accept the premise of Wolf's 'data-driven life'; the role of designers and technologists is then in facilitating the flow of data. This is in-keeping with the paradigm of commercial design of personal informatics tools and the Quantified Self community. In this respect, it is essentially uncritical.

Put another way, such models rarely help us be imaginative about the possible roles for data in one's life: to ask what data is really for or achieves; or to consider the sorts of questions and expectations now being asked of data, and whether these are appropriate.

Rooksby's work (2014), and other more phenomenological, descriptive accounts offer more in this regard. A key tenet of 'lived informatics' is seeking an understanding of how people make tracking their own. They highlight the diversity of practices and values for self-tracking that go beyond an instrument of behaviour change. Even in cases of managing a chronic health condition (e.g. diabetes), it becomes clear how the act of self-tracking becomes integral to one's perception and presentation of self (O'Kane et al., 2015) . Lived Informatics is not only a recognition that self-tracking takes place over a range of lived activities; it also questions what aspects of lived experience personal informatics can really address, and the implications of a data-driven life for how we experience the world.

While the promotion and uptake of self-tracking may initially be premised on their utility in losing weight, or sleeping better, we should not underestimate the more fundamental ways in which data ultimately can become enmeshed with everyday life. There is more at stake here than being fitter, happier and more productive. However, approaching these criticisms constructively, there is an opportunity to rethink, and set out a much broader, human relationship with data.

2.1.5. Summary

This first section of literature review deconstructed the data-driven life as a socio-technical phenomenon. While quantified accounts of the world have a long history, contemporary visions of ubiquitous computing see the rubrics of data gain purchase in personal domains. Advances in sensor technology, activity recognition, data visualisation and storage are leveraged alongside contemporary goals of self-optimisation and personal responsibility; a valorisation of objective, quantified data; and a belief in this data producing new kinds of knowledge. This convergence is epitomised by the Quantified Self movement, and in the design of 'Personal Informatics' tools. However, sociological critiques, particularly of Big Data, demonstrate how data is not raw, but instead constructed as a model of reality. This construction is necessarily reductive, but can be a powerful way of viewing the world, one that often displaces other ways of knowing. Most importantly, in reconciling data with its context, data and its meaning are deeply situated. Within HCI, Rooksby et al.'s 'Lived Informatics' offers a description of the situated experience of self-tracking, and a diversity of self-tracking practice, which extends beyond the ideal data-driven life implicated in earlier models of personal informatics use. This presents a platform to consider more human relationships with data, such as the experience of remembering.

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2.2. Studying Remembering

The study of human memory remains in Brockmeier's terms an *"elusive"* subject (2010). As a remarkable human faculty and a genuinely everyday concern, some notion of memory, and the continuation of past into present and future, touches most disciplines and has been a subject of academic inquiry for millennia. And yet, scholars and scientists remain deeply divided on the phenomenon. Perhaps it is, as Echterhoff (2011, p.7) suggests, that "*the sheer pervasiveness of memory makes it difficult to define or discern a circumscribed, well-defined domain of study."*

Draaisma's 'Metaphors of Memory' (2000) highlights how understandings of memory have frequently been tied to technologies of the day. From Plato's Wax Tablet, to Freud's Mystic Writing Pad and now the networked computer, this history also reveals the prevalence of the 'archive' metaphor, viewing the mind variously as a container, aviary or storehouse for memory. This perspective imagines 'memory-in-the-head': physically located in the mind, and formed through various 'impressions' of the world, before some sort of infinite 'storage' and finally a process of 'retrieval'. It was (and arguably remains) the prevalent metaphor in much classical experimental and cognitive psychology (e.g. Baddeley and Hitch, 1974; Cohen and Conway, 2007; Ebbinghaus, 1913; Tulving, 1985). For example, Baddeley's latest student textbook on memory explains:

> *"Using the digital computer as an analogy, human memory could be regarded as comprising one or more storage systems. Any memory system – whether, physical, electronic or human – requires three things, the capacity to encode, or enter information into the system, the capacity to store it, and - subsequently - the capacity to find and retrieve it." (Baddeley et al., 2015, p.8)*

Brockmeier (2010) however asserts that this archive metaphor is in crisis, citing in particular a 'cultural paradigm shift' in memory research, which localises memory *"within a broader framework of social and cultural practices and artefacts"*. This represents a shift to viewing 'memory-in-the-world' – recognising remembering (an active verb) as a constructive activity, contingent on more than the workings of the mind.

Cognitive psychologists are certainly not deaf to these concerns. Neisser (1982) for example, pioneered the need for more 'ecological' or 'naturalistic' studies of memory

outside of the laboratory. This is especially the case for 'autobiographical memory' (AM), the primary psychological theory for the events in one's life (Conway and Pleydell-Pearce, 2000). This theory describes how internal 'schema' for remembering are malleable, evolve, and are responsive to environmental factors; demanding a more everyday and real-world understanding of human memory. Echterhoff (2011) responds to Brockmeier's (2010) critique emphasising the many wrangles and deliberate efforts by psychologists to acknowledge and work around the evident simplifications of the archive metaphor. Yet, in discourse, and especially in design, the notion of 'memory-in-the-head' undoubtedly persists.

The comparatively young field of Memory Studies faces these disciplinary quandaries head on. Though emerging from a broadly socio-cultural sphere, the editors of the inaugural journal issue (Hoskins et al., 2008) sought to *"mobilize scholarship driven by problem or topic, rather than by singular method or tradition."* Writing in the same issue, Sturken restated *"the challenge is to reconcile, when fruitful, the very different theoretical models for memory that are deployed in different fields and also to not force interdisciplinary questions when they are less reconcilable."* (Sturken, 2008, p.77)

This thesis does not set out to reconcile these deep-rooted differences between disciplines. It is, however, well worth recognising and understanding how differing perspectives have informed the design of technologies of memory. Throughout this thesis, I will argue that a broadly **socio-cultural and phenomenological view of remembering** is most 'fruitful' for the exploratory and idiographic research questions I pursue. Specifically, this thesis takes a lead from Middleton and Edwards 'Collective Remembering':

"...the heart of the topic, the sheer meaningfulness of memories, their content and organisation, their personal and social significance, their context and occasionings in the flow of ordinary experience, cannot be accounted for by reference to mental processes alone."

Middleton and Edwards (1990, p.19)

It is these "*occasionings [of remembering with data] in the flow of ordinary experience*" which are the primary interest here. When do people turn to a quantified past? How is it

shared and brought to bear on the present? How does it compare with existing records and media? How should we design interactions with it? Few of these questions can be answered fully through understanding the minutiae of the mind. Conway's AM theory (Cohen and Conway, 2007; Conway and Pleydell-Pearce, 2000) has informed much research in HCI (e.g. Peesapati et al., 2010; Petrelli et al., 2008; van den Hoven and Eggen, 2008), particularly in refining the 'total capture' perspective of early lifelogging efforts. However, their work still sees the head, and understanding mental processes, as the primary site for memory research. In some contrast, this thesis seeks a rich understanding of the personal and the particular, rather than typically more general observations about the mind. In this literature review, I will develop a socio-cultural and experience-centred perspective which better supports an understanding of how remembering is mediated by our interactions with the world and serves the purpose of interaction design.

2.2.1. Introducing Bartlett

Frederic Bartlett was the first Chair of Experimental Psychology at Cambridge University. Though perhaps most famous amongst cognitive psychologists for his notion of 'schema', he was in fact deeply sensitive to social and cultural concerns. Indeed, some have interpreted his work as an attempt to address anthropological questions through psychological methods (Rosa, 1996).

Bartlett's single most significant contribution is an unequivocal demonstration of the reconstructive, and hence social, nature of remembering (1932). In the method of 'repeated reproduction', Bartlett told English participants an unfamiliar American Indian folk story '*The War of the Ghosts'*. He then asked them to reproduce the story as faithfully as they could, repeatedly, at intervals – over days, weeks, months and in some cases with many years between reproductions. Studying many hundreds of reproductions, he demonstrates how the original story becomes progressively distorted as it is remembered. These distortions (omissions, adding of emotion and detail, changing proper names, simplifying the narrative) are attributed principally to fitting an unfamiliar story to one's own cultural frame of reference: thereby remembering a general impression and the overall themes of the story, but resolving unfamiliar elements and details into terms that fit one's own cultural understanding. For Bartlett, this confounds any notion of 'passive'

or ‘lifeless’ traces of memory in the mind which are later re-excited and retrieved from memory for reproduction – as is presumed under the archive model.

> *“Remembering is not the re-excitation of innumerable fixed, lifeless and fragmentary traces. It is an imaginative reconstruction, or construction built out of the relation of our attitude towards a whole active mass of organised past reactions or experience, and to a little outstanding detail which commonly appears in image or in language form.”* (p.213)

This is a lengthy and complex definition of remembering. However, on deeper inspection, drawing especially from Middleton and Brown’s (2005) unique reading of Bartlett’s work, we can set out the foundations to approach remembering conceptually and methodologically. Parsing Bartlett’s definition, remembering is: a) *an imaginative reconstruction;* b) *active and dynamic;* c) the result of a *past acting en masse* d) a *relation of our ‘attitude’ to this mass;* and e) a relation to *common* or *outstanding detailed images.* Middleton and Brown provide a fuller analytic account of the experience-centred focus of Bartlett’s work. However, I will briefly discuss each of these features of remembering in turn, as they will be developed and returned to throughout the thesis.

2.2.2. Remembering as an Imaginative Reconstruction

The cornerstone of Bartlett’s definition of remembering is to recognise remembering as an ‘imaginative reconstruction’. Practically, remembering should not be misunderstood as a work of pure or deliberate fiction. Rather, from his experiments Bartlett remarks that “*we mingle interpretation with description, interpolate things not originally present, transform without effort and without knowledge (p.96).”*

> “*It was common to find the preliminary check, the struggle to get somewhere, the varying play of doubt, hesitation, satisfaction and the like, and the eventual building up of a complete story accompanied by the more and more confident advance in a particular direction… remembering appears to be far more decisively an affair of construction rather than one of mere reproduction”* (p.205)

It is first worth remarking on the value of Bartlett’s discursive approach to remembering, which so evidently shows its reconstructive nature. It is in these discursive actions - the

mingling, the interpolating, the transforming - and their effect, in which Bartlett is often most interested. Later work (Bergman and Roediger, 1999) has (successfully) replicated Bartlett's experiments, though in a more quantitative manner to measure declining accuracy of reproductions. However, Bartlett was always more interested in the meaning of any such changes, rather than their frequency or accuracy.

On Imagination and Remembering

To appreciate the interplay between imagining and remembering, it is worth reflecting on philosopher Edward Casey's 'Phenomenological Studies' of *Imagining* (Casey, 1976) and *Remembering* (Casey, 1987). His work showcases the potential value of a phenomenological approach to remembering, which relies on skilled attention to, and analysis of, the lived and felt nature of these nebulous phenomena, often reflecting on personal experience. Casey (1977) describes imagining and remembering are a double act – especially in describing things that are 'absent' or that 'elude perception'.

*"What we cannot remember we can try to imagine, and what we cannot imagine we can try to summon up in memory as an analogue from the past." (*Casey, 1977, p.195)

Discussing the literal work of a historian in understanding and describing history, Casey notes how it is necessary for the historian to use their own imagination to reconstruct the past and make meaning of another's recording and remembering. Bartlett's view of remembering as an imaginative reconstruction recognises this imaginative character, especially in "*the struggle to get somewhere"* as we assume, construct and remember composites of experience.

Valuing a Reconstructive Memory

Once remembering is admitted as a constructive act, we can ask why people reconstruct the past in the ways that they do and the implications of a reconstructive memory. The implications are perhaps felt most deeply in a court room, showcased by Loftus' pioneering work on 'eyewitness memories' and 'false memory' (Loftus and Palmer, 1996; Loftus and Pickrell, 1995). A malleable, traumatised and easily misled human memory in such a context is shown to have potentially hugely damaging consequences. However, Bartlett argues that the need for literally reproductive memory is rarely the sort of memory that is important in everyday life. Rather, the courtroom could be thought of a

special case whereas, when we remember discursively "*it is usually incidental to our main preoccupations… there is ordinarily no directed or laborious effort to secure accuracy" (1932, p.96).*

Returning to Middleton and Edwards' (1990) remarks about the '*sheer meaningfulness of memories'*, disciplinary divisions manifest as a question of focus. Understanding 'memory-in-the-world' tends towards an attention to everyday remembering. While we tend to recall memory lapses or 'sins' (Schacter, 2002), which are costly, this overlooks the extent to which a literally reproductive memory is both rarely necessary, or even healthy. Bartlett attributes the purpose of a reconstructive memory to the fact we live "*in a world of constantly changing environment".* Schacter attributes the seven sins of memory as the result of *"adaptive properties"* drawing on evolutionary theories. Both, however, suggest that remembering serves us in response to present concerns and actions - "*our main preoccupations"* (Bartlett, 1932). And as we shall see, remembering, viewed more holistically, and as a social action, accomplishes many other things besides determining an accurate record of the past.

Middleton and Brown (2005) argue that remembering is essential in helping people orient to the demands of the present. They echo pragmatist philosopher William James' (1890) view that remembering is implicit in a sense of continuity in our lives – and hence, our everyday experience of the flow of time. Therefore, "*memory is to be approached in terms of the ability to connect together aspects of our experience as they appear in the ongoing flow of awareness"* (2005, p.12). In other words, the reconstructive and therefore selective nature of remembering helps us to continuously and dynamically relate past experiences to our present circumstances and needs.

2.2.3 Remembering as Active and Dynamic

Considering remembering as reconstructive and responsive to the demands of the present suggests a memory that is far less stable and definite than might be implied by storage or archive metaphors. Instead, it is active and dynamic. Some scholars pointedly talk about studying 'remembering' - an active verb - rather than memory - a noun. Bartlett's definition rallies against previous *'lifeless'* incarnations of memory, and is insistent that we do not describe memory in terms that are too determinate. He even rejects his own

term of ‘schema’ (since taken up wholesale in cognitive psychology) to describe factors influencing remembering:

> *“I strongly dislike the term 'schema'. It is at once too definite and too sketchy... it suggests some persistent but fragmentary, 'form of arrangement' and it does not indicate what is very essential to the whole notion that the organised mass results of past changes of position and posture are actively* ***doing*** *something all the time; are so to speak carried along with us, complete, though developing, from moment to moment" (1932, p.201).*

Having moved away from the notion of a memory as a fixed thing in the head, Bartlett is going further here to say that even the terms on which we reconstruct, an organised mass, are evolving and developing – they are dynamic. As we age, our orientations to the present, our preoccupations, our priorities, and our identities, all evolve.

To reiterate, remembering is not mere reproduction, but something much more expressive and central to one’s always evolving identity and social orientation. Bartlett emphasises that these schemas are "*living and developing... a complex expression of the life of the moment"* (1932, p.214). Recent cognitive models of autobiographical memory also reflect this shift, refining schema-based models of memory to recognise that such schema are constantly reorganised in response to environmental and social concerns.

It is this active and dynamic nature of remembering that underpins the value and tension in personal records. Photographs and diaries, for example, are a far more fixed representation of the past. They can remind us of an *“outstanding detail”* (Bartlett, 1932) and open up new avenues for remembering. However, on occasion, the representation of the past can be at odds with the past that is remembered, or has been “*carried along with us”.* Such inconsistencies lead to the impression of fallible human memory, which requires technological assistance. By contrast, we may ask: if we carried around an entire reproduction of all past experience, how we would ever ‘move on’ and orient ourselves to the changing demands of the present?

2.2.4. Acting as Past en Masse

The picture of a selective and evolving remembering is contextualised by Bartlett in relation to a '*whole active mass of organised past reactions or experience'*. This suggests there are many past experiences we could draw on, from which we select, craft and imaginatively reconstruct each time we remember. Underlying this description is the implication that 'the past' is indistinct and indefinite. Memories are not neatly separated from each other – to borrow an example they are more like milk stirred into water (Loftus and Ketcham, 1994); nor do memories emerge fully formed from a fixed mental trace or impression of a past event as implied by the archive metaphor.

Middleton and Brown draw heavily on the several works of process philosopher Henri Bergson to understand this. Bergson argues that our memory is always 'on' and automatic – "*there is never a start or end to the recording of memories*" (Middleton and Brown, 2005, p.72). Rather than questioning how memories are stored and restored to consciousness, Bergson instead proposes that it is much more remarkable that we 'forget' and hold back the weight or mass of the past which *"gnaws into the present"* (2005, p.116). For Bergson, this mass is 'pure memory' from which remembering is "*an act of disassociation, a cutting out of some aspect of the past to fit the cloth of the present"* (2005, p.232*).* In Bergson's terms, each cutting out or reconstruction is a particular 'actualisation' of a 'virtual' and indefinite past (2005, pp.74,75).

While Bergson's language can be challenging, a phenomenological reflection can help parse this vocabulary. When searching one's own mind, until we seek to remember, it is difficult to account clearly for what we can remember or not. The extent of our own memories is largely unfathomable. We often surprise ourselves when remembering things we have forgotten for many years. Even recalling an episodic event (borrowing cognitive psychology's language) brings a great deal more of the past to bear than the sole event or detail. This one memory is not extracted in isolation. It is often compounded with many others, alongside emotions, and other '*past reactions'* that colour the experience of remembering. Consider the language used to describe remembering. We 'delve' or 'venture' into the past, implicitly recognising how this mass is 'dug' or 'dredged up'. There is then the '*eventual building up of a complete story'* (Bartlett, 1932), as we fashion or 'actualise' the past for present intentions.

2.2.5. Remembering is Situated

It is this instability and indefiniteness of the "*whole active mass*" of the past that has most interested social and cultural scholars who contend, *"the past is not given, but must instead continually be re-constructed and re-presented"* (Erll et al., 2008, p.7).

The risk of this perspective, however, is that we may be led to believe that without any purchase on the present the past is quite fluid. This is clearly not the case, indeed often the opposite seems true. So how is it that the past becomes or appears more stable and definite or indeed what gives it 'weight'? On what terms can the past be reconstructed, and how are these patterned or structured? More specifically for this thesis, what roles do objects, new media and recording technologies play in this reconstruction?

In such questions, we can see that remembering is a situated action; contingent on what Bartlett came to refer to as 'organised settings'. He preferred this description as being more flexible than the idea of schema, which was later taken up in cognitive psychology. What is meant by 'organised settings' can appear quite nebulous. Indeed, the entire fields of socio-cultural and collective memory are concerned with what the 'social landscape' (Misztal, 2003) of such settings could be. A history of socio-cultural study of remembering is not the aim here. However, it is worth noting the outlines of these 'organised settings' in some more detail, drawing closely from Middleton and Brown (2005, p.19).

First, they describe *commemoration* and *conventionalisation*; both of these can be thought of as the way social practices, rituals and traditions rooted in particular cultures and social groups shape remembering (Connerton, 1989). Commemoration entails dedicated remembering of specific events, an anniversary for example; conventionalisation considers the way that actions and language (e.g. salutes, greetings, table manners) inherently reinforce some aspect of the past more generally. Secondly, and of particular relevance to this thesis, Middleton and Brown describe *objectification* and *mediation.* Clearly, commemoration and conventionalisation occur on more than a mental or discursive level. They take place physically in the world, in particular places, and require both physical action and interaction with these places and objects. Once again, Casey's phenomenological work (1987) is illuminating here in providing an embodied perspective, describing how the interactive actions we take 'with', 'through' and 'around'

objects in-place are integral to remembering. As a further foundational aspect of sociocultural study of remembering, these objects and language itself can all be considered as 'tools' – both literal and symbolic, which *mediate* remembering (Middleton and Brown, 2005, p.30).

Taken together, we see remembering does not take place in a vacuum. It is situated and interdependent with these 'organised settings', which mediate what and how we record and remember. However, to set the stage for 'technologies of memory' (Van House and Churchill, 2008) as a part of these settings, we need to further develop the concept of mediation, especially through objects.

2.2.6. Mediating Remembering

Middleton and Brown turn to Russian theorist Vygotsky (1987) to argue that any sort of mediation, through language, symbols, gestures, and artefacts results in the *'objectification of human action'*. Drawing also on the work of Serres (1982), the mediator becomes a third party to any communication that '*contributes its own dynamic.*' (Middleton and Brown, 2005, p.145). More simply, we can recognise that telling a story through pictures, numbers, or in a different language might all lead to different understandings. The challenge is to make oneself understood, to convey the right information, within any constraints or characteristics of the mediator.

Serres' work, and the Actor-Network Theory which follows (Latour, 2005), explicitly recognises the agency of mediators (usually objects or interfaces, physical and digital) in an exchange. With the notion of 'translation', this method of sociological inquiry emphasises how mediators "*extend, ramify, amplify, displace and transform our actions"* (Middleton and Brown, 2005, p.146). Reflected in remembering, this agency creates what (Wertsch, 2002) describes as an *"irreducible tension"*; between the past as mediated, and the past as reconstructively remembered.

For example, in one of Middleton and Brown's many discursive examples, a mother shares a family photograph with her youngest son Paul. Paul's mother is using the photograph as a basis for family recollection, and engaging her son in claims about his developing identity. In this case – being able to keep his balance on a bouncy castle. While the still photograph creates the occasion for such recollection and reflection, it also

commits the family to only one particular perspective and moment of the past - *"a past that was not, and could not have been experienced as such by all the family members"* (Middleton and Brown, 2005, p.144). This is where the tension lies, which necessitates a degree of *negotiation* between Paul and his mother, as to what meaning can be derived from the past as it appears in the photograph.

This photograph is not simply a cue for remembering. Radley (1990) explains the mediating role of objects as offering "*opportunities and directions for appreciating the past".* Middleton and Brown also talk in these terms; physical objects in particular provide *"occasions to extract and reconstruct the past"* and act as "*structures or envelopes into which we can insert and develop recollections"* (Middleton and Brown, 2005, p.142). Radley (1990) describes how objects that mediate the past become mementos when they are *displaced* from their original time and context. Their relatively fixed and enduring nature (in relation to the continuous flow of the present) allows us to *'define the world of which it was a part'* and offers a basis upon which interpretations of the past can then be reconstructed.

These objects can become '*condensed symbols'* (Radley*,* 1990) or, in Middleton and Brown's terms '*punctualise experience'*. Even within cognitive memory research, it is acknowledged that our memories of associated events are rarely distinct. Remembering childhood 'bath time', for example, we would tend to construct a compound image of many 'bath times' rather than bathing on one specific occasion. Middleton and Brown work this through further as a consequence of a memory that is 'always on'. They question how it is that we are able to divide up, mark out and *'punctualise'* our pasts as happening in discrete episodes and distinct parts, rather than as James' (1890) continuous '*stream of consciousness*'. Objects help us do this, and mediate remembering in part by *'packaging up'* the past. In their relative stability and enduring nature, they indicate both continuity, as well as the things that have changed. They often also share a set of collective values, and as such, they seem to offer a cohesive front, or representation of the past, which provides a *'foothold'* in an otherwise seemingly fluid and indistinct mass of past experience.

These footholds are also often publicly available, in a way that one's own mental experience is not. As a shared resource, objects can be used to coordinate and structure

shared remembering. Family photo albums or heirlooms are canonical examples of collective remembering, anchored by an object or indeed a familiar set of activities. Buchanan and Middleton (1995) share examples of older women reminiscing about the effort in washing clothes together. What is notable is the extent to which the building up of a shared account relies on recounting different objects (bath tubs, Sunlight soap, bed sheets) and activities (punching sheets, blowing in the wind). These objects need not even be present, but are the structures through which people localise and share their individual memories. Their interior mental experience is mediated and made available through a shared materiality.

Understood more broadly, Jose van Dijck (2007) emphasises the constructive nature of mediated remembering as ways of '*defining personal remembrance in the face of larger cultural frameworks'* (p.25) – in this case the significant domestic, and gendered, chore of laundry. Remembering is not just the recounting of events that happened, but turns on *"the ability to locate and identify pieces of culture that identify the self in relation to others"* (p.50). van Dijck's work emphasises that mediators are not simply to cue the most evocative memories, or accurately convey the most information about past events. They work to link individual and collective remembering, through aspects of shared culture. The questions in this thesis concern how quantified data becomes a part of shared culture, and the particular qualities it exhibits as a mediator of individual remembering.

2.2.7. Summary

Beginning with the pioneering work of Frederic Bartlett, this section has set out a definition of remembering as an imaginative reconstruction, which is active and dynamic, and is undertaken in relation to the past as a whole, rather than discrete, pre-formed memories. Vitally, remembering is understood to be present focused and action-oriented; it is always doing something. My clear focus here is on the way remembering becomes meaningful to an individual, rather than the psychological faculty of recall. This means that like an understanding of data, the meaning of an instance of remembering is deeply situated in personal contexts and cultural frameworks. Bartlett describes the way remembering is structured and gains stability through 'organised settings'. Middleton and Brown elucidate Bartlett's meaning by describing commemorations, social conventions, objectification, and, most relevant for this thesis, mediation. The crux of this thesis is in

understanding quantified data as a new mode of objectifying and mediating remembering; I seek to understand the value of this new experience.

The next section moves this core argument on, to focus explicitly on ‘technologies of memory’, perceived to directly capture and represent the past. This will first present socio-cultural theories of a ’new memory ecology’, predicated on digital technologies. Secondly, this will chart a brief history of HCI studies of technologies of memory. This begins with notions of total capture and the advent of ‘lifelogging’ through to studies of remembering with digital possessions.

2.3. Technologies of Memory

2.3.1. Distinguishing Digital Memories

A history of technologies of memory is in many ways a history of memory and record-keeping itself. Draaisma (2000) shows how human understanding and metaphors of memory have been inextricably linked to technologies of the time. One might even consider the ars memorativa (the art of memory) (Yates, 1966) – a set of mnemonic and rhetorical systems from classical times – as a technology of sorts. The development of such technologies has always been provocative. Plato famously critiqued one of the earliest technologies of memory, writing, as it would *"produce forgetfulness in the minds of those who learn to use it, because they will not practice their memory"* (Plato, Phaedrus, 275a).

However, in contemporary scholarship in socio-cultural and memory studies, technologies of memory tend to focus on the emergence of digital technologies, which document and create records of everyday life through their use.

> *"Technologies of memory, while they might include memorials, souvenirs, bodies and other objects, are increasingly visual technologies of mass and mediated forms – photographs, films, television shows and digital images."* (Sturken, 2008, p.75)

Records are both produced and remembered through these technologies. Scholars in particular note the rapid development, and distributed nature of such technologies, allowing anyone to record their life in previously unimaginable detail.

> *"A visible shift in memory in recent years has been the increasing availability, sophistication, capacity and portability of consumer, professional and enterprise level capture/record technologies – they are smaller, lighter, wireless-internet enabled, have a longer battery life and are cheaper. We need never be not recording. The result is an explosion in type, format and sheer amount of data being gathered." (Van House and Churchill, 2008, p.300)*

Contemporary memory practices are also seen as entirely interwoven with 'new media' (Lievrouw and Livingstone, 2002; Manovich, 2001). Recording is achieved in the course of everyday life as people increasingly communicate online through a diversity of media

and platforms. Brown and Hoskins (2010) propose a *"new memory ecology which is 'imbricated' in digital recording technologies and media"* (p.96). Mediation (van Dijck, 2007) or 'mediatisation' of memory (Hoskins, 2009a) now connotes first and foremost the recording of everyday life through digital interaction.

Hoskins distinguished this new mediated memory as *"pervasive, accessible, disposable, distributed, promiscuous"* (Hoskins, 2011, p.19). Odom et al.'s (2014) characterisation of 'digital possessions' as placeless, spaceless and formless resembles this description. *Placeless* – they can be accessed from nearly anywhere and are present in multiple places at once; *spaceless* – they do not take up physical space; and *formless* – they can be reproduced, the copy resembles the original, and can be easily altered and reconstituted. These descriptions suggest something more than just the sheer volume of recording available; these records are materially different, and afford new orientations to, and practices of, remembering.

Schwarz, (2014) summarises four broad perspectives on this new 'digital materiality' of memory. The 'connective turn' (Hoskins, 2011) emphasises the networked nature of digital media – that the structure of networks (e.g. social networks, databases) and their always on, constant connectivity shapes a unique accessibility and set of relations between elements of the past. Nothing is really archival if it can be brought to the present at the click of a button. Secondly, scholars propose a 'world without forgetting' (Garde-Hansen et al., 2009; Mayer-Schönberger, 2011) where forgetting and putting the past to rest is increasingly difficult as technologies and institutions save everything by default. This is seen as particularly problematic as "*objectified representations of the past",* for example, records of instant messaging chats *"transform regimes of truth"* (Schwarz, 2014, p.9). However, despite this sense of being trapped by the past, a third thesis of *flexible memory* (Dijck, 2007; Hoskins, 2009b*)* suggests that the scope for digital manipulation (especially of photographs) and its uncertain, unarchived place makes digital memory potentially less fixed and stable than previous records.

None of these theories are mutually exclusive. However, Schwarz adds a further notable characteristic of digital memory – that as a result of its place in a database, it can be non-narrative. Representations of the past can be dredged up, and assembled by hazard and in many different formations, for example, in a routine search of one's email inbox. An

important consequence of this uncertain and dynamic location of digital media is that their encounter is less predictable, and not always initiated intentionally, or by a human. Schwarz suggests such relations are 'neighbourly' – with all the potential tensions that metaphor could imply.

My thesis, like Schwarz, puts stock in each of these perspectives. While they each have different central matters of concern, together they present a compelling case that the scope and distributed, networked nature of new technologies is something of a paradigm shift, especially for the study of collective remembering. Nonetheless, avoiding technological determinism, Brown and Hoskins (2010) remind us that the cultural practices or schemata, surrounding these technologies remains instrumental in how remembering is achieved and to what ends. Further, despite its prevalence, digital memory has not entirely displaced more traditional technologies of memory, or the role of physical objects. Indeed, the flexible memory thesis suggests that the fixity of non-digital records remains distinctly valuable. In most cases, multiple representations of the past co-exist. Neither should we rush to assumptions that the fundamental purposes and qualities of, and approaches to, remembering that Middleton and Brown (2005) unpack are somehow superseded by the sophistication or pervasiveness of technologies and of memory. Rather, they form another layer of the 'organised settings' which offer structures within which remembering can be satisfactorily achieved.

The quantified records that are of interest in this thesis are a new technology of memory, and share the digital materiality of new media. Now, however, I wish to consider a history of work, primarily in HCI, which considers how people *directly interact* with technologies of memory.

2.3.2. From Lifelogging to Digital Possessions

Augmenting memory through Lifelogging

Computer scientists have been inspired by the possibilities of 'technologies of memory' at least since Vannevar Bush's vision of the Memex in his influential essay 'As We May Think' (1945). The Memex imagined infinite storage of, and rapid access to, the world's knowledge; Bush described the hypothetical machine as *"an enlarged intimate*

supplement to his memory". This vision foreshadows the archive metaphor's longstanding influence in the development of technologies to augment human memory.

The Memex vision has been most faithfully enacted on a personal level as part of Microsoft's 'MyLifeBits' project (Gemmell et al., 2002, 2006), with researcher Gordon Bell attempting the 'total capture' of his life through 'lifelogging'. A singularly dedicated pursuit, Bell relied on an extensive array of wearable technologies, in particular the SenseCam (Hodges et al., 2006) an automatic wearable camera that passively and continually takes digital photos. Before being later (unsuccessfully) commercialised (autographer.com), SenseCam inspired much memory-related technology research, with even entire conferences devoted to the novel device (Kerr et al., 2013). Lifelogging envisaged technological solutions to the perceived problem of a fallible human memory. It was not only a case of reminding oneself of important tasks, but appeared to promise a kind of superhuman veridical recall of one's life. Arguably an elder cousin of the Quantified Self movement, lifelogging also offered a means to 'know thyself' and reflect. As storage space became a more trivial problem, the significant research challenges were focused on designing for effortless capture of more and better data about one's life, especially through wearable devices and interfaces to search and manage the vast personal records that lifelogging would produce. A 2006 Special Issue on Personal Information Management (or 'PIM') is illuminative of the 'total capture' philosophy underlying some of this early work. The tagline reflects the pioneering technological spirit: "*Cheap and fast search and storage technologies help bring order to our messy personal information environments, freeing us to make the most of our information collections."* (Teevan et al., 2006, p.40).

Beyond Total Capture

HCI researchers have since questioned and sought to refine the lifelogging vision with a more user-centred approach. Specifically, Sellen and Whittaker (2010) called for the field to look 'beyond total capture'. Their constructive critique described the need for "*a more precise specification of what it means to support human memory*" (p.72). They underline the need for a psychological basis to strategically target weaknesses in human memory, and to design systems that are more situation specific – for example, supporting memory in a classroom or meeting. To this end, they offer 'Five Rs' for types of remembering which HCI researchers might support: recollecting, reminiscing, retrieving, reflecting and

remembering intentions. Whittaker's own work (Whittaker et al., 2012) takes this further and proposes 'synergetic recollection', emphasising that many of the unique faculties of remembering cannot easily be delegated to technology. Similarly, Bannon (2006) was one of the first HCI researchers to suggest '*forgetting as a feature'* necessary for lifelogging systems.

From a PIM perspective, Cathy Marshall's work (Marshall et al., 2006; Marshall, 2007) sought to approach the design of digital archives from studying people's *current practices* of managing material archives. She noted how people's strategies of '*benign neglect'*, which generally served them well enough for physical things, were poorly adapted to the management and accumulation of '*digital belongings',* especially over the long term. Marshall et al. (2006) paint a grave picture of how personal digital possessions are insufficiently safeguarded and are at risk from an approach to *"save everything now, decode it all later".* Instead, there is overwhelming "*digital dross"* caught in the net; curatorial efforts that apply to institutions rarely translate into the home. Similarly, Kaye et al. (2006) studied the material archiving practices of academics, asking not only how people manage, but more crucially, why do people archive at all? This work questions the inherent value of vast archives, and proposes a refinement of 'total capture' towards the present needs and actions that such archives actually serve.

Speaking to lifelogging directly, Petrelli et al. (2009) undertook a study that asked families to create a time-capsule together. Though simple, this work underlined the diversity of motivations and material in creating such an archive. What families chose to 'capture' in their time-capsules were emphatically not materials to support veridical recall, but ways to stimulate reconstructive remembering in the future, from a diversity of memory cues; photographs, children's drawings, newspaper cuttings, small toys, etc. Drawing on Peirce's 'typology of signs' (see Atkin, 2013) they categorise the objects in the time capsule as an *icon, index,* or *symbol.* Icons resemble or imitate the corresponding object to be remembered; a photograph of the family home. Indexes relate physically or causally; home recipes index a family's passion for cooking. Symbols only relate to the object by those who can recognise and interpret it. For example, a knife and fork "*represent eating together as a cultural statement"*. Such semiotic analyses are a further perspective on mediation and suggest distinct intentions and practices for remembering different aspects of one's past.

Together, studies such as these have helped to refine subsequent memory research in HCI, and to move away from a purely archival perspective or a quest for veridical recall. van den Hoven and her colleagues have led a program of work focused on 'memory cues' (e.g. Hoven and Eggen, 2007; Mols et al., 2014; van den Hoven and Eggen, 2014). Drawing particularly on Autobiographical Memory (AM) theory (Cohen and Conway, 2007), their work approaches the design of external memory cues (from objects to people and places), seeking to design the form, time and place of such cues to better support personal remembering in everyday life. Also on a psychological footing, significant work has focused on technology to support reminiscence and reflection often positioned as a personal and societal good (e.g. Cosley et al., 2012; Fleck and Fitzpatrick, 2010; Frohlich and Murphy, 2000; Peesapati et al., 2010; Thiry et al., 2013). Peesapati et al. (2010) designed the 'Penseive', a system that "*supports everyday reminiscence by emailing memory triggers to people".* These triggers consisted of varied fragments of past social media content, or prompts about common life experiences, which participants were invited to respond to. Across all of these studies, reminiscence and reflection are actively encouraged as positive behaviours (following Bryant et al., 2005) and are often imagined as specific activities, involving setting time aside to *do* remembering. However, HCI research has increasingly sought to understand how technologies of memory are embedded in remembering as an ongoing and mundane lived experience.

Memory-as-a-resource-for-action

However, an everyday turn in HCI memory research is perhaps best expressed by Harper et al. (2008), who echo the work of Bartlett (1932) and Middleton and Brown (2005) in considering 'memory-as-a-resource-for-action'. Their approach applies prior debates about memory-in-the-head and memory-in-the-world, to reimagine the role and possibilities of lifelogging devices like SenseCam. With an ethnomethodological sensibility focused on action, they ask what present aims and actions remembering achieves, when looking back at chosen SenseCam images from thousands captured during a brief time spent wearing the device. Their study shows that remembering is much more than simply a question of achieving efficient and veridical recall of the past. Remembering is an ongoing act oriented towards the demands of the present; it involves the imaginative construction and reconstruction of specific personal narratives. In its undertaking, meaning is made through, for example, constructing one's identity, forging and maintaining social bonds, or connecting to a place.

Harper et al.'s approach (2008), echoed in much subsequent work, questions the fundamental assumptions of lifelogging, which assumes that more or 'better' memory is an inherent good. Instead, their focus turns to how people remember in the course of everyday life or in Bartlett's terms once again – their 'main preoccupations'. Research inquiries based on such thinking investigate the existing and emerging role of technology in remembering more broadly; rather than applying technology as a salve to a problematic human memory. This perspective sees remembering as situated action (Suchman, 1987), happening 'on the fly' and contingent on local settings. As we shall see, this invites more holistic discussion of remembering as it relates to specific contexts, practices and values, and admits broader design perspectives around, for example, narrative or temporality. This rather 'third wave' HCI perspective (Bødker, 2006) represents a refinement of the lifelogging vision not only on a psychological basis (as achieved by Sellen and Whittaker, 2010), but a situated, socio-cultural and experienced-centred one.

Digital Possessions

The SenseCam studied by Harper et al. (2008) is an explicit lifelogging technology. However, the 'new memory ecology' described by Brown and Hoskins (2010) suggests that as almost all of our digital interactions are recorded, we are surrounded by technologies of memory in one form or another. Intentionally or otherwise, these produce a vast archive which includes for example: a myriad of personal and work-related documents and files; digital media collections (e.g. photos, videos, music); online accounts and avatars (particularly social media profiles); thousands of emails, message archives and metadata containing histories of online interactions; and location history. Collectively, these personal materials have become characterised as digital or virtual possessions (Lindley et al., 2013; Odom et al., 2011, 2014a). This framing extends earlier PIM research; shifting focus from efficient access and management, to how people orient to and experience their burgeoning digital archives. A focus on possession aptly captures the extent to which such an archive increasingly reflects one's identity. This invites broader considerations of material culture, and attention to the potentially distinctive features of digital possession versus the well-understood roles and possession of physical things.

Importantly, Odom et al. (2012) suggest that the very concept of possession or ownership of digital things may be *"lost in translation"*; especially as digital things stretch beyond

individual devices or networks, and are maintained via the cloud. This picture is complicated further when we consider not only personally crafted objects, like digital photographs and files, but also the steady accrual of digital traces and data.

Many researchers in HCI understand the nature of possessions through the work of Russell Belk, a researcher in consumer behaviour. (Belk, 1988) offers a synthesising framework of possession, relating William James' (1890) conceptions of the self, with a long history of anthropological research. Through 'self-reflection' on and 'self-presentation' of their things, possessions become valued, to form an 'extended self'. People use their possessions to develop *"a sense of who they are and who they wish to be seen as"* (Odom et al., 2014).

Building on Belk's theory, Odom et al. (2012, p.790) emphasise "*that to possess is not merely a noun nor a verb, but a complex set of actions that transform the relationship between a thing (virtual or physical) and a person."* Understanding these actions has been the focus of many inquiries into people's practices with physical and digital things, especially at home or between families, and as it relates to crafting a digital legacy (e.g., Banks, 2011; Brubaker et al., 2014; Durrant et al., 2009b; Golsteijn et al., 2012; Gulotta et al., 2014; Kirk et al., 2010; Kirk and Sellen, 2010; Moncur et al., 2015; Petrelli and Whittaker, 2010a). This body of HCI scholarship almost universally emphasises value-centred design perspectives that propose designing interactions commensurate with existing human practices and values regarding possession.

This value-centred perspective is quite distinct from the earliest computer scientists who envisioned lifelogging technologies to support the total capture of one's life. The coherent archive they imagined, would augment and even supersede human memory. However, rather than being used to achieve efficient veridical recall, as imagined through the Memex, digital possessions are implicated in much more complex human experiences and relationships. These possessions are produced, or at least preserved, by an array of technologies of memory. The diversity and ambiguity of what constitutes these digital possessions, and how they can possibly be accounted for and called upon appears overwhelming, in contrast, for example, to the more well-defined socio-cultural roles of a family photo album. This thesis argues for quantified data (which is just as wound up in identity and culture) as yet another kind of digital possession to reckon with.

But whatever their particular material configuration, these possessions are a resource for all kinds of present action. The following section pursues this thread, to unpick the values and practices of remembering achieved through interaction with digital possessions.

2.3.3. Remembering with Digital Possessions

As I have indicated, 'digital possessions' now traverses a vast literature. What I intend to do here is to surface the values and experiences of *remembering* with digital possessions which have particular resonance for this thesis.

Defining the Self and Social Relationships

As Belk's work suggests, possessions are commonly understood to be valued as a means of defining the self: introspectively, and to others. Petrelli et al. (2008), and Kirk and Sellen (2010) home studies evidence people physically surrounding themselves with objects, which embody elements of their past, and support remembering. But by delving into home archives multiple different identities are shown to be at play: of individual members, of parents, of the wider family etc. In fact, possessions can be especially valued *because* they make often intangible social connections visible; they can index a shared history, or symbolise shared values. Such artefacts provide a unifying perspective, and reflect Middleton and Brown's (2005) description of a collective framework, which orients how remembering, collectively, can take place.

However, contesting historic visions of a unitary or 'all-defining personal digital archive (e.g., Bush, 1945; Stevens et al., 2003) suggest that, at least online, "*a single archive cannot represent different facets of the self"* (Lindley et al., 2013) . Participants in their study of web archiving seemed clear that things online also had their proper place; to collapse the separation between baking interests on 'Pinterest', a gaming profile and one's Facebook page would undermine their work in making and curating those distinct and individual online spaces.

Records of emails, messaging and social media use emphasise the extent to which others are always implicated in one's personal archives. Facebook has employed an explicit 'See Friendship' feature, which allows friends to see their interactions with each other on the site. Schwanda Sosik et al. (2012) studied friends' reflections with the tool, and found humorous media content in particular could signal closeness and reinforce the reasons for

their friendship. However, many found the representation was incomplete, or even potentially misleading, where Facebook activity was 'superficial' or under-represented negative events. This research highlights the limits to any digital traces on their own adequately or holistically representing the complexity of something like 'friendship'.

Life transitions and Legacy

Managing identity is an ongoing process in relation to one's digital possessions. To this end, a great deal of HCI research has paid attention to major life events and periods of significant life transition, where people's identity is subject to change. Odom et al. (2011, 2012, 2014) and Schoenebeck et al. (2016) focused their inquiries on teenagers, but others have considered the break-up of relationships (Herron et al., 2016; Sas and Whittaker, 2013) or moving home (Bales and Lindley, 2013; Lindley and Wallace, 2015). However, the most significant body of work has concerned death and digital legacy, as people look to manage inherited 'technology heirlooms' (Banks, 2011; Kirk et al., 2010; Odom et al., 2012a) and prepare to shape their own legacy (e.g., Brubaker et al., 2014; Gulotta et al., 2014; Massimi et al., 2012, 2010; Moncur et al., 2015; Moncur and Kirk, 2014). It is beyond the scope of this literature review to consider all of these in detail. Legacy in particular is only a tangential concern for this thesis. There are, however, some common threads that are worth drawing out.

Broadly, this work describes significant challenges for people in managing their digital possessions to keep up with and reflect the changes in their lives. Digital traces are potentially far vaster, and interconnected than their physical counterparts. This makes it a struggle firstly to know the extent of what possessions you have, and hence to find, and untangle or disconnect them from services that continue to be used, particularly social media. Phone numbers can be deleted, and belongings thrown out, but it is a much more laborious, even impossible, ordeal to process all evocative emails or photographs posted on Facebook. Further as Schwarz (2014) points out, our encounters with such material can be all the more impactful when they are unexpected, presented by an unwitting algorithm, unaware of the significant change in circumstances.

The other fundamental challenge in considering 'The Future of Looking Back' (Banks, 2011) is recognising what will be meaningful to remember in the future, and for whom. In some respects, this uncertainty is what underlies the 'total capture' mentality. Some

people seek to avoid placing a burden on future generations; but for others, perhaps it is that they fail to appreciate how the unremarkable and the mundane may well become remarkable once 'displaced' (Radley, 1990) from present cultures and routines. Gulotta et al. (2013) report that people have mixed feelings about the potential longevity of their digital traces. There are competing desires to remove unflattering or revealing information, meanwhile appreciating that it is just such information that they themselves lack about their ancestors, and may well become most compelling. In this sense, it is not only that digital possessions should keep up with one's present identity, but that it might also be managed with an eye to future selves.

Narrative and Context

Concerns about legacy exemplify how people recognise the role of possessions in telling stories about ourselves and others. They anticipate "*the record being interrogated for what it showed about the kinds of people that they, and those they associated with, were like"* (Lindley et al., 2009b, p.6). Kirk and Sellen described many objects that were on display at home were intended to be 'talking points'. Lindley et al. (2009b) once again emphasise that the constructing of narrative, particularly mediated by object or media is a collaborative and situated activity, oriented to present concerns:

> *The performances we observe as people recount their experiences to us, normally in the presence of other participants, reflect the identities they construct for themselves at these moments.* (Lindley, 2009b, p.6)

Somewhat earlier, (Frohlich et al., 2002) described 'photo-talk'. They noted how reminiscing with a photograph, where everyone experienced the original event, entails the emphasis of only a few particular details and some clarification, but often without a definitive resolution of a narrative. Bamberg and Georgakopoulou, (2008) emphasise the importance of such 'small stories' in everyday conversation – in contrast to the grand autobiographical narrative or monologue. Narratives are not then fixed, or even ever complete: stories develop; they are retold with differing emphasis; the audience and storyteller orient and reorient themselves over time. People increasingly document the world around them to tell a particular story, and for this to be shared, narratively, in the moment. However, in making sense of an accumulation of digital possessions, Lindley et

al. (2009b) show how narratives are also developed post-hoc, and reflect what appears to be interesting, or important, at that present time.

It's notable that much of the discursive work entailed in constructing a narrative involves putting things into context. Schoenebeck et al. (2016) argue that digital possessions such as Facebook posts should maintain 'temporal integrity' and users are required to have a degree of 'temporal literacy' to recognise how content is a product of its particular time. Hence, contextualisation is not only achieved discursively, but (especially online), through a range of organisational and personalising actions, which situate digital possessions, and determine who can see what and when. Ames and Naaman (2007) suggest that tagging of photographs is done not just for organisation, but also communication, for one's self, and also for other viewers. Indeed, Odom et al. (2011) suggest: *"Metadata is a defining aspect of virtual possessions. It provided a platform for users to collaboratively and individually personalize a possession, as well as to relationally link multiple types of virtual possessions together."* However, it is not simply a question of accumulating more and more data as context. To the contrary, Sosik et al. (2012) suggest that messy, unstructured material "*begs to be made sense of"* and can stimulate considerable reflection.

In relation to Facebook, Page (2010) suggests that status updates can be considered as 'small stories' of a sort. By bringing a number of these together, filtering and sense-making, people can create and build larger narratives. Such work raises questions of how narrative structures occur and are developed through interactions with digital possessions. What content together makes a narrative? How do archives tell their stories? What features (frequently metadata) are available to help people properly contextualise digital possessions – particularly on social media?

This brief review develops how digital possessions, much like physical ones, are valued as ways to define oneself and others, and the importance of narrative and context in communicating identity with digital possessions. However, recalling Odom (2014), there are a complex set of actions that transform these relationships between people and their things. In the digital context, curation emerges as one of the most fundamental actions.

2.3.4. Curating Digital Possessions

Active Curation

Curation can be undertaken very deliberately, such as in making a photo display (Durrant et al., 2009a), or a time capsule (Petrelli et al, 2010). People can have clear and creative intentions about how or what they wish to remember, and Petrelli et al. (2010) emphasise the importance of such 'active meaning building' in contrast to passive capture, in relation to lifelogs. The implication is that people are more likely to value things they have personalised, and have invested time and effort in, rather than those that have effortlessly accumulated.

Watkins et al. (2015) report on collections as a more refined example of curation, which are distinct from digital archives or clutter. From Belk et al. (1991), collections are selective, active and entail longitudinal acquisition. Examples of digital collections could include video game items or achievements or media such as eBooks and music. For digital things, the authors emphasise the need to enable users to *"to mark [collections] elevated status by separating them from other possessions and to impose their own structures of meaning."* (Watkins et al., 2015, p.3421)

Curation-through-use

Where digital possessions are subject to careful impression management, especially on social media sites like Facebook and Instagram, (Marwick and Boyd, 2014; Schoenebeck et al., 2016) curation becomes *inherent to use* (Zhao and Lindley, 2014). Sites have different bars and norms for what should be posted. If Facebook is considered as a form of archive, it's clear that what makes it into that archive is very dependent on the evolving features and cultures of use of Facebook as a platform.

Whether with foresight, or through use, curation is a form of identity work, a means of presenting and reflecting on oneself. However, people are also found to experience tension between past and present self-representation needs. They seek to reflect current identity, and experience a certain temporal 'fixity' (Harper et al., 2012) in certain online spaces, particularly the need to update social media where novelty is prioritised. Simultaneously, many have described feeling a need to maintain the authenticity of past content. Schoenebeck et al. (2016) report mixed feelings and practices of retrospective impression management with young adults. Though they sought to accept their pasts as

they were, most still curated some of their past content to match their present self-perception. At home, Kirk and Sellen (2010) describe how things can be taken off 'display' and put into 'deep storage' to be forgotten. Online, this is more challenging, with deletion perceived as blunt response to the nuanced needs of identity work.

Curatorial practices

The literature exhibits a range of strategies and structures by which the presence and access to digital possessions can be curated. A straightforward measure is to give digital things physical form. Odom et al., (2011) reports teenagers printing out screenshots of social media content. Screensavers, digital photo frames and personalised calendars all open up a physical space for digital content (Durrant et al., 2009a, 2009b). More elaborate efforts, including many by HCI researchers involve 'hybrid crafting' (Golsteijn et al., 2014) where tangible physical objects represent, re-situate or provide new windows on to digital content and traces. Golsteijn et al., (2012) emphasise the role that personal crafting of an object can make it feel cherished; working on it can be a mode of self-expression and investment. Such thinking suggests *"looking beyond the physical as a mere container for the digital"* and *"exploiting the advantages of the physical for this integration."* (Golsteijn et al., 2012, p.663).

Much curation relies on organisational structures: making particular folders or albums; linking different content together; tagging; bookmarking or marking favourites; filtering or reordering possessions by chronology, location or another characteristic in their metadata. Clearly the selective uploading of content, for example, preserving the 'best' photos for an Instagram or Flickr account is inherently a form of curation. Curation can entail appropriating content, editing it, mashing it up and putting it to another use. These practices all represent ways of deleting and elevating certain content above others. Alternatively, curation relies on ways to eliminate trivial things, or 'digital dross' (Marshall et al., 2006). This might mean simply cleaning up duplicates, throwing away the old or unwanted. Nonetheless, despite all these actions, (Harper et al., 2013) argue for the need to investigate and develop a better 'grammar of action' for curation.

Designing for Curation

Despite the creative approaches and workarounds that mark out some digital things from others, this prior work evidences a lack of appropriate features to manage and curate

one's digital possessions. Further, whether carefully intended, or haphazardly through use, it is repeatedly clear that while curation is necessary for making meaning from one's digital possessions, in many cases it is much too effortful. People seem to curate more in response to storage limits (for example deleting extraneous smartphone photos), impression management, or for special occasions (i.e. a significant birthday), than purely for themselves. As Kirk et al. (2006, 2007) found with 'photo-work' and 'video-work', people often simply do what is 'good enough', practicing 'benign neglect' (Marshall et al., 2006). These present significant challenges and opportunities to interaction designers.

It is in this context that algorithms increasingly have a role on what information is presented to us and how it is curated. 'Curatorial agents' have been proposed to better support curation. (Gulotta et al., 2015) Location and timestamp metadata can be interpreted to suggest photographs that belong together, perhaps representing a particular trip or event. Facebook's 'On This Day' feature, among others, repackages content on the site as 'memories' to enjoy and share. Gulotta et al. (2015) speculate further about how much agency and generativity systems could have in curating and presenting information to users based on their digital traces. Seen to support reminiscence and reflection, these can overlook how transgressive such actions can be, and the difficulties artificial systems have in becoming proactive in re-presenting and re-constituting the past. This seems all the more challenging given the evidently diverse, personal and indeed organically cluttered (Swan et al., 2008) ways people wish to organise their belongings.

There is something of a paradox here though; more active curation is more meaningful, but the effort required to do this is frequently too great, or even resisted. Automated solutions have so far proved problematic. As this thesis turns attention to data, two important possibilities emerge. First, data might be used as a kind of metadata to help curate and punctualise other media. Location data is already a common mode of organising photographs. But second, what about curating data itself? These are questions I will return to.

2.3.5. Summary

In part three of this literature review, I have sought to chart the long arc of research on 'technologies of memory' in HCI. We have seen a considered evolution from more simplistic lifelogging perspectives, prioritising total capture and veridical recall, towards

understanding remembering more broadly, and considering lived experiences with a mass of digital possessions. Such work is fruitfully complemented by sociological and media studies of a new memory ecology. Digital possessions, like physical ones have many roles, practices and values; for defining the self over the lifespan, shaping legacy and sharing personal narratives.

However, the literature highlights some particular challenges and opportunities for remembering with digital possessions. People tend towards a more passive 'benign neglect', unless exceptional circumstances dictate otherwise. Concepts of ownership and possession become more fraught in a digital landscape, with things existing in many places and forms at once. Assuredly deleting, forgetting or even putting digital things in deep storage is also complicated by cloud technologies. Entwined with their unpredictable location, there is a risk of encountering a 'past next door'. Careful curation is required to address many of these issues and to mark out meaningful belongings, but this is frequently too effortful.

This thesis does not aim to resolve these issues; each offers thesis topics on their own. However, across all of this work there has been a recurring interest in the materiality of remembering with digital possessions. The primary focus in this prior work has been on social media, photographs, web digital traces (e.g. email, messaging), visual and written records of activity. These digital traces are a melange of intentional and increasingly unintentional documentation of one's life. My thesis extends this interest. In this final section, I will weave these prior parts of related work together to make the case: that self-tracking tools are new technologies of memory; that quantified data is a new kind of digital possession; materially and culturally different from many other kinds of records. In so doing, I will set up the fundamental contributions of this thesis, and the questions it seeks to address.

2.4. Remembering a data-driven life

This literature review began by outlining a data-driven life as a socio-technical phenomenon, describing the material and cultural qualities of data. This final section seeks to reflect on these in terms of remembering, and as technologies of memory. I look firstly at the pockets of existing research on remembering with digital traces, and secondly, at the reported documentary use of personal informatics tools. Finally, I outline a quantified past as an emerging material and cultural phenomenon, outlining the broad avenues of investigation for this thesis.

2.4.1. Remembering with Digital Traces and Quantified Data

A small number of studies have already considered digital traces and quantified data as a material for remembering. Primarily, such data is understood as metadata, alongside other digital media or physical things. It provides context, helps to navigate or can be used to relationally link digital things, for example, photographs all taken in the same location or on the same day. As context, it bears some resemblance to 'ephemera', such as newspaper cuttings and shopping bills that Petrelli et al. (2009) found included in families' time capsules.

Other work has quantified and visualised media use. The PieTime project (Ng et al., 2011; Zhao et al., 2012) visualises an individual's use of communication technologies; TheMail focused on visualising personal relationships (Viégas et al., 2006). These examples show how data tends to be used to abstract from, and to summarise, experience. In these cases, the data shows both patterns and particulars, which relate to many thousands of events. Notably however, Zhao et al. (2011) insist that while users of the system noted patterns in their data, it is often particulars, and specific experiences which they chose to reflect on more deeply and talk about with the researchers. To this end, they emphasise the need for systems which support storytelling about the particular experiences indexed by the data, not just higher level patterns.

Kalnikaite et al. (2010) perhaps inquire most deeply into the mental processes of remembering with data, studying the role of location tracking alongside lifelog images. The authors suggest that such data tends to be used 'inferentially', rather than leading to vivid remembering of an event. This draws upon a prior distinction Sellen et al. (2007) make, between 'remembering' and 'knowing' about the past.

However, this is a further example of using data as context alongside other media. This raises questions about the potential emotional and evocative value of data. Is its role solely indexical? Dong et al. (2014) present a rare example of study that addresses remembering with data itself. This considers the potential application of 'activity traces' in the home, questioning the long-term and future uses of home monitoring devices such as the Nest thermostat (nest.com). Through an ethnographic study of existing physical 'traces' in the home, Dong et al. (2014) suggest data could be used to provide a unique sense of place. These might connect multiple owners of a home over time, and overlay data into physical space, giving it presence and promoting a reflection and reinterpretation of one's current and past living environment. Though containing elements of speculation, this work hints at a less instrumental use of data - not simply as an addendum to other media, but as a valued digital possession for remembering in its own right.

2.4.2. Self-Tracking Tools as Technologies of Memory

The prior studies can be understood as studies about remembering, where data plays a part. However, there are also studies about data, which incorporate remembering, and allow us to begin to consider self-tracking tools as technologies of memory.

The lived informatics perspective proposes that self-tracking is interweaved with a range of lived activities. This thesis has presented remembering as a significant lived activity, and a feature of everyday life. Just as Rooksby et al. (2014) report that data became wrapped up with romantic walks, or stories of people moving home or job; we can recognise that as quantified data could be encountered and appropriated in many ways to mediate remembering of one's life. Indeed, it's clear that when asked in an interview to describe their use of trackers people inevitably remember and tell particular stories about their past, present and future. Further, they describe 'documentary tracking' as a particular style of tracking common to a number of participants:

> *"In this case, the participants were interested in documenting their activities rather than changing them."* (p.1167)

Li et al. (2011b) also report some participants using personal informatics in a primarily documentary way; however, they then focus their remaining study on behaviour change. These documentary uses are perhaps unsurprising, given the significant overlap between lifelogging, and self-tracking activities. As we shall see, these frequently share motives of self-reflection, and lifelogging tools can be employed for self-tracking, and vice-versa.

However, it is notable that Rooksby et al. (2014) emphasise the largely prospective nature of self-tracking; data was most valued in the short or immediate term. People would compare themselves to their last run; or the number of steps this week; or set immediate goals as part of a training program. There could be some mitigating explanations for this short-termism. First, most participants in the study had only been self-tracking for a few months – they had little in the way of long-term records. Second, the study focused explicitly on health and fitness, activities and industries that are founded explicitly on the promise of a better future.

However, most of all, this finding highlights the extent to which the design of data-driven tools is focused on present and short-term goals. None of these devices are presented to consumers as a mode of remembering their life. Most features centre on motivation – to do better, or go harder next time. There is little consideration as to how people might use and reflect on much older data. Indeed, while it is clear that physical activity is at least somewhat representative of daily life, is this the data that people would most value documenting about their life? A data-driven life is synonymous with Quantified Self, and healthy, productive living. But, as artists have shown, data could be used to track and represent almost anything, not just wellbeing. It is perhaps unsurprising that consumers of these devices then only rarely use them in a documentary way, in the long term.

The Dear Data project (Posavec and Lupi, 2016) epitomises the wider possibilities for self-tracking. These two information designers exchanged physical postcards with self-portratis of data collected and visualised by hand each week. Described as ‘exquisitely human’ (Popova, 2015), their drawings cover diverse personal topics such as tracking thankyous, wardrobe choices, and phone addiction. Their work reimagines data altogether, as something playful, social, performative and expressive.

There are therefore two possibilities here. First, while only some may be explicitly tracking in an actively documentary style at the time, this thesis argues that tracking ultimately becomes documentary. Many traces of everyday life, may be incidentally documented, but in another context, could become a potent record of some event. A significant question to explore in this thesis is the fate of quantified data in the longer term, as a new form of digital possession. Lived informatics currently is focused on present interactions, with mostly present, or near-term data. As self-tracking becomes more mainstream, we can anticipate that people will develop a lifetime's worth of data. Indeed, Quantified Baby devices (see Kane, 2016) make this a reality for some young children. This thesis questions 'if' and 'how' quantitative personal data records evolve from present-focused, motivational tools to more meaningful biographies (akin to the 'biographical objects' discussed by Hoskins (1998). What values and experiences are there for people in interacting with this past, now documentary, data?

But secondly, and perhaps more radically, this thesis suggests that self-tracking, and the tools used to achieve it, could be fundamentally reimagined to support 'documentary tracking'. What new kinds of data and self-tracking cultures might this entail? This considers quantified data in the longer term as a conduit of identity, memory and storytelling, and its personal meaning as a digital possession.

2.4.3. Data as an expressive digital possession

Both of these directions emphasise the construction of data as a digital possession, with a distinct personal value, beyond its purely instrumental use. As a digital possession, data is anticipated to play a role in forming personal narratives. Indeed, telling stories is a fundamental means of making-sense of and contextualising one's data. It is a foundational aspect of QS meet ups (Choe et al., 2014). Davis (2013) posits a 'Qualified Self' that emerges through contextualising one's data – *"narratives and subjective interpretations are the mechanisms by which data morphs into selves".* This is especially interesting in the context of remembering – as Sharon (2016) notes, *"self-tracking does not straightforwardly produce a definitive truth."* Instead, it is frequently described as another layer, which enhances *"broader understandings and self-narratives".* Quoting one attendee at a QS conference:

> *"Speaking about yourself through the data you collect is another way of creating identity. It is sharing your identity through the lens of some sort of information about yourself. Whether or not it is microbiomic, your activity, [or] heartrate, it is another way of saying 'I am someone and this is who I am.' "* (Sharon, 2016, p.23)

Such statements raise intriguing questions about how data is used to produce an authentic account of oneself. Is it a self that we perceive ourselves, or a self that the data portrays? Lupton (2014a) and Ruckenstein (2014) use the concept of 'data doubles' (borrowed from surveillance studies) to describe numerous possible personal representations which people are increasingly required to confront and engage with. As Rooksby et al. (2014) remark on the emotionality of tracking, it is clear that making sense, contextualising and qualifying oneself in respect of one's data is not a trivial experience. Considering self-tracking tools as technologies of memory, and quantified data as digital possessions, hints at fruitful and novel design opportunities, which extend the current paradigm of self-tracking for behaviour change and actionable insights.

2.4.4. Conceptualising a Quantified Past

This literature review sets out foundations to advance the concept at the heart of this thesis: a quantified past.

The essence of this concept is that quantified data has an under-explored potential to document one's life. Much like social media, email inboxes and web browsing histories, a by-product of self-tracking tools is that they are technologies of memory. Through the lens of digital possessions, we can therefore investigate longer-term relations, practices and values of quantified data.

Further, in recognising the way that mediators of memory "*contribute their own dynamic"* (Middleton and Brown, 2015, p.145) the core matter of interest in this thesis is the ways in which remembering with a quantified past is a distinct experience. Put simply, this thesis suggests that remembering running with quantified data may be a different experience to remembering running with a photograph, a video or a pair of old running shoes. Personal, quantified data that documents our everyday activities is an emerging phenomenon. However, some brief examples from artists and consumer applications are instructive as to the potentially intriguing features of such a record.

Perhaps pushing most critically at the potential to *"collect, list, database and absurdly analyse the data of everyday life*", artist Ellie Harrison undertook a series of data-collection projects between 2002 and 2009 (Harrison, 2005, 2009). Notably ahead of her time, many of her projects relied on manual tracking using log sheets; projects such as Goldcard Adventures, which accumulated her travel across London, are now routinely collected by Transport for London and individuals themselves. Importantly, her work presented self-tracking as something more than a conduit to behaviour change, and highlights the diversity of what one might quantify about one's everyday life.

Graphic designer Nicholas Felton's 'Annual Reports' (available at feltron.com) provide perhaps the clearest example of a quantified past. He was one of the first people to use personal informatics to lifelog, as much as to change or improve his life. Over ten years, his work exemplifies two things: the diversity of what can be quantified, both manually and automatically, and how it can be represented. Felton employs a number of common techniques. Counts – such as a striking total of 3,761 book pages read – are often used as a summary and an introduction to a topic, which is then explored in greater depth. Ordered lists, particularly of food and media consumption feature frequently, as do percentages and pie-charts. Alongside these arguably 'simpler' representations, are also more complex visualisations and correlations – for example, mapping call history and message archives.

Looking beyond Felton's striking typographic style, his work raises questions about the particular qualities of this way of representing and remembering one's life. There's a certain uncanny level of detail and precision expressed by quantified data. What kind of narratives does it foster or invite? Recall Schwarz' insight that once stored in a database, memory can become non-narrative, and subject to multiple ad-hoc reformulations. What context is captured, and what is left out? How does quantified data compare emotionally to the pictures painted by photos and video?

Felton's work is undoubtedly idiosyncratic, requiring an obsessive degree of self-surveillance, present in earlier lifelogging research. Much of what Felton captured, required manual logging and note-taking, although he also made extensive use of existing digital traces, and personal informatics tools. Felton even developed a manual tracking

app 'Reporter'[3] based on his practice. However, a key aim of this thesis will to be investigate the quantified past as a more everyday and mainstream concern. Appropriately, Felton's final annual report in 2014 exclusively relied upon commercial self-tracking tools.

A primary example is the Moves app (acquired by Facebook in 2014)[4]. Moves "*The Activity Diary of Your Life"* uses a smartphone's accelerometer and GPS to constantly track a user's location and activity (walking, running and cycling: measured in steps and distance). This data can be viewed daily as a map, and as a timeline. It is easy to navigate through one's Moves history and view the data on a monthly scale. Moves data can also be easily exported to a number of other 'Connected Applications'. Although Moves implicitly encourages greater physical activity, and highlights 'record' distances covered, it is striking as a personal informatics tool that promotes itself as an automatic diary.

Moves, as a record of one's life bears some comparison to the SenseCam, through its passive, ongoing accrual of data. Although the data initially presented to users is not as 'raw' as SenseCam images, 'Moves' captures the mundane routines of everyday life that might rarely be worth capturing. Used over long periods of time, the volume of data captured is potentially vast, leading to questions about how such an archive might be navigated to rapidly browse points of interest and support a 'mobility of vision' (Lindley et al., 2009a).

The prospect of a quantified past is particularly intriguing when considered in relation to a reconstructive memory. Data is intended and designed to provide a precise and determinate view of the world; but this seems so at odds with our experience of remembering – "*an affair of construction rather than one of mere reproduction",* to recall Bartlett's terms. In relation to images, Susan Sontag argued that photographs, so realistic, literally fixing light, have become so culturally dominant that *"reality has come to seem more and more like what we are shown by cameras…. 'It seemed like a movie.' This is said, other descriptions seem insufficient to describe how real it was."* (Sontag, 1977, p.161) Taking photos becomes a way not only of remembering, but a testament that the

[3] http://www.reporter-app.com/
[4] https://moves-app.com/

remembered experience could be real. The contemporary refrain "pics or it didn't happen" (Whitehead, 2015) reflects this ongoing conflation between photography and reality. But what of data, with its guises of objectivity and scientism? What is the relationship then between data and realism?

As the reach of data capture expands, will reality be restrained to what is captured? What then of the inevitable reduction, and lapses in the record? The Moves app, for example, relies on a strong phone signal to pick up an accurate location, and requires the user carries their phone continuously. How might people maintain an 'authentic' relationship with such a record, similar in the way they manage other digital traces Schoenebeck (2016)?

These kinds of questions are core to the experience of remembering, and are at the heart of this thesis. They suggest that as we live an increasingly data-driven life, a potentially distinct record of one's life may emerge. The Moves app is just one example. Gyroscope[5] is a 'health tracking dashboard' that showcases the array of self-tracking data now available to consumers. And while these devices and applications are overwhelmingly aimed towards becoming fitter, happier and more productive, it cannot be overlooked that they are also creating a remarkable record of everyday lives, especially if we consider longer term, or even lifelong use.

This data may be construed as creating a new kind of digital memory, but how and when and why people *remember with* that record is another matter entirely. This discussion has so far been largely absent from both the study of technologies of memory, and the design of self-tracking tools. This is what my two central research questions, introduced earlier, seek to address.

1) *What is the experience of remembering a data-driven life?*

2) *What are design considerations for remembering with data-driven services and technologies?*

[5] https://gyrosco.pe/

Chapter 3. Methodology

The conceptual foundations of this thesis and the grounding extant literature already suggest a number of rewarding methodological approaches. In this chapter, I seek to sketch out more clearly the methodology that underpins the empirical work throughout this thesis. Once again, the work of Middleton and Brown (2005) is instructive; it provides a discursive basis for the study of remembering. I then draw on the work of Wright and McCarthy (2004) to develop an orientation to the 'lived experience' of remembering. Taking these together, the argument is then developed for Interpretive Phenomenological Analysis (IPA) as a fit for the empirical basis of this thesis.

The speculative and design-led methodologies in Chapter 6, which are characterised as 'Speculative Enactments', will be discussed explicitly in Chapter 6. Each of the study chapters (4, 5 and 7) will also have its own brief methods sections to describe, in practical terms, how the studies were carried out.

3.1. A Discursive Approach to Remembering

The foundational work of Bartlett (1932), supported by Middleton and Brown (2005), positions remembering as a present-oriented, and situated action. Furthermore, it is worth recalling how Middleton and Edwards (1990) push against more cognitive, or interior understandings of memory, and instead seek out ways in which remembering the past comes to matter, and gain purchase in the world:

> *"...the heart of the topic, the sheer meaningfulness of memories, their content and organisation, their personal and social significance, their context and occasionings in the flow of ordinary experience, cannot be accounted for by reference to mental processes alone."*

But more than just a move from memory-in-the-mind, to memory-in-the-world, Middleton and Brown (2005) contest the view of memory as 'entitative' or 'thing-like'. Instead, they focus on *"remembering and forgetting as social acts, as ways of accomplishing some activity in the present by invoking the past in an appropriate and resourceful manner"* (p.84). In this way, people can be seen to *perform* rather than *possess* memory.

From a methodological perspective, this argument suggests we attend to remembering as it is visibly performed through discourse and practices, rather than inquiring into the contents of the mind. This harks back to Bartlett's approach, which focused discursively on how people performed a re-telling of the 'War of the Ghosts' story, in order to understand the bases of a reconstructive memory. Middleton and Brown analyse in particular the conversation around objects, such as a family photograph, or the Sunlight soap brand, to show how these become shared resources for remembering, and accomplish particular present activities. Casey (1977) and Connerton (1989) locate remembering in bodily actions, especially performing rituals such as a salute, or 'good table manners'. These actions, like discourse, present ways in which remembering, and its situated meaning, are made accountable.

In the broadest sense then, this work provides a starting point to study remembering as the way people talk and act in relation to the past, in their present activities.

As an aside, it is worth briefly remarking how I am borrowing some ethnomethodological language, through such a discursive approach. Building on the process philosophy of Bergson (1905), Middleton and Brown inquire about the way the past is 'cut out' and 'punctualised' from the otherwise indistinct and indefinite 'past en masse'. An ethnomethodologist might approach this as understanding how people make sense of and make order of the past, and how they might make this visible, or accountable to others. Middleton and Brown align their work with the 'radical empiricism' of Discursive Psychology (Edwards and Potter, 1992), in pursuing psychological phenomena as they are 'publicly available'. The work of Harper et al. (2008) in particular highlights distinctively the potentially productive relationship between Middleton and Brown's ideas about memory and the mind, and ethnomethodology's core concerns about accountability of action. (Hence, while an ethnomethodological approach has not been directly followed here, the tradition and its language has at times offered a useful analytical sounding board).

3.2. Studies of Remembering in HCI

Consciously or otherwise, much existing work in HCI on technologies of memory follows Middleton and Brown's approach to understand remembering through situated talk and action.

First, numerous studies of remembering have been situated in the home (e.g. Crabtree et al., 2004; Dong et al., 2014; Durrant et al., 2009; Kirk and Sellen, 2010; Petrelli and Whittaker, 2010). As fieldwork, these have undertaken 'tours' of the home, seeking to uncover existing practices, rituals and sites of remembering. These studies typically endeavour to capture everyday talk around or with valued personal possessions. By interviewing multiple participants in the same home, remembering can be shown to be collectively contested and negotiated. This mode of research (most notably that of Kirk et al., 2006; 2007; 2010), also affords the mapping of the 'work' undertaken to process and mark out certain materials (e.g. photos and videos) as fit for remembering.

More broadly, studies of remembering in HCI have engaged participants with deployments of a technology such as SenseCam, other kinds of 'probes' (Durrant et al., 2008; Taylor et al., 2007) or design activities, such as creating a timeline (Thiry et al., 2013) or family time capsule (Petrelli et al., 2009). These open-ended engagements are premised on engaging participants in an experience of remembering, and then making this accountable to researchers. Through such activities, it is natural for participants to explain and justify their actions and personal media to the researcher, their family or fellow participants, often by telling stories of some personal significance and remembering in the context of an interview. Remembering can then be understood in the discourse of such narratives, but also through actions such as choosing specific images to share (e.g. Harper et al., 2008), the way people navigate vast collections of images (e.g. Lindley et al., 2009) or the objects people choose to display (e.g. Kirk and Sellen, 2010; Petrelli et al., 2008).

These examples show how action and discourse undertaken through engagement in a research project can provide glimpses of remembering, and its broader 'organised settings' as it happens. It also shows how HCI has been successful in doing such studies of remembering, on similar terms to those set out by Middleton and Brown.

But a broader ambition, especially within HCI, is to understand these technologies of memory *as experience* (Wright and McCarthy, 2004). More than the pragmatic concern with how remembering is performed, the research questions in this thesis are largely centred on experience and the *'sheer meaningfulness'* of remembering; who, or what remembering is for.

3.3. Studying Remembering as Lived Experience

Middleton and Brown (p.238) use the term 'experience' to denote a *'continuity of being'* or an ongoing *'sense of identity throughout time'*: once again, this builds on the ideas of Bergson, but also Pragmatist philosopher William James (1890). Within the field of HCI and interaction design however, Wright and McCarthy turn to another Pragmatist, John Dewey (1934/2005), to develop a framework for *technology as experience,* which emphasises the 'felt-life' and 'lived' experience of everyday technology. Besides the conception of experience as continuity, Wright and McCarthy develop from Dewey the notion of 'aesthetic experience' which is "*creative, enlivening and expressive, and involves the senses and values in inclusive and fulfilling activity that is considered engaging for its own sake"* (Wright et al., 2008; p.18.2*).* Applied to technology, their analytic framework, only briefly recounted here, looks beyond the efficiency or utility of technology, to consider the subjective and lived user experience as a basis for design.

Summarising their account of aesthetic experience, Wright et al. (2008; p.18.4) emphasise three themes. Firstly, as a *holistic approach,* they emphasise multiple threads which make up an experience, where the "*intellectual, sensual and emotional stand as equal partners in experience".* Secondly, they see sense-making and engagement with technology as *continuous – "wherein the self is always already engaged in experience and brings to each situation a history of personal and cultural meaning and anticipated futures that complete the experience through acts of sense-making".* Lastly, they emphasise a *relational or dialogical approach;* this accounts for the way the "*self, object and setting are actively constructed as multiple centres of value"* which are always in ongoing dialogue with each other.

It is worth recounting these themes in terms of the experience of remembering with technology. Middleton and Brown comprehensively describe *how* remembering takes place; however, the more phenomenological approach of Wright and McCarthy extends

this to appreciate the sensual and emotional threads of experience which can make remembering *feel* meaningful. Further: the notion of experience as *continuous engagement* is contingent on remembering; this already indicates the utterly fundamental nature of remembering as an experience and resonates with the idea of a past acting en masse. However, Wright and McCarthy articulate specific ways in which making sense of experience depends on remembering: as we *anticipate* an experience, prejudiced by prior encounters; as we *interpret* and *reflect* on an experience in terms of previous interactions; or as we *appropriate* an experience to mark it out as personally significant in some way. Lastly, the dialogical approach recalls the way in which remembering takes place in 'organised settings' and the way in which objects or technologies 'contribute their own dynamic'. Further, through this ongoing dialogue, we see how remembering is always reconstructed in relation to the demands of – or in dialogue with – the present.

The potential value of an experience-centred approach in this thesis is foreshadowed in particular by the work of Rooksby et al. (2014) and their conception of 'lived informatics':

> "*Tracking was explained in terms of people's lives, worries, hopes, interests, careers and so on. Something that we were perhaps a little underprepared for was the emotionality of activity tracking… The situation is reminiscent of McCarthy and Wright's discussion of "technology as experience" and we find ourselves drawn to their call for design to engage with the felt life."* (p.1193)

By studying self-tracking as 'lived informatics', Rooksby et al. (2014) develop a holistic and diverse articulation of the experience and meaning of tracking in everyday life. It is precisely this experience and meaning that concerns this thesis.

3.4. Interpretive Phenomenological Analysis

The work of Middleton and Brown, and Wright and McCarthy sets a course for the investigation, and suggests where to focus attention in pursuit of the experience of remembering with data. However, the final common thread underpinning the methodology of this thesis is the use of 'Interpretive Phenomenological Analysis', or 'IPA' (Smith et al., 2009).

IPA has roots primarily in Health Psychology, with a phenomenological focus on *"an individual's personal perception or account of an object or event"* (Smith et al., 1999; p.219) – how they make sense of their life experience. It is an idiographic orientation and method, heavily focused on individual experience, and often favouring smaller, but diverse samples, sometimes with as few as 3 to 6 participants, though potentially more. In this respect, sampling is often purposive, but heterogeneous, viewing participants as experts in their own experience and the phenomena under consideration. Like much other phenomenological and qualitative work, most IPA studies make use of semi-structured or unstructured interviews "*designed to enable the participant to articulate as much detail as possible about the experience"* (Langdridge, 2007). It is also an inductive approach, which is open-ended and explorative, with particular attention to describing and representing a participant's experience throughout the analysis and write-up of research data. Although each participant's experience is first analysed individually, subsequently commonalities in experience can be surfaced, and are reported thematically for clarity, while being selective to emphasise the most significant details and commonalities of different individual's experiences. Hence, IPA is both a methodological orientation (which is epistemologically compatible with the other conceptual influences in this thesis); as well as a method, providing a practical analytic framework for the study design and analysis in this thesis.

IPA also clearly goes beyond the more descriptive approaches to phenomenological analysis (Langdridge, 2007). IPA proposes that the researcher is *"trying to get close to the participant's personal world"* (Smith et al., 1999; p.219). However, this interpretation depends on the researcher's own conceptions and perspective, described as a '*two-stage interpretation process'* or *'double hermeneutic'*:

> *"The participants are trying to make sense of their world; the researcher is trying to make sense of the participants trying to make sense of their world."* (Smith and Osborn, 2003; p.52)

Pragmatically, while the process of analysing and coding interview transcripts in IPA is similar to thematic analysis (Braun and Clarke, 2006), IPA attempts to show the hermeneutic process involved by staying close to the data, and producing layers of initial description and comment before coding. The way IPA was carried out in the studies in

this thesis is described in detail in section 4.3.4 (p. 86) and illustrated in an example transcript in Appendix B.5. The use of individual vignettes is then further articulated in section 4.4.1 (p.88).

Overall, this interpretive basis provides a clear framing for the design of studies into lived experience, as well as a specific method to support the researcher's analysis and reporting of those studies. IPA has become a widely used and flexible method, applicable to many domains beyond health. Wright and McCarthy (2008) explicitly point to IPA as a useful 'empirical technique', especially in understanding interactions with technology in the longer term.

In relation to this thesis specifically, IPA is attractive for its compatibility with the methodological positions outlined above. Indeed, IPA seems especially suited for studies of remembering, where the researcher seeks to describe and interpret how individual participants make sense of their past or, to borrow another phrase from Middleton and Brown, *"turn around on the continuity of their experience"*. There is more harmony here than simply shared roots in the work of phenomenological and pragmatist philosophy. All of the approaches discussed advocate the value of heterogeneous, single cases as relevant to the research questions. Vignettes and rich descriptions of situated practice are seen as both a key mode of analysis and reporting findings. Rather than validating hypotheses, insights are sought which are transferable, or can be used to inform design.

Both as an analytic approach and as a method, IPA is flexible enough to accommodate aspects of methods already widely used in HCI. Interviews supplemented through contextual inquiry (Holtzblatt and Jones, 1993), home tours (Kirk and Sellen, 2010), or cultural, design or technology probes (Gaver et al., 1999; Graham et al., 2007; Hutchinson et al., 2003) can all be admitted as ways to elicit, or help the participant to articulate as much as possible about an experience, or to help the researcher to contextualise and more sensitively describe and interpret an experience. Within HCI, the work of Durrant et al. (2009a) and Ní Chonchúir and McCarthy (2008) provide exemplars of the use of IPA in technological contexts, or alongside creative interventions to make available a participant's experience for phenomenological analysis. Demonstrating the value of IPA to understand individual relations with data may be considered a supplementary contribution of this thesis.

Further, interviews – especially those conducted alongside or with reference to personal possessions and media (e.g. Harper et al., 2008; Petrelli et al., 2008; Schwanda Sosik et al., 2012) – can elicit rich cases of remembering and personal narratives, amenable to the discursive approach employed by Bartlett, and Middleton and Brown. On the surface, there is a potential tension between an 'interpretive' approach, and a radical discursive approach which rejects the mapping of verbal reports onto cognitive phenomena. As Langdridge (2007) highlights, in practice, most researchers using IPA *"resist the urge*" to speculate on cognition, focusing instead on the meaning of an experience to the participant. Likewise, in this thesis, the interpretive step is not to try to decipher the mental processes of remembering – these have been set to one side already. Rather, the interpretive analysis at work here is to carefully interpret an individual's values and competences and hence, the relationships between data, people and remembering.

3.5. Towards a Methodological Approach

The discursive approach, pioneered by Bartlett and extended by Middleton and Brown, offers an empirical basis to study remembering as it is performed through situated discourse and action. HCI has been shown to be well equipped to elicit and study discourse and action with technologies of memory. To address the meaningfulness and 'aesthetic experience' of remembering, this thesis turns to the foundational work of Wright and McCarthy and their perspective of 'technology as experience'. In particular, this thesis is positioned as exploring a further kind of 'lived informatics'. Lastly, in practice, these approaches can be brought together through the use of IPA, to guide the overall study design and data analysis. IPA shares phenomenological and pragmatic roots with these other approaches, but maintains a central focus on participant experience, and is flexible enough to admit more varied engagements with participants typical in HCI, and the discursive approach of Middleton and Brown. This focus on individual experience is especially important, given the very idiographic practices of self-tracking, and keeping a diary, which are under consideration in each of the studies.

3.6. Informing Methods

The specific methods and studies are described in detail in each chapter. However, here, I wish to make clear the way methodology relates to the research questions and how it has subsequently shaped those studies. For clarity, these research questions are restated:

RQ1: What is the experience of remembering a data-driven life?

1A) What are current experiences, practices and values in remembering and long-term recording of everyday life with data?

1B) How can quantified data become a meaningful, personal, digital possession?

1C) How is remembering mediated by a 'quantified past'?

1D) How can empirical research be undertaken for anticipated phenomena - such as remembering a data-driven life?

RQ2: What are the design considerations for services and technologies to support data-driven remembering?

In the introductory chapter, I laid out the overall structure of the thesis, which is to address these questions firstly through fieldwork of current practice, and secondly through a speculative and design-led approach.

The initial questions (RQ 1A, 1B and 1C) all concern the experience of remembering a data-driven life. As already set out, the studies that address these questions draw on a discursive approach to understand how remembering takes place, and IPA to make sense of the participant's experience. The questions are primarily addressed by two studies of current practice.

Chapter 4 focuses on the emerging 'state of play' of a quantified past, through interviews with 15 long-term users (6 - 84 months' use) of personal informatics tools. The study purposively sought a sample of participants at different life stages, tracking data from different kinds of activity. The interviews were highly open-ended, beginning with an invitation to show their data on their device, and explain 'what their data is about'. This naturally led to the participant remembering and making sense of their data in-situ, through extensive personal narratives. Such naturalistic talk around their data was amenable to the discursive approach employed by Middleton and Brown. In these instances, evidence is gathered for the way remembering is mediated by a quantified past (1C). In the second part of the interview, I was able to probe more deeply into

participant's reflections on their quantified past, and their existing practices and values in relation to it. From here, it was possible to develop rich descriptions of these participants' current experiences, and consider some initial experiential qualities of a quantified past.

Chapter 5 takes a somewhat broader focus, to understand experiences of documenting one's life with different media. Smart journals – a contemporary form of mobile lifelogging – are smartphone apps that support the creation and curation of a diverse range of personal media and data, alongside written entries, to create a digital record of one's life. Interviews with 11 users of different types of such apps, as well as five handwritten diary-keepers, develops a complementary picture to the findings of the first study in Chapter 4. This study helps to situate data as a digital possession (1B), and explore its experiential qualities alongside language, images, videos and other digital content. While many participants in the first study had accumulated their data as a by-product of everyday use, diarists and journalers gave insight into the experience and value of deliberately crafting such records. IPA was especially suited to this study, since each individual's motives and practices for journaling were so idiographic. This chapter presents rich vignettes of each participant, before finding commonalities in the way different media are used to account for their lives.

These two studies do much to reveal *current* experiences of remembering and documenting one's life with data, however only take a snapshot of the relatively recent past. A quantified past is clearly an emerging phenomenon. Hence, RQ 1D is a methodological question to consider how to grapple with anticipated phenomena such as reflecting on a lifetime of quantified data. This is developed fully in Chapter 6, as a proposal for 'Speculative Enactments', but it is important to emphasise here that the speculative design research of Chapters 6 and 7 is cut from the same methodological cloth as the rest of the thesis.

In seeking an understanding of anticipated experience, Speculative Enactments seek to stimulate talk and action amidst speculation, which can then be the subject of empirical investigation. Working closely with participants, the researcher again is positioned in a double hermeneutic, making sense of how participants interact with, and make sense of, speculative circumstances. By focusing deeply on the experience of just two engaged couples, the final design-led inquiry in Chapter 7 takes inspiration from IPA. As Research

through Design, this study practically explores the properties and embodiments of data as a material, in relation to remembering. This inquiry draws on insights from the prior fieldwork, but also reflects back on them, and particularly their considerations for design (RQ2).

Chapter 4. Fieldwork Study One: Long-Term Use of Personal Informatics

4.1. Introduction

The fieldwork in this thesis revolves around seeking out emergent instances of a 'quantified past'. There are two complementary approaches to this inquiry. The first, Study One (Chapter 4), investigates **how long-term users of personal informatics tools interact with historical data** they have accumulated. The second, Study Two (Chapter 5), **investigates the use of contemporary journaling or diary-taking apps**, many of which support the capture and curation of multiple data-streams, alongside written entries and other visual media. Both are in-depth interview studies, where participants interact and look back on their data and records during the interview, to reflect on the ways their lives have been documented by quantified data and other digital possessions.

The studies collectively respond to the initial research questions (p. 9) concerning the experience of remembering a data-driven life. Study One inquires quite directly into the nature of quantified data as it currently documents the lives of long-term users of personal informatics tools. This study directly captures interaction and remembering with data in the context of the interview. Study Two develops an account of the experiences and motivations for keeping a smart journal, as a contemporary form of lifelogging. Hence, this can be understood as a broader inquiry about the place of quantified data as a digital possession, and its position alongside the vast digital media and traces people accumulate throughout their lives

Study One points to the emerging future of a life suffuse with data, intentionally or unintentionally captured, which comes to document everyday life. Study Two provides a clearer understanding of *why* and *how* such records might be meaningful to people. By mapping the emerging characteristics of a quantified past, with the values people have for their digital records, I propose we can recognise opportunities and challenges in designing for the experience of remembering a data-driven life. The fieldwork and findings for both studies are introduced in separate chapters, but then discussed together at length, in conclusion of Chapter 5.

4.2 Aims and Rationale

The opening section of the literature review in Chapter 2 described the 'data-driven life' as a socio-technical phenomenon, a confluence of extremely affordable sensors in consumer devices and a contemporary trend towards 'dataism', greater self-knowledge and self-optimisation. The emergence of a 'data-driven life' as an everyday phenomenon, powered by consumer electronics and smartphone apps can be broadly identified in the past decade. By example, the first version of Nike+ was released in 2006[6]. The first Fitbit appeared in 2008[7]. Withings first Wi-fi Body Scale was released in 2009[8]. Gary Wolf's first TED talk on the Quantified Self took place in 2010[9]. Moves, a smartphone activity tracking app emerged in 2013, and was purchased by Facebook in 2014[10]. Perhaps a final indicator of a mass market, in 2014 Apple announced 'Health Kit'[11], a control centre for self-tracking apps and devices, as a default feature of iOS8.

These examples briefly outline a position where, in a little under a decade, self-tracking has become an increasingly mainstream concern, moving beyond so-called 'extreme users' (Choe et al., 2014) in the Quantified Self movement. In 2013, Pew (Fox and Duggan, 2013) reported that 1 in 5 Americans used digital technologies to track their health. As such, when this first study was undertaken (Feb-April 2014), I could readily find different examples where individuals had been tracking some aspect of their lives over a significant period of time, ostensibly several years. In terms of the history of these devices, these people could be termed long-term users; in the context of a lifetime, this is a relatively short period. Nonetheless, given the short-term, present focus of much self-tracking activity, this data can rapidly become documentary, beyond the original intentions for its capture.

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[6] https://www.apple.com/pr/library/2006/05/23Nike-and-Apple-Team-Up-to-Launch-Nike-iPod.html

[7] https://www.technologyreview.com/s/410806/self-surveillance/

[8] https://www.engadget.com/2009/07/28/withings-connected-body-scale-remembers-what-youd-rather-forget/

[9] https://www.ted.com/talks/gary_wolf_the_quantified_self

[10] https://www.moves-app.com/press

[11] https://www.theverge.com/2014/6/2/5772074/apple-healthkit-ios-8-announcement

Further, it remains the case that little research has investigated the meaning of self-tracking in the long-term, and the value of historical personal informatics data. Some studies have charted participant's evolving relationships with commercial trackers (Kim et al., 2016; Lazar et al., 2015), however, these trackers were an intervention in people's lives, deployed with participants for a short number of weeks. Such studies have also typically focused on reasons for 'abandonment' or 'stagnation' in the use of the device (Clawson et al., 2015; Epstein et al., 2016). While these are clearly important in understanding the dynamics of a long-term relationship with self-tracking technology, a focus on the status of a device as either in use or abandoned, tends to overlook the potential for future interactions with historical data. Notably, Lazar et al. (2015) do report that some people continued tracking, even when it was no longer useful for them, hoping for an unspecified future benefit. Indeed, *"this expectation for future benefit led participants to stop using devices that did not store data"* (p.641). As Rooksby et al. (2014) demonstrate, people appear to naturally interweave a whole range of different trackers throughout their lives with different aspirations and motivations. As such, like Clawson et al. (2015) they encourage researchers to avoid viewing the abandonment of devices as necessarily a failure.

Given this context, the qualitative study reported in this chapter sought in an open-ended way to understand how different personal informatics tools and their data are currently experienced retrospectively, and their possible roles in the long term.

The study was guided pragmatically seeking answers to the following broad questions: **1)** What kind of historical data do people currently possess? **2)** How do people access and encounter this older data? And what current practices exist around its use (or non-use)? **3)** How do people interact with, remember and make sense of their historical data? **4)** In what ways can this data become meaningful to participants in the longer term?

These questions were oriented to revealing the current 'state of play' of a quantified past. First, to develop an understanding of individual's interactions with their historical data. And secondly, to suggest the material qualities of historical self-tracking data, especially as they relate to the experience of remembering.

4.3. Study Design

Pursuing the aims above, I now outline the overall study design, detailing the methods, recruitment, procedure, analysis and ethics of the study.

4.3.1. Method

The methodology chapter set out the basis for the discursive and phenomenological study of the experience of remembering with data; IPA was appropriated as a specific analytic framework for pursuing this. Hence, qualitative studies, and specifically semi-structured interviews were identified as a primary method of data collection to support such analyses. Further inspiration was taken from recent qualitative studies of technologies of memory in HCI, which have foregrounded open-ended interviews and discussions with participants on specific artefacts or digital possessions. Such methods create opportunities to capture more discursive, naturalistic interactions with technologies, as participants incorporate them into their narratives, and work to make them accountable to the researchers. Similarly, this study set out to conduct semi-structured interviews together with medium to long-term trackers and their data.

4.3.2. Participant Recruitment

This study sought to recruit participants who had been independently self-tracking at least one aspect of their life, for at least six months, and hence had a significant amount of personal data to look back upon. As common practice in IPA, a small but diverse sample was sought, to explore a broad range of self-tracking tools and data. Participants were recruited with histories of data that varied greatly in age, the tools used, and the type of activities being tracked. Recruitment was undertaken in the North of England via adverts on Newcastle University campus, mailing lists, social media and word of mouth. Specific groups, such as local sports clubs, were seen as likely to be earlier adopters of self-tracking tools and were also contacted to help disseminate a call for participants. An advert invited participants to interview who had been tracking any aspect of their life for at least six months, giving examples of a range of then popular self-tracking applications. Though participants were most likely to be early adopters by virtue of having a history of self-tracking, participants were not recruited from ‘Quantified Self’ groups. The purposive sampling reflected convenience in recruiting from the local area, but was also an effort to avoid recruiting the ‘extreme users’ identified by Choe et al. (2014). As a sentiment of thanks for their time, participants were given a £7 shopping voucher.

The resulting heterogeneous sample included 15 (8M, 7F) participants who are shown in Table 1. The average age of participants was 28.3 years; all lived in the North-East of England in the UK. A number of participants tracked their exercise, fitness or diet, but others were interviews about, for example, music listening, coding history or tracking their finances.

Name	Metric	Principal App(s)	Hardware Device(s)	Time self-tracking (years/months)
Colette	Food Intake	MyFitnessPal (MFP)	Smartphone	6m
Becky	Location/ Activity	Moves	Smartphone	8m
Lily	Food/ Activity	MFP/ Misfit Shine	Smartphone, Misfit Shine	11m
Joanne	Fitness	Excel/Fitnotes/ RecordMySwim	Pen and paper, Desktop, Smartphone	1y 8m
Ivan	Activity	Endomodo/Moves	Smartphone	2y
Tanya	Running	Nike+ (iPod)	iPod, Desktop	2y 1m
Tony	Running	SportsTracker	Smartphone, Desktop	2y 4m
Suzanne	Running/ Cycling	Runkeeper/ Pebble Watch	Smartphone, Desktop, Pebble	2y 6m
Jason	Fitness	Fitocracy	Desktop	2y 7m
Leanne	Food	MFP/Fitbit	Smartphone, Fitbit	3y 2m
Aaron	Money	Accounts/ MoneyLover	Smartphone	3y 6m
Peter	Cycling	Strava/Garmin	Desktop, Garmin	4y
Stefan	Coding	Github	Desktop	4y 6m
Tim	Music	last.fm	Desktop	5y
Darren	Music	last.fm	Desktop	7y

Table 1: Shows the participants (pseudonymous) in Study One. This lists the activity/metric they were tracking, and the self-tracking apps and devices they used to capture and view their data. These apps are all included in Appendix A. The table is organised according to the length of time they have been tracking that data, and hence the age of their oldest data.

Participants evidently had a variety of motivations and '*styles'* of tracking (Rooksby et al., 2014). In contrast to Li et al.'s more formal stage-based model, these styles describe varied primary uses of self-tracking tools (see p.27). Some participants tracked more than one thing, or used more than one device. Table 1 shows the principle apps/devices they used, which were the focus of the data they shared during the interview. Most participants were tracking in a *directive style,* related to behaviour change: e.g. losing weight; being more active; monitoring training progress. For others, tracking served as a way of '*checking up'*, and was seen as part of responsible living. Such tracking tended to be more *documentary* than towards attaining goals. The sample included a mix of more active and passive tracking tools and required different degrees of user interaction; some tools could be turned on and forgotten about, others required daily attention.

Participants' data dated back, on average, three years prior to interview. The most recent data was 6 months old, the oldest recorded seven years of music listening history. Many participants had, at times, temporarily stopped tracking or changed tools, as found in other studies (Rooksby et al, 2014); all but one were still tracking at the time of interview. On reflection, and in light of the reported frequent abandonment of self-tracking tools, this sample reflects a potentially more motivated (and self-selecting) group of individuals.

Section 4.4.1. (and Appendix C) provides further detail on the individual participants through a series of short vignettes. Described further in section 4.3.5, these vignettes evidence the initial analytic step to understand each participant's individual experience. However, they are also included here to give the reader a sense of the life world of each participant in this heterogeneous sample. Treating each participant first as single cases, as they relate the data to their own unique life experience, affords the in-depth discursive and phenomenological analyses that help answer central research questions around the experience of remembering one's life with data.

4.3.3. Procedure

Participants who had expressed an interest in the study were sent an information sheet (Appendix B.1) with further detailed information about the study by email. At this point, the broad nature of their self-tracking data was clarified, and they were then invited to take part in a two-part, semi-structured interview, which would last between 30-45 minutes. The interview was audio recorded for full transcription. Before the interview

began, participants were briefed fully on the study through the information sheet, and asked to read and sign a consent form (Appendix B.2).

Participants were first asked to present and look back on some of their historical data, on their own devices (e.g. smartphone, laptop, wearable device), which they had been asked to bring to the interview. Each interview began in an open-ended fashion, as participants were asked to open up the interface to their data, sharing it with me, and to simply talk through and highlight the data that meant something to them. After an initial description, participants were prompted to go back to the very earliest data they had, and encouraged to look through it, describing anything that came to mind, or which stuck out to them as potentially interesting. This open-ended approach induced broad and long narratives from participants as they related to, made sense of, and remembered with their historical data during the interview. While some participants were quite familiar with their earlier data, others had rarely looked back. These narratives captured the way participants made sense of this data first for themselves, and then for the researcher, by interweaving descriptions of their data, with aspects of their activities as they remembered them. This also allowed me to query, clarify and prompt reflection on specific parts of the data.

Following this opening narrative, which typically lasted between 15-25 minutes, the second part of the interview asked participants more direct questions. An interview schedule is shown in the Appendix B.3, however this schedule was treated very flexibly, and tailored to each interview. Questions clarified issues arising from their opening narrative, and probed participants first on their experiences of looking back – in-situ during the interview, and also previous occasions they had reflected on this data. Through this, and their interactions with their historical data, the researcher tried to gain an understanding of how such data was encountered and any existing practices relating to it in everyday life. Finally, this made way for a discussion about how participants imagined the future of their data, and any potential long-term value it might hold.

At the end of the interview, participants were thoroughly debriefed, provided a debrief sheet (Appendix D.4) and provided with a £7 voucher to compensate for their time. Five participants were later contacted after the interview and asked if they would provide representative screenshots of their data, to be used in disseminating the research.

4.3.4. Analysis

All interviews were transcribed in full by the researcher. This transcription and initial analyses took place concurrently to later participants being recruited and interviewed. This helped inform further participant recruitment, and allowed emerging issues of interest to be explored more deeply in later interviews. A sample of a transcript is included in Appendix B.5.

The transcripts were prepared for IPA following the analytic procedures and template presented in Langdridge (2007, p.110), summarised as follows. The transcript was formatted into three columns. The first column contains the original transcript. The second column (or left hand margin in Langdridge) was used to create initial notes and comments alongside the transcript, and tended to *'state what is going on in the text'* (ibid. p.111). The third column (or right hand margin in Langdridge) represented a more interpretive step, to transform initial notes into emerging themes or more meaningful statements. Any themes produced in this way can be clearly linked to the utterances and analysis that produced them. Transcripts were analysed initially in Microsoft Word documents, but some were also printed out and annotated further by hand.

Importantly, this form of analysis treats the experience of each participant individually, analysing each case on its own merits, before attempting to look across cases. This was especially important in this study, given the heterogeneous activities and data of participants, which should make one cautious in generalising from limited cases. As clear vignettes and thematic codes emerge to describe each individual participants' experience, it is however possible to identify common resemblances and distinctions in experience. These vignettes, thematic codes and patterns were then discussed at length with Prof. David Kirk and Dr. Abigail Durrant, to test the robustness of the interpretive analysis, to surface further patterns in the data, and a coherent way to describe them thematically, alongside individual sense-making. What follows in the analysis, and particularly in the discussion provided in section 5.6, are selections of data and participant experiences that serve to illuminate the research questions, and subsequently design reflections.

In this way, the use of IPA enables an open-ended, 'bottom-up' and idiographic engagement with the data, seeking to understand how each participant made sense of their past life as it appeared through their data.

Lastly, in respect of the discursive approach to remembering proposed by Middleton and Brown (2005), a further specific analysis was oriented to parts of the transcript where participants visibly interacted with the data and made sense of it aloud, narrating how the data related to what they remembered. These instances, evident in each interview, were identified as particularly rich discourse, which point to the specific ways in which quantified data structures and mediates remembering. Sympathetic to a long history of studies to understand the local accountabilities of interaction (Button, 1991) this analysis focused closely on discursive details such as asides and embellishment; pauses and explanations; self-selective commentary; surprise and questioning of data. These instances were collated and analysed together with particular respect to the way data was made accountable to the past as participants knew and remembered it, in such a way that was reasonable and presentable in the context of the interview.

4.3.5. Study Ethics

This study was approved by the Faculty Ethics Committee at Newcastle University after submitting a Full Ethical Assessment Form. There were minimal risks to participants taking part in the study, however it was acknowledged that remembering events in one's life in a wide-ranging interview could touch upon topics that were upsetting to discuss. Participants were briefed fully prior to the study with an information sheet (Appendix B.1), and understood and signed a consent form (Appendix B.2) prior to beginning the interview. They were also able to pause or withdraw from the interview at any time, and are described pseudonymously throughout the thesis.

4.3.6. Limitations

There are a number of limitations to observe in relation to this study. Firstly, the sample was self-selecting, responding to a series of advertisements, and all came from a small geographical area around the city of Newcastle in the North-East of England. Those interviewed were also generally well-educated, most having received at least an undergraduate degree. All of the participants were still self-tracking at the time they were interviewed, although several explained lapsing in the past and the use of multiple

different tools. Still, it is quite possible that those who are early-adopters and continue to track have quite different relations to their historical data than those who abort self-tracking altogether. Further, these interviews necessarily represent only a snapshot of participant's relations to their data. It would be expected that these relations are dynamic: it may be that participants have since stopped tracking, or no longer even possess this data – or it may have had a greater significance to them after the interview.

This study at least briefly captures live interactions of remembering with historical data – even if this is in the context of an interview with a researcher. Of course, remembering is situated, and so the kind of past which is remembered with a stranger is different to one remembered with one's family for example. It is still possible to inquire about the wider context of these records in participant's daily lives in an effort to bridge this gap, and learn from the way in which data mediates remembering in-situ.

4.4. Findings

In reporting on the analysis in this thesis, I begin with presenting a selection of the vignettes that expose the first step in my analysis, and illustrate important details about the participants and their experience. I then look across the sample to describe ways in which participants reported encountering their data, before further interpreting the way they make personal meaning from it. Lastly, drawing particularly on the discursive analysis, I demonstrate how participants worked rhetorically to make sense of their data, and made it accountable to their present experience.

4.4.1 Participant Vignettes

As described briefly above, these vignettes worked as an initial waypoint in the analysis. Following the initial passes through each transcript, which generated descriptive comments and interpretive emerging themes, a 'thick description' (Geertz, 1973; Ryle, 1949) was written for each participant. This weaved key quotes, comments and emerging themes together, to create a narrative account summarising each participant's experience. These then provided a succinct overview of the data and emergent themes, rooted in individual experiences, which could be used to orient discussions with supervisors, and further supplementary, more deductive, analyses of the data. Vignettes were produced for each participant, as an extended biography. Summaries of these are included in Appendix

C. Here, I reproduce a sample of these to work as a series of 'family resemblances' (Wittgenstein, 1953), which illustrate the diversity of self-tracking tools, practices and experience. The use of vignettes in this way also serves to illustrate the commitment to understanding and representing meaningful remembering as an individual experience.

Becky (Moves)

Becky has used Moves[12] to track her location and physical activity for nearly a year. While her primary motivation is to see how active she is, having previously owned a Fitbit and used other self-tracking apps, she also enjoys the 'story' that Moves presents for each day. Becky tends to look back on her Moves data at the end of the day or week – out of curiosity, or in response to a specific thought or question like "*what happened this week?"* or *"why am I tired this week?".* However, she has also reflected repeatedly on specific important events she has recorded, like moving house, being in hospital, and a recent holiday.

Reflecting on an illness, and a heavy workload leading up to being admitted to hospital, Becky interrogates her data. She searches for specific events like a work deadline and doctor's appointments to orient her remembering and telling of the story. And for events like this in particular, she is interested to *"see how much you remember or how that aligns with what you think happened that day or how different it actually recorded what, what you know happened."*

For other events like moving house, the app offers reminders of specific details of the experience, such as sharing some fish and chips with friends who helped her move, and the following day, an absence of movement, spent entirely in the new house. While she says she is "*quite aware of the period of my life"* the data she has recorded adds detail *"like where I was and who I've met.".* The app doesn't include data of who was there, but this is easily remembered or inferred by Becky. By contrast, the routine days - "*Home, going to school, having lunch, going back to uni"* – are repetitive and '*doesn't really tell me very much"*.

[12] https://moves-app.com/

Her appropriation of Moves data for remembering is emphasised by her parallel use of a journaling app Momento[13] which brings together photos and social media data with her activity data. This gives a "*better picture of what you did that day."* And offers more than the "*pure, neutral data or locations."* After a year that's "*been a bit of a blur"* however, she started writing a diary to have *"not just what happened, facts, but like what I thought that day or felt".* The combination of feelings and facts is valuable to her as "*all the feelings or emotions are attached to a place".*

In fact, without the feelings and thoughts, she's "*not 100% sure what [the pure data itself] does for me".*

Tony (SportsTracker)

Tony, used to be a keen runner, who competed in half-marathons. He describes a history of tracking his training *"to have a sense of progress"* and to become competitive with himself. Now, he either does not have, or cannot remember, how he tracked his training, nor the apps, user accounts and devices he had used years previously. Instead, he presents running data from an app Sportstracker[14] (Figure 1), which he has used in the past 2-3 years to track his intermittent running.

Tony has never before dedicated time to looking back retrospectively at his data. Many of his runs follow regular routes through local parks, but he also recognises runs to work, and other one-off routes. However, long gaps in his data clearly speak to him of periods of injury, busyness, moving house and the birth of his first child.

During the interview, Tony produced a rich narrative as he viewed each run: making sense in-situ, adding many details, often being surprised by the data, while also predicting a number of regular runs he would then expect to see, working particularly from maps of his route. He vividly recalled one instance of being misled by GPS, forced to run a long way around following a fence and *"thinking bloody hell this is miles".*

[13] https://momentoapp.com/
[14] http://www.sports-tracker.com/

However, despite this engaging interaction with his data during the interview, he is quite sceptical about the value of this data beyond a "*hum-ho 'oh right' kind of interest*". He claims it evokes very little emotion or nostalgia in him, even in cases such as recollecting that he went for a run on the day his son was born. At most, it's an "*interesting sort of marker of time*" which inevitably reflects local details and habits.

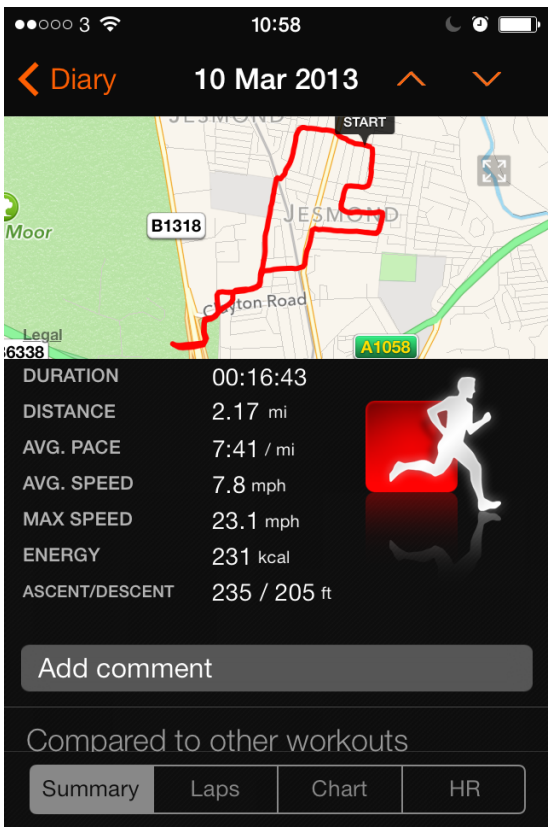


Figure 1: Screenshot of the 'Sportstracker' running app

Leanne (MyFitnessPal)

Leanne uses a combination of her Fitbit[15] and the MyFitnessPal[16] (MFP) calorie counting app to manage her weight (Figure 2). Her sister and cousin encouraged her to use the app, which is mainly a way to 'check-up' and be more aware of how she could eat better. Although she feels she is quite honest with the app (which relies on manual self-reporting) she has a fairly inconsistent record, which disappoints her. However, on reflection, she reads periods of having kept a good record of her diet as a sign she *"felt*

[15] https://www.fitbit.com/uk/home
[16] https://www.myfitnesspal.com/

good about things" and was *"getting stuff together"* while a lack of a record suggests more chaotic times.

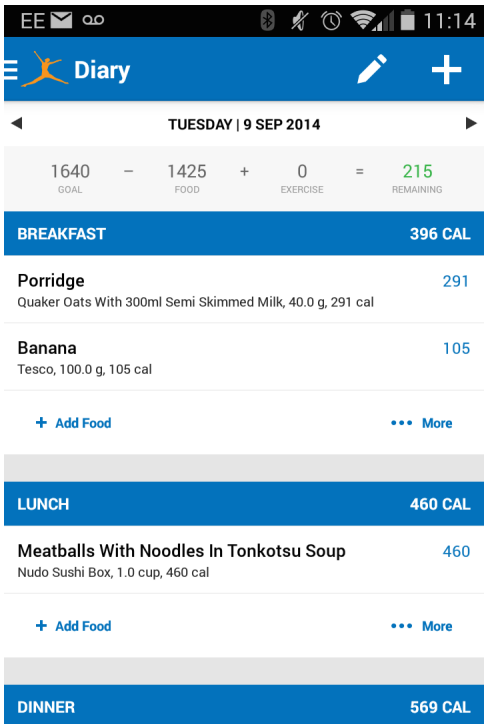


Figure 2: Food intake recorded with the MyFitnessPal app

She describes a dual relationship with MFP: "*one where I hate it for telling us what I've done wrong and one where I love it because I feel like it's gonna make us really healthy."* Using the app proactively could inform decisions about her diet; but using it retrospectively after she's eaten could leave her feeling guilty. Leanne would tend to look back only on what she had eaten the current or previous day, and had never looked back longer term. Narrating and passing comment on her entries, she flicks through some days that are "*so anonymous"* and "*just blend"*. However, there are others – a birthday lunch with friends; breakfast cooked by her sister – which stand out, or "*tells you more about your life than you perhaps would have thought it would."* As a record, she suggests it is a "*more intimate experience… kind of private"* than looking at a photograph which is often "*a much more romanticised version of what happened."* Such detail however seems only to be valued when it can be connected to days or events you *"really remember"*.

Overall, Leanne has a complicated relationship with self-tracking that she describes as a "*weird mindset"*. She feels obligated to record, and despairs when she forgets to wear her

Fitbit after a long walk: "*like recording it really acknowledged or really meant it was a thing. Whereas not recording, is as if it doesn't exist."* Simultaneously, she knows she will rarely if ever look back on that data, so "*part of us thinks why am I bothering?",* and questions why she has become so invested in her data.

Darren (Last.fm)

Darren has used the music website Last.fm[17] to record or 'scrobble' each track he has listened to on a number of devices for over seven years, since 2007. For a period, it was an important source of conversation among his high school friends, as a way to share, compare and talk about the music they listened to and identified with. He rarely uses the service in this way now, but has continued tracking his music listening in the background, and has *"accumulated all this data"*, which he will still occasionally reflect on.

Like many, his music taste has developed since high school where he identified as being an 'emo' and listening to then popular bands such as 'My Chemical Romance' and 'Greenday'. Besides the sheer volume of music he has listened to during the past 7 years, it is this *change* in his taste that most interests him. Some artists and songs are associated with particular times, people or memories in his life, although the specific date and times of listening rarely seem meaningful to him. However, he appreciates the view of his data which is entitled a 'weekly snapshot' since he describes it as *"a kind of snapshot of a past version of me almost".*

The total number of listens is interesting to him as a sort of validation of his belief that he is 'very into music' and so he is surprised where there are occasional weeks where it is recorded that he has listened to little or no music. While this is possible, his reaction is to cast doubt on the processes by which tracks are 'scrobbled', and to suggest possible sources of error. Nonetheless, he is generally quite accepting of these inconsistencies. Yet he becomes more inclined to trust the data as it goes further back in time, and his memory is poorer.

[17] https://www.last.fm/

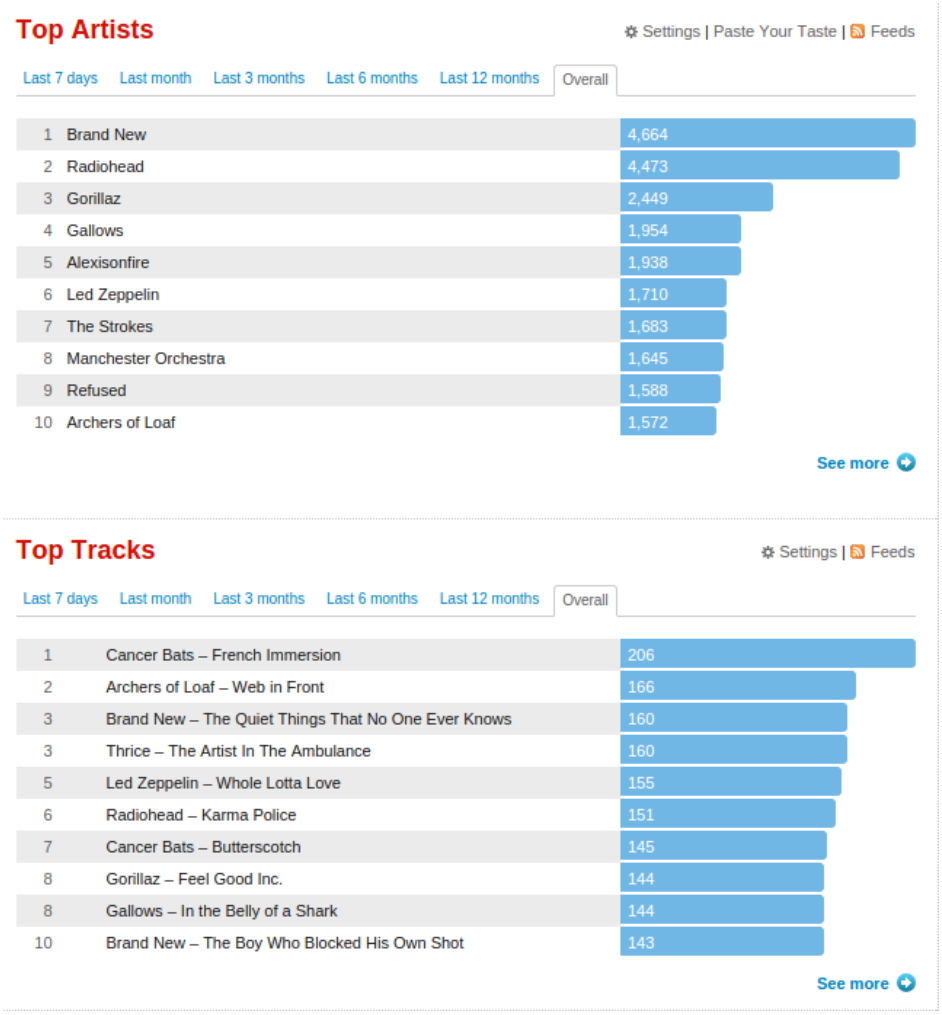


Figure 3: Screenshot showing aggregate listening statistics on last.fm

Darren will occasionally make time to reflect at length on his data. While it often doesn't tell him anything new, he suggests it does *'back [his thoughts] up'*. However, the most practical use for it is to support the recommending function within Last.fm for new music, and to encourage him to listen to new music, if he feels he has been listening to the same music for a few weeks.

Vignette Summary

These vignettes each offer a particular lens on a quantified past. Nonetheless, some common facets of experience may already be seen to emerge. Self-tracking is emphatically personal and emotional, taking place over a series of 'lived activities' (Rooksby et al., 2014). Self-tracking is dynamic; its practice and meaning fluctuating and evolving. Numerous participants expressed a strong sense of investment and possession

towards their data; both its personal, potentially private nature, and the 'work' that its collection represented.

Around half of the participants described having deliberately turned to their historical data to remember or think about the past. Perhaps remarkably then, half had never looked back at their data, its use being exclusively present or prospective. Across all participants, remembering with data was mainly a by-product of its original or present use; self-tracking was rarely a *solely* documentary affair. As we shall see, there were hence varying orientations to the value of this quantified past. This ranged from scepticism and ignorance (Tony, Peter), to bemusement (Leanne), curiosity (Becky) and strong personal attachment (Joanna).

Having set the scene, we can now look more in-depth at the ways participant's (i) *encounter,* (ii) *make sense* and (iii) *make meaning* of their historical data.

4.4.2. Encountering a Quantified Past

It is important to understand the means and occasions by which a quantified past might be encountered. In some cases, past data was actively sought out; in other examples, we can see ways in which the past is brought to bear more implicitly through features of the interaction.

Looking back purposively takes place for several reasons, and within different *rhythms of reflection.* Many participants, especially those recording events such as a run or a cycle, described either immediate reflecting on the data, or reflecting at the end of the day, as its original and central function. At this point, specific details such as times, top speeds, calories and leaderboards are important to assess one's 'effort' and progress. Peter, an experienced cyclist who used the competitive tracking app Strava[18], illustrates this: *"My interest originally was where have I been, what speed did I do. Ok, forget about it. But it's kind of extended beyond that, the fact that they store it."*

[18] https://www.strava.com/

However, like Jason, who records his gym workouts using the Fitocracy[19] app, as data accumulates over time it can take on further values. *"I think it started off as a tracking thing, but I think more recently it's just become a useful log."*

As these examples suggest, participants described a variety of motivations for looking back at recent history in their data. In Becky's case, this might be diagnostic as she looked back at her Moves data and the events leading up to her illness. Providing a quick overview of her recent past, Becky might also turn to Moves to ask "*what happened this week?"* or *"why am I tired this week?"* Others also browsed their data in order to account for something: Aaron used an app to keep track of his spending, and found he would look back "*when you get a surprise"* or "*something has gone wrong"* with his finances.

This sort of checking up, on a daily, weekly or perhaps monthly basis is also a way *"to keep myself honest"* (Jason, Fitocracy), and is commonly supported by applications like Moves, MyFitnessPal and Misfit Shine (Figure 4) through daily or weekly summaries of the data. As Ivan explains, reflecting on his Moves data *"the way it breaks it down for you, it just encourages you to look at it per day."* The Nike+ running app, however, also displays the most recent runs on the main dashboard. Suzanne frequently uses recent, or past runs recorded with Runkeeper[20] as a source of confidence and inspiration. *"It's the knowing that I can do it, and the thinking that I can get better. And so the fact that I've got it on there shows me that I can."*

In a more implicit way, past entries can provide a sense of progress and continuity with the past. Lily described the pressure and pride in maintaining a continuous 135-day streak of using the MyFitnessPal app.

[19] https://www.fitocracy.com/
[20] https://runkeeper.com/

Figure 4: A daily view from Lily's Misfit Shine ap.

> *"And then like the other day… I'd forgotten to put any data in and I had this panic at the end of the day that it was gonna get to midnight and I would have broken my streak! I was really worried about it! I was like you can't break 135-day streak, that's terrible!"* (Lily, MyFitnessPal)

Many apps, especially those concerning fitness, support the comparison of past and present achievements. Highlighting individual records are the most explicit ways of doing this; Strava's dissection of a route into many discrete sections allows many points of comparison and competition with previous efforts. By beating a record or topping a leaderboard, the present data implicitly draws its entire meaning in relation to the past.

Graphs literally draw a line from the past to the present. In Lily's case, she frequently refers to a graph of her weight loss (Figure 5) that shows how she rapidly lost weight to begin with and has since plateaued. Interestingly, she frequently manipulates the graph to show it over the longest time frame (over 6 months, rather than 3) to emphasise the progress she has made. This connects her present with a past where she lost a lot of weight (and hence could do so again).

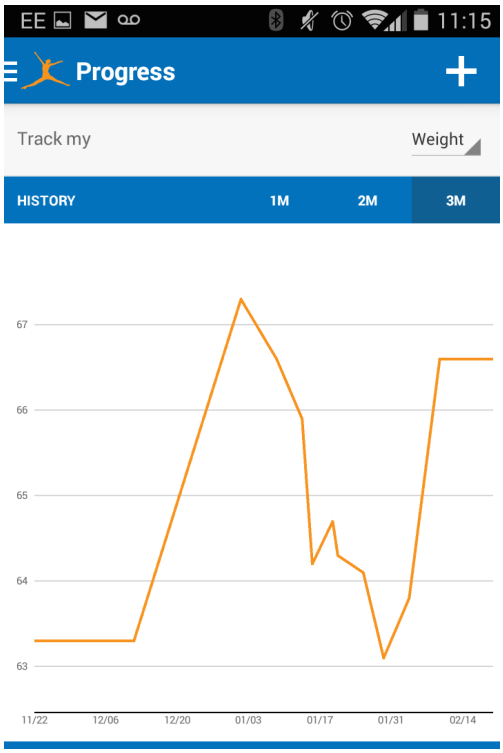


Figure 5: Graph of weight loss in MyFitnessPal app with adjustable time axis.

On occasion, particular data and *"certain stats" (Peter, Strava)* can become marked out as somehow important: a record number of steps; winning a triathlon; a 'Coast-to-Coast' bike ride; a good week of healthy meals.

> *"So I have kept this week, glancing back at that one.... I do keep going back, going hmm that was a good day."* (Lily, Misfit Shine)

Sometimes this data can be set aside as it represents some kind of record, is shared with friends, or relates to a clearly remembered event, which can be easily revisited. Becky reckons she has revisited data surrounding her development of pneumonia at least ten times, and it has become uniquely interwoven with the way she recounts that period of her life as one of stress and over-activity. However, much data is not exceptional in this way or may represent a past, which is of little interest or value to their present, and should perhaps even be forgotten.

> *"Because if I'd lost like... say I had lost two stone in the last 6 months, I would be bothered [if I lost the data] because it would be a measure of that success, whereas at the moment this is just a reflection of my failure."* (Colette, MFP)

Because Collette's data only shows a current status of not having lost weight, rather than a change or an achievement, it has limited purchase on the present. In this way, data can fall out of use and meaning, until such a time as it becomes significant again. Perhaps returning to tracking after a long injury, and seeking a benchmark or inspiration or the need to account for something like an illness. However, for several participants, it was only the unusual case of talking about data in an interview which brought their data to light again.

The situation is reminiscent of the way Radley (1990) describes the *"mix of international and fortuitous circumstance surrounding memory involving things"* (p. 55, 1990*)*. Borrowing Radley's language, a trajectory emerges of data passing from a functional object – "*through which to achieve ends within a particular time and space"* – to become "*a memento or historic artefact with which to define the world of which it was a part"* (p. 57, 1990).

Participants here are using their data on a daily basis to lose weight, to run faster, to save money, to listen and share new music. But as their data is stored, it can become a way to define and reconstruct the past towards some present activity. Although in several cases this activity is one of reminiscence, this remains "*a partial view of the role of artefacts in people's remembering" (*p. 51, 1990). Examples here show the way in which present data derives meaning from the prior record, and ways in which features such as 'records', 'streaks', and 'summaries' bring the past and present into relation. And in fitness related contexts, these encounters are broadly oriented to support ongoing present efforts to sustain an activity or motivation.

Relating this study to Radley's work underlines a basic premise of the thesis: that data can be oriented to remembering as much as any other object - an antique cigarette lighter, family letters, gas masks in a museum to borrow some examples. It speaks of the way in which, almost accidentally at times, data inevitably documents and represents people's

lives. The work of the remainder of this chapter and thesis is to develop ways in which remembering with data might be perceived as distinctive.

4.4.3. Making Sense through 'Data-Work'

Having established ways in which our participants encountered a quantified past, I now turn to how people made sense of it in-situ, and accounted for their data in relation to broader personal narratives, and the how they remembered the past.

As previously highlighted, a specific discursive analysis was directed towards those parts of the interviews where participants were seen to very directly interact and make sense of their data. These interactions were defined by a tension between what was remembered, and what the data implied. This manifested as points of *negotiation*. Here participants were attempting to both *communicate* the meaning of their data for the interviewer, and crucially, to subjectively interpret it, in such a way as to construct a coherent narrative and achieve their own sense of *verisimilitude*.

There are various rhetorical means people used to achieve this: asides and embellishment; pauses and explanations; self-reflective commentary; surprise and questioning of data. Together, I describe these as '*data-work'*. By this, I mean the language and 'work' that is done to qualify and make sense of one's data. In this case, the data was made *accountable* to the past as participants knew and remembered it, and such that it was reasonable and presentable in the context of the interview. Parallels for this are to be found in design ethnography of the local interaction surrounding photo narratives (Crabtree et al., 2004) and similar ethnographic work on the situated organizational practices surrounding 'home-mode' photos and videos (Kirk et al., 2006, Kirk et al., 2007). Most contemporaneously, data-work offers another lens on Taylor's conceptualization of 'data-in-place' – a description of how data is necessarily *'entangled with wider forms of life'* (Taylor et al., 2015). While the term 'data work' has arisen rather briefly before (specifically on work about data infrastructure in collaborative research environments (e.g., Jackson and Baker, 2004; Karasti and Baker, 2008), it is adopted here to describe how individuals interact and make sense of *personal data,* in-situ.

Data-work here is hence shown to achieve contextualisation, negotiation with data, and a sense of verisimilitude. The extracts below are typical, and give a flavour of the rich and personal narratives of participants.

Data-Work as Contextualisation

In several cases, data-work took the form of contextualisation, to identify oneself within the data, and develop its potential personal significance within a broader context. Consider these two extracts, from participants looking back at their running data.

> *"Oh, this is funny, so this is... the day before Tim was born. His birthday is the 16th. So that's [pointing at the map] the flat that Jill and I moved to so… how funny... that's a really short route. Oh it's not that short. I kind of went down into the Dene – this bit in the middle is Jesmond Dene, and so I always try and kind of work a run through there." (Tony, SportsTracker*)

> *"Yeah here is just exactly when I moved to Newcastle. This is the week that I moved here. So this is the first time that I... I live really close by Leazes Park so that's why everything starts changing now, because it's in the park, I can't run at night anymore, because it gets weird and the birds are getting weird noises [sic] and it's really scary. But this is the first time that I ever ran in Leazes Park."* (Tanya, Nike+)

The quotations above are both about a run in the park, and yet both have special significance for the participant, which is instantly recognized and explained. Seemingly anonymous data is marked out to 'talk to' – *"Oh this is funny"* – and elevated to something more personal. Rhetorically, this data has been put above data about many other runs. Important details, like the date, or one's home are highlighted. Tanya in particular emphasises the novelty of this particular run; that it was the first time she ran in Leazes Park. In both cases, the data is located temporally in terms of bigger life events: a child's birth, or moving to the UK. Overall, in both cases, the data becomes embellished with personal commentary – about birds, places, family etc. – which goes beyond what the data alone can show. All of these are ways of personally contextualising the data, remembering and showing how the data relates to them.

Data-Work as Negotiation

Beyond simply contextualising the data, data-work was also a means of negotiation with the data. This formed an effort to resolve a tension between what the data appeared to represent, and one's own memory and narrative. Consider two further extracts, relating to food intake on MyFitnessPal, and music listening on Last.fm.

> *"The 14th of September, I apparently had no tea that day as well – which I don't believe – porridge for breakfast, and more pasta for lunch and some prawn cocktail crisps, a horrible mugshot thing and some grapes and I did loads of walking, which doesn't feel like very much on that day either." (Leanne, MFP)*

> *"See, I would say, it's probably not that I've only listened to seven songs, I've maybe, I dunno… Or maybe I did only listen to seven songs. Or maybe I just didn't scrobble them somehow. I'm not exactly sure, but it is kind of odd because there's sort of, a consistent number of over 100 plays each week and then it is this gap."* (Darren, last.fm)

The underlined portions indicate a number of different techniques to play down the meaning of the data being discussed. In the first case, the validity of the data is undermined by conditional words like 'apparently' or 'probably', and an outright rejection of the data, which is reduced to a question of belief. Quantities are qualified to give them meaning – "*loads*"; "*not very much*"; "*only*". Darren compares the questionable data to another week where there is a "*consistent number*" of plays, in contrast to the 'gap' he is now seeking to explain. The efficacy of the tracking can be brought into question - "*maybe I just didn't scrobble them somehow*". As Becky suggested, in the case of her Moves data: "*Sometimes my phone died, or the battery's gone and it turns Moves off.*" These are all efforts at explanation but also ways to render the account more flexible, and to make it fit more easily within the current exposition.

Of course, what exactly has happened is often simply not clear, and some participants then sought to probe their data more deeply for an explanation. Consider another extract from Darren:

"I guess this was maybe… this was maybe when I stated getting into running… so there's a slight chance that when I was listening to Chemical Brothers, if… I wonder if it will tell me what songs I listened to… because it's further…. Ah ok, Escape Velocity, yeh that's the one I was thinking of, yeh that was one of the tracks that I sort of put on to run to." (Darren, Last.fm)

Here he has in mind a period of time when he was running, and remembers specific songs he would run to. He then browses the data around this time for these songs, to identify and temporally locate this section of his music data. Note also how these extracts could be data or narrative-led. Whereas in Leanne's example above she is led by the data – she literally recites her data with commentary – here Darren is using the data to back up his narrative.

Data-work as verisimilitude

Darren's example above shows the way a resolution might be reached. Overall, participants clearly sought a sense of *verisimilitude* – that their account was close to real life as they experienced it; that it seemed right. This was found somewhere *in between* what was remembered and what was recorded, as participants sought coherence between the two. Participants like Leanne above were quick to disregard or undermine data if it was unaccountable to their own remembering. However, even when the data was perceived as inaccurate – especially where there were gaps and errors – it remained highly interpretable and could be spun into a narrative. While participants often sought and found affirmation in their data, on occasion it refined their narrative – adding specific details, or curbing inflated claims.

"I can see there... how I went from 30 minutes swimming in the morning, <u>just a casual</u> swim, to 60 minutes, at least <u>forty-fi</u>...at least 40 minutes." (Joanne, Excel)

This tension between past-as-remembered and past-as-recorded is evident, and not easily resolved.

"Because obviously, I don't take [the data] as a, you know, 'this is what happened.' But at the same time, your memory doesn't always remember things in the correct way either." (Becky, Moves)

Becky highlights this tension directly in this quote. It is 'obvious' that she interprets the data in light of her own memory of what it portrays, but she remains open to the possibility that one's own memory could be flawed and is hence flexible. In certain contexts, people placed more trust in the data, or their own memory. Joanne above, a fitness addict who fastidiously and actively records her activity in an Excel spreadsheet, claimed total confidence in her data and stood corrected by it. Darren suggested that "*in my mind, I probably listened to as much music that week'.* However, he could attempt to explain and reverse engineer perceived errors within last.fm to support his doubts. His data was still informative, but not always authoritative.

The above analysis reveals the significant work required to qualify and contextualise one's data - the way in which *"data morphs into selves"* (Davis, 2013). Secondly it suggests that tensions arise in doing this, and there are seams in the data which people are able to pick at to construct a coherent narrative. An important limitation should be sounded out here. While it did appear quite natural for people to talk, rhetorically, about their data in this way, one ought to question why or when this kind of data-work might be necessary or important. Bartlett (1932) might remind us here that literal recall is *"extraordinarily unimportant"* (p.204) in the course of everyday life, in contrast to extreme circumstances, like a witness stand in a courtroom. The data-work here took place in the context of an interview. The present activity towards which participant's remembering with data was oriented likely had a number of ends. First, they were making sense of their data for themselves; they then tried to present this in a coherent way to the interviewer. This sense making was interwoven with broader stories they had to tell: about being a 'fitness addict', becoming a parent, losing weight etc. Perhaps participants sought to please or impress the interviewer. This is simply to argue that just as remembering is situated, so is data-work; and hence the data-work represented here, is representative of the particular local needs to account for the data in a particular way. Data-work in a doctor's office or in a boardroom might well take on a different character.

Such narrative work and tensions also surround retrospective interpretations of other media like photographs or social media posts. However, particularly in the context of the aforementioned '*dataism'* (van Dijck, 2014) – the belief in the objectivity of data – there is something to be learned from the way that participants constructively and flexibly interact and remember with data. Personal informatics tools are deliberately employed to

provide 'objective' *measurement*, differing from other recording tools or historical markers, and create a historical record often as a by-product of their everyday use. Clearly, that record cannot simply be read or taken as-is.

Nonetheless, however accurately, and for whatever purpose, it is clear from the study findings that personal informatics, for these participants, did not miss the mark in capturing some essences of people's lives. The next section of these findings explores ways in which these essences might be perceived or constructed as meaningful for participants, and of broader value in their lives.

4.4.4. Making Meaning from a Quantified Past

During the interview participants were asked to scroll through, present and reflect on their data. In the main, this was a task of rapidly making sense of the data by relating it to themselves and their everyday lives, past and present. But beyond sense-making, and achieving a settled record of the past, there are clearly elements of this record that could hold a wider personal value to participants, or provide the basis for reconstructing the past with some relevance to the present. Clearly, what this data will mean to any participant is situated and dynamic; the findings here only speak of the meaning and identities participants presented at interview. Selected examples from individuals' experiences are presented here thematically to demonstrate the range of possible meaning and value quantified data can develop as a form of personal record.

Remarking on Changes in One's Life

In different ways, all participants remarked upon transitions and things that had changed in their lives. Old houses and neighbourhoods; improved fitness; changed diet; forgotten places; moving in with a partner; weight loss; teen music tastes; recovering from injury; leaving university. Leaning on Radley's terms once again, *"these objects become interesting because they are displaced from their time"* (p.51). The data, in various ways - through maps, graphs, peaks and troughs, absences – offered a highly legible reflection of these life changes, no matter the metric recorded.

Change was also a way to navigate through the data and anchor a narrative. Browsing through extensive records, change or exception was often more evident than the routine

and humdrum. Well known routines and patterns – regular routes, commutes, lunches etc. – were ways of gathering data together, and describing it as belonging to a certain period of time, or way of life.

> *"All of those days that I basically did home, school, Pret again, and then going back home. By itself that doesn't really tell me anything, it's not very interesting, it just shows how boring some days are. […] Maybe they are not as similar as I think they are. Don't know."* (Becky, Moves)

This phenomenon is reminiscent of the way people browse thousands of SenseCam images. Lindley et al. (2009) describe people 'compressing the everyday' as they move past the humdrum, and instead become attentive to changes in their images. *"One watches in anticipation of change rather than pausing to reflect upon a fixed moment." (*pp 9, Lindley et al., 2009)

Remembering Moments and Periods of Life

Data was variously approached as an index to remembering in broad strokes, distinct periods of their life, as well as specific moments and events. Lulls or gaps in activity-related data were revealing of periods of injury, illness or busyness. Routine and consistent data tracking might also reflect a settled period of time. The scale, visualisation and granularity of the data could mediate these different temporal perspectives. Running charted over a month in Nike+[21] would prompt a wider focus than the detailed breakdown of one cycle ride in Strava for example.

> *"It was my first 5k, July or August, I think it was July, because August I train a lot, because September I train a lot, it was the second one, so July was the 10k but what happened was that in April I twisted my ankle. I had to stop for a month, that is why May is sort of a phantom here."* (Tanya, Nike+)

Details, perhaps a top speed, the elevation, and especially locations might focus remembering on specific events.

[21] https://www.nike.com/us/en_us/p/activity

> *"Oh actually this is one to Wylam. This is one I did with my girlfriend, and I was obviously just using it at the time, I don't think we were going very fast."* (Ivan, Endomodo)

Alternatively, the mass of data was sometimes oriented to by memorable events - birthdays, sightseeing, races, long bike rides. The data around these special occasions was held up as "*another layer"* (Darren, last.fm). In an exceptional example, Suzanne described recording the route of her honeymoon - US road trip.

> *"So we've got it on Google Maps and then because you go with the little man, and drop him at places, so places that we didn't necessarily take photos of, like where we stopped and had a picnic one day which was just like, you know a picnic bench in the middle of nowhere but you can look at it on GoogleMaps and you can look around."*

Following this experience, Suzanne intends to use Moves to map routes in upcoming sightseeing holidays in Prague and Budapest. In such a way, the data became a way for participants to orient personal remembering, even within a public record such as Google Maps. And Suzanne now anticipates using Moves in a documentary fashion to explicitly support this.

Vivid Recollection and Inferring the Past

During narratives, the participants clearly engaged both in vivid recollection as well as inferring the past through a kind of personal detective work, relating recognizable features of the data to remembered experience, routines and known facts about one's life.

> *"And I remember running down there, and thinking bloody hell this is miles, I really wish I could cut across but coming across the fence, and then it being rough terrain. Isn't that funny, I actually remember that really distinctly."* (Tony, Sportstracker)

Tony is pointing out a specific part of the map here, an unusual squiggle, which prompts him to remember, vividly, the effort and frustration of the terrain. Remembering vivid

memories such as these was evidently surprising and pleasurable. Often, with the passage of time, data could be reduced to "*just numbers"* (Peter, Strava). However, there was also a satisfaction to working out one's past, being able to account for it, to put it in order and tell a coherent story.

> *"I must have went to boot camp... yeah. So and then I've even put my water consumption in, which I never track so I must have been messing around with what I could track …Yeah... must have been... I guess it was January so it would be people having silly selection boxes of sweets. Bring them in don't they to get rid of them…"* (Colette, MFP)

This example also highlights the very live sense-making process interacting with one's data, and the desire to resolve and explain it.

Reminiscence, Nostalgia and Emotion

A feature of several interviews, participants would occasionally reminisce about their past and the changes in their life, which were sometimes a fleeting source of nostalgia. Tim reminisced about a music festival with an older group of university friends. Lily missed 'proper lunches' since starting a diet. Joanne recalled an especially satisfying triathlon victory. Tanya recalls beginning to run just as she moved to the UK.

> *"I think this period is really good. It was autumn here, and I'd never experienced that because they don't have leaves falling and brown things, so it was beautiful in the park. I remember feeling all of that... Like it was a different thing from running in the same track, seeing the same people, that I usually done... here it is like watching… I dunno nature more... more trees. [sic]"* (Tanya, Nike+)

Tanya was sentimental as she recounted her data in this case. For her, the data represents some of the best of her running activity, especially in contrast to periods of injury, or slow running; but it also remarkable for being a novel, and more aesthetic experience. Not all participants reacted emotionally towards their data in this way however.

> *"I don't feel nostalgic about this data... It's kind of an interesting sort of marker of time, but I don't."* (Tony, SportsTracker)

Tony's comment reflects a curiosity with his data, frequently described as 'interesting' without being as emotive an experience as perhaps, looking back through a photo album.

At interview, participants were directly prompted to compare remembering with photographs to remembering with their data. The majority of participants, like Tony, described photos as being somehow more evocative or having a *"warmth of feeling"* (Suzanne, Runkeeper) in terms of remembering. However, some participants also described their data as being more personal, private and intimate – something they were much less likely to share.

Other participants suggested that their data sometimes lacked details that would evoke specific memories of an experience in the way that photographs taken at a time and place *"pick out particular moments and episodes"* (Lily, Misfit Shine). An activity tracker is just always on, and hence rarely turned and focused on a particular event the way a camera might be. The way such moments and episodes are captured and represented by data seems almost incidental by comparison. Put bluntly by Darren (last.fm), data, colder and more abstract, rarely achieved the same emotive value as an image:

> *"When it comes to photographs, it can be funny sometimes to see how you used to look when you were a lot younger it doesn't really trigger, the same emotion, because this is just kind of a chart."* (Darren, LastFm)

A photo of how he used to look, therefore seems more emotionally resonant than a data double (Lupton, 2014; Ruckenstein, 2015) of how Darren used to listen to music.

On reflection, data seems to act best as a *"condensed symbol"* (Radley, 1990) to "*punctualise experience"* (Middleton and Brown, 2005) and structure remembering. This resonates somewhat with Thiry et al.'s (2013) description of a timeline as *"a framework for authoring"* rather than an evocative mirror of the past.

Becoming a possession

Throughout, almost regardless of its emotive value, or the extent to which participants had previously looked back on their data, data was conceived of as a personal possession.

> *"This data is very personal to me, it's my data and my numbers and my figures. And it feels a lot more mine."* (Lily, MFP/Misfit Shine)

Many felt they had worked to create their data, even when passively tracked, and were keen *"not to mess up the history of it"* (Tim, last.fm). For others, the data represented a desired identity or facet of their life, seeing themselves and their lives reflected in it.

> *"It sounds ludicrous but you get a personal attachment to… you. Because that's what you did."* (Aaron, MoneyLover)

Aaron identifies with his data here, because it portrays how he has carefully managed his money through several bank accounts, reflecting how he already saw himself, as someone shrewd. Hence, nearly all participants were reluctant to lose their data; even those like Peter who felt more clinical about their data suggested there were "*certain stats"* that would endure and remain meaningful in the future.

For others, the accumulation of their data maintained a motivation for tracking. As such, many participants saw their records as valued possessions, which they would be reticent to lose, even if they had not set out to accumulate such a record, and struggled to articulate a clear future purpose for them.

No editing, curating or deleting data

Interestingly, despite these claims about the importance of some of their data, few participants took any steps to retrospectively edit, manage or curate their data by, for example, deleting data, gathering important data together, or adding comments or annotation. At most, curation involved sharing data between different apps. Participants like Leanne did combine calorie data from her Fitbit with MyFitnessPal, but this happened automatically, without her input. As a rare example, Brianna imported her Moves data into a journaling app, Momento (momentoapp.com) along with other media, giving her a place to annotate and reflect on different streams of personal data together.

Curation might otherwise occur by hazard, through the occasional sharing of data to social media. Lily explained "*on the days when I had massively beaten my goal I have*

taken a screenshot of it and put it on Twitter". In this way, her 'best' days of activity recorded with her Misfit Shine have become marked out and put aside, elevated to being worth posting publicly a representation that will persist beyond the original application.

Notably however, no one in the study admitted to deleting or even editing any of their data. Even though some data was deliberately avoided during the interview, the only data that was missing was lost hazard, for example through changing devices. To selectively edit their data would potentially undermine it as an objective record, even while they acknowledged the inaccuracies in that record.

Nevertheless, with the exception of importing data into journaling tools, or exporting 'raw' data (often a non-trivial technical process), there appear few opportunities to personally curate one's data. Like much curation, these seem effortful processes. Therefore, curating data and changing its presentation was overwhelmingly system-driven. Features such as dashboards (Figure 4, p.98), records, achievements, 'recent activity' and graphs over time, offered participants different 'visual cuts' (Epstein et al., 2014) of their data. Yet, cases such as Lily extending the graph of her weight loss, to emphasise her past success, hint at the potential meaning gained in curating or editing at least the presentation of one's data. In broad terms, this attitude reflects Marshall's description of 'benign neglect', common to other digital possessions. Yet, the success of filters applied to selfies in apps like Instagram and Snapchat point to the way photographs can be tailored and ameliorated in a way that data currently cannot.

Mixed meanings of sharing

Finally, the analysis revealed occasions for the participants to find occasional meaning in sharing their data. In line with other studies, there were few examples of participants shared data on social media, and certainly not past data, perhaps as sites like Facebook tend to be 'in the now' (Harper et al., 2012). However, tracking did occasionally encompass shared experiences, such as a cycle ride (Ivan), birthday meal (Leanne) or honeymoon (Suzanne. In these cases, participants described *selectively* sharing their data with friends. In Ivan's case, historical data of a joint achievement was seen as a resource for both shared reminiscence, and to motivate doing something together again.

> *"I kind of thought it would be nice to say to him in five years' time, do you want to go out and do the Coast to Coast [cycle ride] again, and see if we can beat the record? And I can send him a graph or something."* (Ivan, Endomodo)

Ivan anticipates that having a record would be a hook for remembering their ride in the future, towards the practical aim of motivating the ride again.

Nonetheless, the prevailing feeling from participants was that one's own data was most likely quite uninteresting to anyone else. Some protested they were being boring at points in the interview, as they felt they were speaking about the most mundane concerns. For many, even if their data was public, it was so personal – *"because it's just me"* – that to share it with someone would be *"very selfish in that way" (Leanne, MFP).* Data by default reflects on oneself more than anyone else, and so perhaps demands a degree of humility or modesty, at least publicly.

4.5. Study One Summary

Returning to the original questions raised at the start of this chapter, there is clear evidence for the emergence of a quantified past. The findings here suggest we will increasingly encounter a quantified past through living a data-driven life – even if such a retrospective or long-term use is initially unintended or unanticipated. These new records can be meaningful to people in the way they show the changes in one's life over time; support reminiscence for special moments or periods of one's life; and represent 'work' and time invested in tracking. Such meaning may arise despite a lack of curation or shared tracking, through which further value could be accrued. Significantly, interacting with personal informatics data entails 'data-work' – to situate and contextualise one's data in a present narrative, accounting for this data in relation to one's everyday life and identity.

A broader discussion of these findings, and their implications for design, are set to one side for the moment, and will be considered hand-in-hand with the second fieldwork study, around the use of smart journal apps.

Chapter 5. Fieldwork Study Two: Smart Journals

5.1. Introduction

The first fieldwork study studied the accumulation of quantified data through self-tracking practices using personal informatics tools. The second fieldwork study identifies the emergence of a quantified past through the use of mobile diary taking applications termed 'smart journals' (Figure 6). Significantly, this explores self-tracking data in a context where multiple media have been brought together *with the express purpose* of documenting one's life. Keeping a written record of *personal life* – a diary or journal is one of the earliest personal 'technologies of memory'. The possibilities for diary keeping have clearly advanced with digital technology. Numerous applications have since emerged, across platforms and devices, on the premise of enhanced journaling to create a record of one's life. (N.b. Diaries and journals are synonymous. Mallon (1986) proposes that the terms 'diary' and 'journal' are *"hopelessly muddled"*. As such, I make an entirely semantic distinction between traditional written *diaries* and digital smart *journals*).

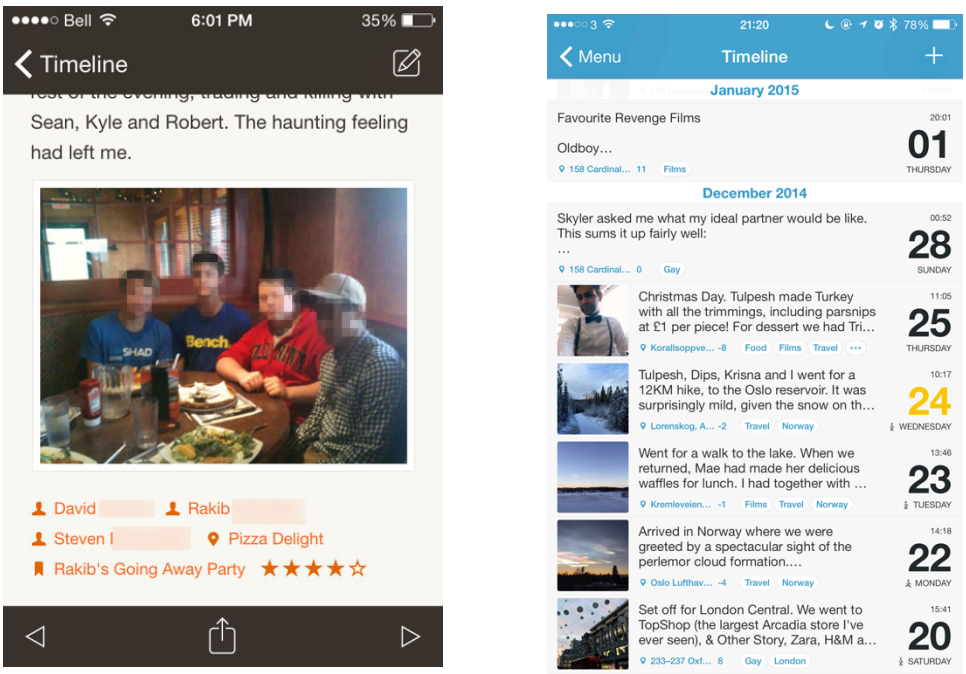


Figure 6: Screenshots from two popular smart journal apps: 'Momento' (left) and 'DayOne' (right)

These afford functionality that goes well beyond a written diary, which can be summarised with regards to four key features.

Firstly, ‘Smart journals’ (see Appendix D for further examples) are **networked (1) –** affording cloud storage, the sharing of journal content, and the drawing of content from other online services; particularly social media (e.g. *Facebook*, *Twitter*), but also, most notably for this thesis, self-tracking apps (e.g. *Moves*, *Fitbit*). As such, they support the seamless integration and curation of **multiple media (2)**, especially photos, from multiple sources, alongside written records.

For each entry, contextual **metadata (3)** can be created (e.g. timestamps, user-generated tags, GPS location and weather) either automatically, or manually by the user. This supports sophisticated search and organization of journal content, for example viewing entries related to a particular location, keyword or person.

Finally, smart journals act **autonomously (4),** in two ways. Firstly, they push the boundaries of authorship through the automatic import and generation of journal content from, for example, smartphone camera rolls and social media posts. These can then be later annotated or edited by the user. Secondly, they may also push notifications to encourage a user to interact with historical journal entries, based on context such as ‘a year ago today’ or revisiting a previous location.

The promised effect of this networked and near-automatic integration of a range of media is to facilitate a kind of total capture that *“makes remembering effortless” (Heyday).* Metadata and cloud storage bring organisation and order, to ensure that *“moments become treasures” (Flava).* The promise of automation is simply that “*keeping a diary has never been so easy” (Momento).* I will return to further explore the implications of these features through the rest of the chapter. First however, I turn to related work to emphasise the distinctive nature of smart journals as an emerging technology, and their position as a form of contemporary, everyday lifelogging.

5.2. Related Work

5.2.1. Diaries and Autobiographical Writing

There is a range of work in the humanities addressing diaries (Johnson, 2011; Kadar et al., 2006; Mallon, 1986). These books describe and deconstruct notable diaries and autobiographical writings throughout history, addressing matters of style and the great

personal significance of diary keeping. Critically, they also demonstrate a tremendous breadth in form: from online confessions to mundane chronicles, journeys of self-discovery to creative mumblings.

Mallon in particular identifies seven broad styles of diary-keeping, derived primarily from famous diaries and autobiographies. First, the **'chronicler'**, like Samuel Pepys - "*the idea of the diary as carrier of the private, the everyday, the intriguing, the sordid, the sublime, the boring - in short, a chronicle of everything"* (p.1). The **'traveler',** who records "*our own unique way of seeing places"* (p.42). The **'pilgrims'** - "*those who set out in their books to discover who they really are"* (p.75). The **'creators'** – *"have needed books in which to sketch and brainstorm, private pages on which invention's audacity can fly or fail"* (p.119). The **'apologists',** who "*have all felt the need not only to make history, but to write it as well - or at least to get their versions on record"* (p.167). The **'confessors'**, like Oscar Wilde who kept diaries "*in order to enter the wonderful secrets of my life"* (p.208). And lastly, the **'prisoners'**, for "*whom diaries are not simply habits; they are attempts to create life"* (p.251). Yet, despite these broad characterisations, notably, none of these works categorise or define diaries, journals or logs too zealously – rather they emphasise autobiographical writing as a diverse, and highly idiographic practice.

In 'Mediated Memories in the Digital Age', Jose van Dijck (2007) describes 'writing the self' as mediating memory by constructing *"continuity between past and present while keeping an eye on the future"* (p.57). van Dijck largely focuses upon blogging rather than journaling. Blogging, or 'web logging', is often autobiographical, however the practice has evolved considerably, and is now predominantly a means of broadcasting content, which seems quite distinct from the more personal diary or smart journal. Following up earlier work on web-based diaries (Sorapure, 2003), Sorapure (2015) remarks that many web based diary services have been discontinued, and describes the need for research to understand contemporary autobiographical writing. Hence, while diaries have served as primary historical sources, and subject to astute reflections of other authors, there is little empirical work that has addressed *diary-keepers themselves*, to understand the experience, practice and personal significance of this personal record, especially as they turn to new digital tools such as smart journals to document their lives.

5.2.2. Smart Journals as Contemporary Lifelogging

A cursory review of the marketing of smart journals quickly suggests their resonance with earlier lifelogging visions. Human memory, and especially memory for moments of one's life, are positioned as fallible and precious. The past is portrayed as a resource, in glowing terms; smart journals hence propose to capture your 'amazing' life story, your 'highlights' or 'best moments' and ensure they are never forgotten. Many smart journals emphasise the privacy and security of what are, ultimately, cloud based services. Smart journals seek to distinguish themselves in particular by their supposed ease of use; they can be carried with you everywhere after all. The automation of many aspects of capture makes it seem effortless to record one's life in great detail. This might be contrasted with the effort associated with keeping a written diary. The context provided by metadata within the app, social media accounts and activity data is presented as a means to capture 'everything', and hence, to 'never miss a moment'. Meanwhile, some apps emphasise smart journals as a way to manage one's vast digital memories, to gain a 'bigger picture'. Tending towards a self-tracking ethos, this presents opportunities for reflection, 'discovery', personal growth and 'insights'.

Together, these present arguments for the active recording of one's life – lifelogging – with a diversity of media. The work, lives and devices pioneered by Steve Mann and Jim Gemmell in the 'MyLifeBits' project can appear somewhat niche or extreme in their pursuit of 'total capture'. Smart journals however represent a remarkable condensing of the features and ethos of lifelogging, into a mainstream category of mobile apps. In this respect, smart journaling apps are a contemporary and, arguably, more everyday and mundane instantiation of lifelogging. Further, their extensive modes of capture present an opportunity to explore the meaning of different media in relation to the past, and especially the implications of combining multiple media together.

5.2.3. Smart Journals as Digital Possessions

In the way that they generate and incorporate digital traces, it is also helpful to contemplate smart journals as both digital possessions themselves, and a window onto other sites of digital ownership. Smart journals offer a way to make meaning from burgeoning digital possessions, through the construction, curation and collection of personal narratives (Gulotta et al., 2015; Lindley, 2013b; Watkins et al., 2015; Zhao and Lindley, 2014). With a degree of automation in the way they combine multiple media and

link disparate archives, Smart Journals resemble 'Curatorial Agents' (Gulotta et al., 2015). There can be tensions in this shared agency in remembering. Investigating the use of timelines as a framework for curation, Thiry et al. (2013) describe a delicate balance to structure reflection, without limiting an author's voice. Further, Lindley et al. (2013) highlights that when it comes to digital possessions *'place matters'* – different archives and online identities are often carefully and deliberately delineated. Smart journals offer a new way to create and interact with existing disparate archives, rooted in a historical human practice of diary keeping, and are hence a distinctive digital possession.

5.3. Aims and Rationale for Studying Smart Journals

As a contemporary mode of lifelogging, and window onto numerous sites of digital possession, smart journals offer another lens on the emergence of a quantified past. The first fieldwork study focused exclusively on personal informatics tools and their data as they have accumulated to document one's life, mostly by chance. This second study explores self-tracking data in a context where multiple media have been brought together *with the express purpose* of documenting one's life. Studying smart journals, along with the historical backdrop of diary keeping offers an account of the diverse and personal experiences and motivations for keeping and looking back on any such records. This provides a contemporary account of lifelogging as an everyday practice, and crucially, examples of *when it matters to remember the events of one's life in such detail*. Furthermore, smart journals bring into focus the pertinent issues surrounding curation, and the passive and automatic capture of data. Finally, there is an opportunity to consider the experiential qualities of remembering with quantified data, in relation to other digital possessions, like photographs, video and social media posts. As such, this study presents an opportunity to identify both resonance and dissonance between the experiential qualities and characteristics of a quantified past, and the everyday practices, motivations and values of recording one's life.

Pragmatically, while the study was open ended and exploratory, the study design was guided by the following questions about the use, value and design of smart journaling apps:

1) What are the practices and motivations for keeping a journal?
2) What are the particular affordances of smart journals, as a technology of memory?

3) How do smart journals leverage existing digital possessions and self-tracking towards remembering?
4) How do smart journals support the curation of digital possessions, and manage a shared agency in authorship?

Study Two hence provides a clearer understanding of *why* and *how* the records created as a quantified past might be meaningful to people

5.4. Study Design

Pursuing these aims above, I now outline the overall study design, detailing the methods, recruitment, procedure, analysis and ethics of the study.

5.4.1. Method

In keeping with the methodology previously set out (Chapter 3.4, p.75), semi-structured interviews were used to develop a phenomenological account of the practices and motivations in keeping a smart journal. However, while pursuing this enquiry, it was important to be mindful of the long history of autobiographical writing, seeing a continuum from hand-written paper diaries to journal apps on a smartphone, with varying media and automation. Furthermore, the oldest smart journals are only around five years old, yet this thesis is clearly interested in the long-term perspective of those who keep lifelong records. As such, while the focus of the study was on smart journals as a contemporary lifelogging technology, I also sought to speak to a small number of traditional diarists (5/16 participants). Rather than a comparative study, these interviews are seen as offering another lens on the practices and motivations of smart journaling, their younger cousin. In fact, most participants who used smart journals (7/11) had also kept paper diaries earlier in their lives.

5.4.2. Participant Recruitment

My initial investigations into the marketing and features of smart journals had produced a large collection of different smart journal apps of interest, based on their popularity, media coverage and range of features (Appendix D). This study sought to recruit a heterogeneous sample of diverse participants (particularly by age) who had used one or more of these apps. The apps varied greatly, particularly: by their focus on writing and manual input, versus automatic capture and curation; by their focus on imagery and video

versus text; and in the range of data and input feeds which the app could connect to and capture.

Name (Age)	App(s) Used	Frequency of Primary Record	Length of App/Diary Usage (Years)
Smart Journalers			
Tyler (20)	**Momento**	Daily	3
Alexis (21)	**Day One**, Memoir	Daily	2
Martin (27)	**Day One,** Momento	Several times daily	5
Shona (28)	**Day One**,	Weekly	1
Anil (30)	**Momento, Day One,**	Daily	5
Ness (33)	**HeyDay**, **Day One**, Momento	Daily	1.5 / 5
Aaron (36)	**Day One**, Momento	Daily	5
Jorge (38)	**Grid Diary**	Daily	2 months
Karen (38)	**Day One**	Daily (travel)	6 months
Michelle (45)	**Narrato**	Weekly	8 months*
Lisa (48)	**Day One**, Momento	Weekly	2
Diarists			
Emily (25)	Notebook	Annually	19
Laura (46)	Diary	Weekly	33
Audrey (66)	Notebook	Daily (travel)	47
Andrew (68)	**Annual Agenda,** Five-Year Diary	Daily	40
Diane (72)	Annual Agenda	Daily	50

Table 2: List of pseudonymous participants and their age (at time of interview); the applications and materials they have used to keep their smart journal or diary (primary/current applications in bold); The frequency with which they usually make entries; and the length of time they have kept those records. *All participants still maintained their smart journals or diaries except Michelle.

Participants were sought to sufficiently reflect this diversity and were recruited primarily through social media and word of mouth. For example, several of the older diarists were acquaintances of family, friends and colleagues known to keep a diary. In particular, the public social networking site Twitter was used to engage with user communities of a number of these apps and invited them to visit a website for the study, where they could

short survey of demographic details and journaling history (Appendix E.1). Following expressions of interest through the website, which were followed up via email, 11 users of six different smart journal apps were interviewed (Table 2, above).

The specific media inputs and features for each of these apps are shown in Table 3 below.

Inputs and Features		*Mobile Applications*					
		DayOne	**Momento**	**Grid Diary**	**Narrato**	**HeyDay**	**Memoir**
Writing	Diary	✓	✓	✓	✓		
	Annotation		✓			✓	✓
	Questions			✓			
Media	Photos	✓	✓	✓	✓	✓	✓
	Video	✓	✓		✓	✓	✓
Data Input	Location	✓	✓		✓	✓	✓
	Social Media		✓		✓	✓	✓
	Activity	✓	✓	✓	✓		
	Weather	✓		✓	✓	✓	
	Mood			✓	✓		
	Music	✓					
Curation	Search	✓	✓	✓		✓	✓
	Tagging	✓	✓			✓	✓
	Automated		✓			✓	✓

Table 3: Significant inputs and features of the six different smart journal applications used by participants.

Most participants lived in the UK (12/16), were long-term users, and in the case of smart journals, early-adopters. Others lived in Australia, the US, Canada and Belgium. The sample includes more Day One users than any other single app, (though it is a market leader, and one of the earliest smart journal apps). Many had transitioned between apps, and some used two apps together for a time. Participants also discussed other note-taking, self-tracking and photography apps and practices, but the interview focused on their primary journaling app(s) shown in bold in Table 2. Only Michelle no longer kept a journal. While other participants had given up on journaling at different times, this represents a potential limitation of the sample. As early-adopters, and continued users with an online presence, this sample perhaps over-represents those who found value in smart journal apps, rather than those who had lapsed or given up on smart journaling. Yet, these participants did frequently express frustrations and limitations in their journaling.

Further, the aims of this study are more oriented to the values of actively documenting one's life, and this sample provides significant diversity in this respect.

Most critically, participants were distinct in their backgrounds, life-stages and life experience: from students to professionals to retirees; new parents and homeowners; and immigrants to travellers.

5.4.3. Procedure

I conducted 16 semi-structured interviews (11 smart journalers/ 5 diary keepers) in total, each averaging around one hour in duration, (30-80 minutes). 13/16 of these took place as a video call over *Skype*; two other interviews were conducted as home visits; one took place on the University campus – per the convenience of the participants. Before each interview, I briefed participants on the study and interview according to an information sheet [Appendix E.2], which had been sent to them, along with a consent form, in a prior email. Following this briefing, and their signing of a consent form [Appendix E.3], participants were asked if they were happy to begin audio recording of the interview (over Skype, both video and audio were recorded).

The interviews for both diary keepers and smart journalers shared a similar schedule (see Appendix E.4), which I used to guide and structure the interview in four parts. The first two parts of the interview concerned participant's practices and motivations for keeping a journal. I then invited participants to look back through their journal and pick out any interesting examples. Lastly, we reflected together on the practice of journaling generally, and their intention for the future.

Interviews began with an open question, asking participants to 'tell me about your journal'. Participants were then asked about their practices and the way they used their diary or journal. They were asked how they kept a journal and what they sought to record; when they would create entries; when they would look back; what media and different features they had used. Having established these practices, the interview sought to reveal participant's motivations for journaling: how they had started and why; what they most valued and enjoyed about the practice; and why they would look back at past entries. An ongoing concern here was to identify the meaning people found in their journaling

practice, and the records themselves, in the course of their everyday lives – what does the remembering that their journals afford accomplish for them in the present?

Following this, participants were invited to look back in their journal, and pick out poignant or interesting examples. For those participants who rarely looked back, this was an unusual experience. One participant (Emily) preferred not to look back at all, while Michelle had deleted the app she had used, and did not have the records to hand. For others, they turned to examples that they had thought about or looked back at recently. Similar to the first fieldwork study, there was an element of freedom to this, as participants explored and remembered their past, often aloud, hence inviting a discursive approach. Importantly. Participants were being asked to make a choice about which parts of their journal to share with a researcher. Aside from preserving their privacy, perhaps avoiding delicate issues, for the most part participants were seeking entries that exemplified their practices and motivations or provided a personal flavour to their accounts. Looking back in this way also gave some participants pause for reflection, and the opportunity to reconsider how and why they kept a journal. Finally, this gave way to broader reflections on their journaling practice, its comparison with other records such as holiday photographs or social media posts.

The nature of semi-structured personal interviews afforded a freedom to explore these topics in a natural manner rather than an order constrained by the schedule. It is important to emphasise how personal and individual these interviews were. At many points participants took tangents to tell me personal stories, provide some wider context or discuss other related memory practices asides from journaling. In some cases, participants asserted their motivations up front, and these were discussed prior to their actual practices. Some participants referred to their journals throughout the interview, not only when directly prompted. The interview schedule however ensured all topics were covered with each participant. After the interview, participants were asked to provide representative screenshots of their journals, related to the course of the interview. Participants were given a £10 Amazon voucher for their time, debriefed (Appendix E.5), and given the opportunity to ask any questions about the study.

5.4.4. Analysis

I transcribed all of the interviews in full. As before, this transcription and the initial analyses took place concurrently to the recruitment and interviewing of further participants. This helped to ensure a diverse sample, and to explore emergent issues of interest. The transcripts were once again prepared for an IPA, as set out in section 4.3.4 and the analytic techniques also remained the same as Study One.

IPA was especially suited to this study, given the individual and personal character of journaling. It was quickly apparent that not only was the content of each journal quite different, and inherently personal, but that the reasons to keep a journal were equally personal. Once again, the experience of each participant, whether they kept a diary or smart journal, was analysed individually, before attempting to look across cases. Extensive vignettes were written for each participant as the initial analytic step, which summarised the themes emerging from each transcript, alongside extensive illustrative quotes. These vignettes were shared with Prof. David Kirk and Dr. Abigail Durrant to substantiate the interpretive analysis, and ascertain emergent themes and patterns in the data.

While each diary or journal was distinct, it was possible to look across the sample as a group and note what Wittgenstein (1953) might describe as ‘family resemblances’. There are numerous overlapping features to journaling, which when taken together, demonstrated broad dimensions of the practice. For example, between those who journaled every day, recording mundane events, and those who journaled only occasionally, but with a greater depth of feeling. There were clusters of participants whose practices could be seen to share commonalities, regardless of the format they used. In this respect, the diarists were rarely viewed comparatively to the smart journalers – each participant was viewed individually and then in relation to all of the others. And indeed, in cases where there was considerable commonality between a diarist and the use of a smart journal, this reinforced the sense of a continuum of practice, with varying degrees of technological sophistication. A selection of relevant cases are described in the findings thematically to demonstrate these commonalities.

Mapping these practices and values to smart journaling provides a contemporary reflection on lifelogging. Sellen and Whittaker (2010) originally turned to psychological

theory to develop a more nuanced vision for lifelogging design and applications. This study shared some of these aims, but sought to develop an account of the values and implications of lifelogging derived from the *practice of using smart journals*, as an everyday, contemporary mode of lifelogging

However, as a supplementary analysis, it was possible to look across all of the data – from diarists, to those with the most automated and technologically-driven smart journals – and consider the most telling affordances of smart journals. A number of participants used a journaling app like DayOne, much as they would use a diary. In other cases, however, features such as search and tagging, or passive tracking were vital to the way that they kept and used their journal.

This study also provided an opportunity to understand how different records were valued retrospectively. Many participants also recorded other aspects of their life, had kept diaries as teenagers, or had inherited and managed family archives. Some older diarists had remarkable records stretching back decades. I was particularly attentive to the ways and occasions when participants turned to their records as-a-resource-for-action (Harper et al., 2008). These analyses are reflected in the findings to follow.

5.4.5 Ethics

Although the study pursued different kinds of records, this study undertook all the same procedures as Study One, and an extension of the same ethics was followed. Once again, none of the journal or self-tracking data of participants was collected besides representative screenshots provided by participants after the interview. In each case, participants chose only a small number of journal entries to share with the researcher, and had complete control over how much of their diary and data they shared.

5.4.6. Limitations

The limitations of Study Two entail some of the same caveats as Study One. All bar one of the participants was still journaling or keeping a diary. It is known that many people lapse or give up on journaling. However, this study sought to find out what was meaningful to participants about these records, therefore those who continued journaling, and therefore found some meaning in doing so are the most relevant to this inquiry. Of course, this is once again only a snapshot of the meaning and practice at a particular time

in participants' lives. That said, this study presents a broad range of ages, life-stages and experience. As several participants were recruited online, particularly through their interaction on Twitter with smart journal apps, a broader, UK and worldwide demographic was achieved, however, it should be acknowledged that these likely represent the more active and engaged users of these apps. Once again though, these seemed like important people to speak to, and 'experts' in the field who clearly cared and held strong opinions about their journaling practice.

It is also important to note that the findings do not include any contextual analysis of the materials themselves, besides representative screenshots and photographs, and instead rely on what participants were able to and chose to reveal during the interview.

5.5 Findings

The findings present a selection of the analyses participants' experiences, to develop an account of different practices of journaling, and then the broader motivations and values that drive journaling. Lastly, I consider the distinctive values and affordances of passive tracking of data as part of a journal. The broader implications and design considerations that emerge from these findings are reported in the following section, in tandem with a discussion of the findings from Study One. I begin however, with a rich description of four diverse exemplars of diary and journal keeping.

5.5.1. Participant Vignettes

As in the first study, the following biographical vignettes both demonstrate the initial analytic step, and serve to illuminate the data and findings to follow by giving a sense of the participants as individuals, and highlighting the personal nature of keeping a journal. The four vignettes here have been chosen to illustrate the diversity of journaling practice, and ground the wide range of practices and motivations I will subsequently introduce. Further vignettes are included in Appendix F.

Diane, 72, (Diary)

Diane has kept a diary in simple agenda-style books for nearly 50 years. First inspired by an older friend, her diary is multi-purpose: as well as a note of what has happened, it acts as a daily planner, and contains phone numbers and bank details. She uses it to organise her everyday life, but in so doing organises her past. Her entries are only a few lines long,

and in older diaries some days have been missed out entirely, though this does not upset her. She sees these as very simple, everyday records – there is very little personal sentiment – yet they're *"so handy"*. She refers to them frequently to provide an account of what and particularly *when* things happened. In her words – "*just things"* – such as health issues, hanging out flower baskets, or a relative's death. Her diary is mostly scribbled notes, but includes scores from playing bridge, and old records of her sons' successful days in amateur golf. She moved house 25 years ago, and threw many of her earliest diaries away, which she greatly regrets – at the time they seemed like junk, of little interest to anyone but her. Now, while still central to organizing her daily affairs, they also give great pleasure, with simple questions turning into flights of fancy.

> *"I'm amazed when I look back, at some of the things that I read, I'll say fancy, fancy that, I'll shout to him [her husband], I don't think he's all that interested."*

Tyler, 20, (Momento)

Tyler, now a biology student, went on a memorable high school camp when he was aged 15:

> *"And then I got back, and I hadn't written down any of it. And just as the months went by it was like you remember less and less and less. And suddenly, like I remembered the people and I remembered the feelings, but I couldn't tell you what we did, the places that we went."*

On his next trip in 2010, he committed to keep a journal to remember these details, and has done so faithfully ever since, using the app Momento exclusively since 2012. Combining long, well written entries, a small number of photographs synced from Flickr, and occasional social media posts, Tyler is proud of his journal. Journaling for him is a virtue as well as a pleasure. Fundamentally, it gives him a sense of perspective on his life as he is maturing and experiencing new things during college. It is an account of, and testament to, life well lived.

> *"It just seems like all we have is memories, and if you can't remember it… it's like it didn't happen."*

Tyler makes extensive use of tagging in Momento, to mark people and events (e.g. finishing a book), creating a highly indexed, and searchable record. This is key to the very social and public use of his journal – to settle discussion, reminisce together and "*actually have the info."*

> *"I like pulling out my phone when people ask questions. 'When did we do this?' 'When did we meet?" When did we go to… What's the last time we saw a movie?"*

Tyler enjoys his writing; creatively and with humour. Photos and other data are all secondary to this expression, but they *"flesh it out like, this is an actual day, not like, a piece of writing that I did."*

Ness, 33, (HeyDay and Day One)

Ness is a new mother, who began using Day One to journal four years ago. However, since the recent birth of her daughter, and the launch of a photo and GPS-driven journaling app 'HeyDay', she now uses both apps, separately. Motivated in part by the premature loss of her own mother, HeyDay has become a solution to chronicling daily life and events of being a new parent. It is visually attractive, automatically producing montages of photos each day, captures her location, and is manageable to upkeep, annotate and share.

> *"I'm building it for my daughter, and for her to learn a little bit about the stuff that I'm forgetting on a daily basis, I'm forgetting the milestones and what we were doing as a family. So it's a way that I can help remember for her when she asks those crazy questions."*

By contrast, Day One – once a record of *"this is what I did this day, and this is how I'm feeling about something"* – is now exclusively for her personal reflections, which she writes around once a week. Her Day One journal rarely includes photos anymore, is much more "*freeform"* and has been "*stripped of any kind of structure"*, present in HeyDay. Hence, Ness has two different motivations to journal – to record her family's life, and express personal feelings. These motivations are so distinct, she even initially transferred her 'what-I-did-today' entries out of Day One into HeyDay. Day One is only rarely looked back upon, and is private. HeyDay is a regular point of familial reference, shared

in-situ with family and friends, and imagined as both a digital and potentially physical legacy for her daughter as she grows up.

Shona, 28, (Day One)

Shona has used Day One for 18 months, beginning as a New Year's resolution, evolving from her frequent habit of note-taking on her phone. Her practice in fact represents a quite common usage of the app, driven by this focus on writing. The app is set up to send reminders for her to journal monthly, and she does not write every day. Instead, she opens the app *"when I've got something that I want to say"*.

> *"When I started it, I wanted to use it as a way of not just writing, "Today I did this." […] It's usually things that have bothered me or something really nice I want to remember."*

She enjoys writing ("*I can write. It's one thing I can do.")* and will usually write long entries in a *"stream of thoughts"*, often during her commute home. These particularly give her own perspective on events – for example a '*behind-the-scenes'* reflection on her sister's wedding or her frustrations while buying a new house. In this respect, Shona sees something therapeutic in the way she journals: *"it's quite useful to record how you feel about something at the moment, and then I do look back at them and think, "It wasn't that bad."*

There are very few photos in her DayOne journal, although her life is captured visually in other applications like Instagram and Evernote. In part, she recognises that it is difficult to visually record negative events, and the journal is often quite reflective. Shona looks back through her journal occasionally, every one or two months, though often with a clear purpose or in an effort to "*balance things out a little bit"*. Fundamentally, she journals what she does not want to forget, the good and the bad, and imagines she will use and learn from this record in her future.

5.5.2. Practices of Journaling and Diary-Keeping

These vignettes help to illustrate the distinctly individual practice of keeping a journal or diary. This study revealed widely varying means and motivations; some participants journaled after more than one fashion; no two participants were the same. It is also an

evolving practice for most, involving lapses, changes in what and how they record – as their lives change. As such, these interviews necessarily represent a snapshot of a participant's journaling practices and motivations, which are unlikely to remain constant. Bearing this in mind, I now seek to describe examples of the range of overlapping and diverse practices which participants displayed. I first describe what, when, who and how journals are recorded, before practices specifically related to data and automated passive tracking.

What people record: Chronicles to personal expression

What participants sought to record ranged from **chronicling** quite mundane accounts – what-I-did, where-I-was and who-I-was-with – to deep and emotive **personal expression** of thoughts and feelings. Most participants had developed over time a sense of what was important for them to record – people they met, shared meals and new places and experiences were common topics. Not one expressed any specific rules about what they would or would not record, often emphasizing a *'*natural filter'. Some however did regularly record specific activities such as bridge or golf scores, books read or money spent.

Relatedly, some participants spoke of an urge to record smaller everyday pleasures. Though often mundane, they were felt to be important or pleasing to record precisely because they are often forgotten or overlooked. A common aim (prevalent in Mallon's descriptions) was to record one's **unique perspective** or impression of everyday life – *"It's just my history, isn't it? I'm not bothered that it's not terribly interesting." (Laura, Diary)*

For some, like Shona above, this meant recording more thoughts and feelings, rather than a 'today I did this' type of diary. However, this was a personal choice – others, like Diane, rarely recorded any emotion or feeling. Their diaries were not "*philosophical" (Anil, Momento/DayOne),* even during extreme moments such as a partner's serious illness – *"It's just because it's a record of things. It's no really got a feeling no." (Diane, Diary)*

By contrast, many described expressing thoughts and feelings in their journal as therapeutic. They aimed to record (exclusively by writing) as a means to vent frustrations, or resolve emotions. These interior and subjective thoughts could be related to the events

of the day but were often a wide-ranging stream of consciousness. Data, and photographs were notably less suitable for such emotive expressions. As such, this study reveals a strong distinction between daily, quick and often passive 'what-I-did-today' journals, and more infrequent, expressive and reflective ones.

Temporalities: When people record, and look back

It is a misconception that journals are kept daily – around half of the sample kept a journal **as and when** they could or they felt the need to. Those more committed to chronicling the everyday wrote **daily**, or at least passively tracked each day with a smart journal. Most participants recorded their journal at the end of the day, though some took any time they were alone, such as a train journey, or during children's swimming lessons. Those with automated journals described regular 'data cleaning' to regulate and curate this content, for example avoiding repetitions or triviality. Time pressures often determined journaling *as-and-when*, but it was also a deliberate choice to focus on key events when feeling that the day-to-day could often be too trivial or mundane to warrant a daily record. However, when entries were made, usually a few times a month, they would often be longer, and more thoughtful.

Some participants looked back on a daily or weekly basis, while others would look back very rarely, if ever. One participant Michelle no longer even had access to a journal she had kept in Narrato (the only participant no longer journaling). Common triggers to look back were to answer or settle some specific present concern; a desire to reminisce, perhaps revisiting somewhere; or else driven by apps presenting history from 'a year ago'. Inquiries frequently focused upon everyday concerns and about placing events in time – when did we buy that car? When did we first meet? How much did that holiday cost? These were some of the most social uses of a diary; Tyler even described, "*settling bets"* referring to his records of what he and his friends had been up to. Reminiscence might be provoked in social circles, but also individually through a sense of boredom and escape from the present, perhaps evoking a nostalgic mood. Aaron, who had especially extensive records, described looking through his archives as an *"adventure"*, which always yielded something new.

It was initially surprising that some of the participants rarely looked back. However, all participants experienced some present value from writing a diary, either as therapy, or a

satisfaction and virtue in recording. Here, the catharsis of writing the journal sometimes left little desire to reflect too soon. But, nonetheless they envisaged a much longer-term **future use** for their records.

Who: social and private journals

Journals were rarely solely private affairs. Journal entries were often consulted or shared in response to questions that arose, to achieve a settled account of the past, or to reminisce together and contrast each other's remembering of an event. Entries were shared in person – Karen shared her DayOne travel journal with her mother; or at a distance – Anil *(Momento, DayOne)* occasionally sent his friends screenshots or exported PDF files. Some participants related their journal keeping to a wider social role or interest as the family archivist and imagined their children at least cursorily reading their journal after they passed on. Through their own experience of family archives, Laura *(diary)* and Ness *(HeyDay)* felt a degree of responsibility to establish who they and their families were – and recognized how future generations can become interested in what, at the time, seems trivial and mundane.

How people record: Combining different media

Written words and photos were the dominant media in journals; they drove narratives and in smart journals were crafted to complement each other. Participants could be more expressive in a longer entry, but also carefully chose their best or most representative photos to include. HeyDay is a particularly photo-driven app, syncing to one's camera roll and creating a montage for each day. In this case, written text became more of an annotation. Similarly, Karen used Day One exclusively on holidays with her partner; short entries along with photos served as "*a quick way of looking through the highlights"*. Rather than physical photos, often stored apart, diarists occasionally included postcards *(Audrey)*, personal letters *(Laura),* or ephemera like concert tickets or sweet wrappers *(Emily)*.

Other (usually family) photo collections, physical or digital, were entirely separate. Journaling was often distinguished as being *"for myself" (Michelle)* in contrast to blogging or posting on social media that has another audience. Occasionally photos were taken specifically for the journal, for example of food, but usually photos were chosen from the many photos that were already taken and accumulated daily. Journaling is

therefore both an *authored* and *curatorial* process. Interestingly though, no participants described deleting any entries, and later editing of entries was limited to spelling errors.

There was a striking lack of video recording as part of a journal – despite many apps supporting this. Aaron described a specific collection of video journals or "*captain's logs"* from 2008 as the "*most fun thing to go and review"*. However, for him, the on-the-spot nature of the video camera and an implicit awareness of an audience tended towards performance rather than emotive reflection.

Data as context and authenticity

Automatically imported social media content seemed more interesting to participants as a historical artefact in itself – how one used to use Facebook – but was rarely an accurate record of one's everyday life, as many reflected how sanitized and curated it was. Likewise, no participants saw data, such as location, weather, music listening or step counts, as their prime means of remembering or creating record. However, this imported content was described as another layer to help them relive an experience. Others felt this contextualization enhanced the authenticity of a journal entry – making it seem more real.

> *"It helps kind of flesh it out like, this is an actual day, not like a… piece of writing that I did. So this is no longer a short story or exercise in writing, this is now an event that happened." (Tyler, Momento)*

Tyler's quote emphasises how the corroboration of data and social media records serve to make his writing appear more real, and documentary, rather than solely creative.

Passive and automatic journaling

Passively journaling required frequent 'data cleaning' on a daily or weekly basis. This might be to eliminate repetition from different data streams, correct any errors (e.g. automated false location check-ins), or to be selective about the photos included. Passive tracking acted then as something of a baseline, which could be achieved with little effort. Participants pursued synergistic approaches (Whittaker et al., 2012): well aware of the limitations of their automatic journal; important events would be written about at greater length. Three participants *(Anil, Ness and Aaron)* went so far as to use Day One

separately from their automated journals (Momento and HeyDay) to write longer, more reflective and personal entries. Alexis had tried a number of smart journal apps, and while seeing the appeal, struggled with their automation, which cluttered his journal and sought too strongly to *"determine what a memory is"*. Hence while participants clearly appreciate the potential convenience of automated journals, it is important that it remains an active, narrative practice.

5.5.3. Motivations for Journaling

Going beyond the practices of journaling, this study evidently speaks to lifelogging more generally, and the quite fundamental motivations people have to record their lives. In the analysis, four principal motivations for journaling were identified: ***accounting*** for one's life; pleasure in ***reminiscence***; the ***experience of writing*** and recording itself, and creating a ***legacy***. For some participants, these motivations were quite distinct, others journaled for multiple (and sometimes changing) reasons.

Accounting for one's life as lived

Records, especially those kept of everyday events, allow people to account for their lives. Participants described this in different ways: being able to *"keep track" (Ness)*; "*actually having the info" (Tyler)* to settle discussions; or simply *"I like to know what I was doing" (Anil)*. This motivation hence describes the value of having an accurate record of one's past activities and experience to refer to, in order to give accounts of oneself, in the past and present.

Such accounts are often valued for their present and practical use – in maintaining routines, learning from past experiences (e.g., house buying), medical histories (e.g., tracking hay fever symptoms), and recognizing change (e.g. the cost of holidays, fitness). However, for those who kept such records, there appeared to be a more fundamental value in knowing one's past – who I was, where I went, what I did. In the old and young, such records can give a sense and appreciation for a life well lived.

> "*It's not all my imagination, they actually did happen, because the strange thing about life is… it goes past very fast! It's really scary!" (Andrew, Diary).*

> *"There are parts of my life of which I have no recollection and if there aren't any journal entries at all it is just a gap." (Lisa, DayOne)*

Both these quotes express the unease that can arise with being unable to remember or account for periods of one's life. Participants with these motivations tended to value detailed chronicles of the everyday, which could be nonetheless very concise, or supported by other media. Andrew and Diana both used agenda-style diaries, with only a few lines of space for each day. For this reason, smart journals are clearly well suited to these motivations – easing daily recording, and supporting organization and search of one's journal in response to present concerns.

Yet more than simply *what* one did, accounting for one's life also means accounting for *who* one was - one's emotions, the way time passes and the way one changes or moves on.

> *"I think it helps to give a sense of connection to the past, connection to somebody who was past. If there is any sense of reflection it is that I as a person have moved on." (Lisa, DayOne).*

For Lisa, being unable to account for her past, means not knowing who she was before, and how she has changed. These can be important for her to understand who she is now, and how she will move on in the future.

Pleasure in reminiscence and capture

Some people derive great pleasure from reminiscing about the past, and journals obviously provide a means to do that. While there is a simple satisfaction to be gained from the accounts we mention above, the most 'fun' and emotive records were those that revealed a ***unique perspective*** or personal observation. More than an account in this case, people sought to record so that they could relive positive experiences and emotionally connect to them, as *their own* experiences. For this reason, the aesthetics of such records were important – writing tended to be more expressive and narrative, and photos were carefully and actively chosen to represent particular personal aesthetics.

> *I think when you look through Momento, I don't think you can really get a really good feel as to what you did that day or how you felt. Because the entries are not particularly personable. (Anil, Momento and Day One)*

The value of personal authorship and investment in one's journal seems of significance here. Thiry et al. (2013) and Petrelli et al. (2009) both make similar claims about the importance of active construction and creativity in producing mementos that are personally meaningful.

Pleasure was not only in reminiscence, but for some participants, there was a certain thrill or satisfaction from capture itself:

> *"I just had this urge to start recording my life, but recording seemingly insignificant moments, just recording moments, just to capture them, because I've often, often you can feel nostalgic about a moment as it's happening... not so much to revisit it, but to get a sense of closure a sense of satisfaction from you know, I've collected that moment, I've locked it in, and somehow it's not lost. Which is, you know, a false reality, because it is lost." (Alexis, DayOne and Memoir).*

Alexis seems to draw on the instantaneous capture in a smart journal as a way to try and slow life down, and gain a sense of appreciation for fleeting moments in his life. He may not revisit these moments, so it is all in the act of their capture, that he 'collects' it and attains a sense of closure. Others like Aaron, actively explored different media and modes of capture through their journaling. He described his video logs as those that give him the purest pleasure, but alongside extensive family records, including letters and dictaphone recordings, he feels a sense of *"adventure"* in exploring the past through different records, which he often browses without a particular intention or target.

Reflective experience of writing

Even if they rarely or never looked back upon their journal, some said the motivation for journaling is the experience of writing itself, and the peace this brings them. Many described the therapy and catharsis they have found in the moment of writing, as a means to deal with emotions.

> *"My father was very ill and then died, so obviously I did a lot of writing about his diagnosis with cancer, and how we looked after him, and his death and his funeral […] after he died, I went back and read quite a lot of it, and in a way, I found it quite comforting." (Laura, Diary)*

Others described a sense of focus through writing and regular reflection – *"forcing me to think about the things that matter" (Jorge, GridDiary).* In Jorge's case, a question-based diary helped prompt his reflection in specific directions. Writing a journal was frequently discussed in contrast with more public writing via a blog or on social media. Journaling was found to afford an alternative private outlet to write, either in a therapeutic or creative sense, and a sense of liberation in not writing for any audience but oneself.

> *"Because it was about more than just text, it was kind of a nice toy to play with, and I could write things privately for myself." (Michelle, Narrato)*

For some, this more emotive experience of writing then precluded the kind of casual or frequent reference to journals made by those simply keeping a daily record. Emily, who kept infrequent, at least annual, updates as a kind of personal check-up had never yet looked back at previous entries.

> *"I like the idea that in my old age I'll look at it but I'm not looking at it now…I'm curious but I think it would be too cringy." (Emily, Diary)*

Emily is unusual in not looking back at her journal at all. However, as a lifetime project, with the aim of taking stock at key moments in her life as she has grown up, looking back is not yet meaningful, or necessary. Rather, by never looking back, she can maintain a record, while writing freely and looking to the future.

Legacy

Divergent attitudes were expressed about the legacy of journals. All participants bar one took steps to look after and ensure the preservation of their journals – creating back-ups and storing them carefully. Those who had significant family archives said they had a

clearer impression of the legacy they were creating – even if they kept their journal private. Others strongly doubted that anyone would be interested to read their journals – and saw it as an activity above all for their own interest. The preservation and organization of journals, especially for diary keepers was something for one's *"dotage"*, always a far-off future, even for Audrey, herself retired.

Nevertheless, while awareness of the possible extent of one's legacy varied, it is not clear that this impacted how study participants actually journaled. Only Ness described concretely how she wanted to use HeyDay to curate highlights to share with her daughter as she grew up. A more common attitude was an urge to capture important experiences in the moment, and the possible but unarticulated need for them in the future. It was from this perspective, and in light of a developing record, that participants expressed pride and a sense of virtue in journaling as a good habit. None of our participants could be said to be creating a journal solely to leave a legacy. They were doing it primarily for *themselves;* because they wanted to account for their life; they enjoyed remembering their life or felt they benefited from writing and reflecting on their life.

These descriptions together present a broad picture of how and why participants kept different records of their life. Before considering the implications of this in terms of the thesis, it is worth reflecting briefly on the particular affordances of smart journals as a new assemblage of technology, and passive tracking as a whole, in relation to record keeping.

5.5.4. Particular affordances of smart journals

As a technology and in practice, smart journals appear distinctive from traditional written diaries in three significant ways. Most significantly, they support the seamless integration of photos with a journal, and benefit from a tradition of snapshot photography whereby people regularly capture and communicate the everyday with photographs (Chalfen, 1987; Sarvas and Frohlich, 2011). None of the diary-keepers we spoke to included photos with their diaries – visual and written records were kept separate. Curiously the ability to import from a smartphone 'camera roll' even supported the retrospective creation of journal entries – adding memorable photos to the journal, annotating with what could be remembered about that day or event. This retrospection is implicitly supported by the

existing accumulation and organisation of photos in a timeline, which may then be elevated to inclusion in the journal. Diary-keepers gave no such examples of writing retrospectively in this way.

Secondly, as digital content, smart journals have strong search functions. Along with tagging functions that can index entries around categories (e.g. people, a place, food, etc.), this makes navigating and *checking* one's journal far more expedient. Diary keepers journaled chronologically, and may have separate books for each year, but little structured organisation beyond this. When Diane was asked by an old colleague about when a bank robbery they had witnessed together took place, she had to set aside time to look through her diaries and locate this event, working from her memory of other big events at the time, like moving home.

> *"He said 'when was it?' […] I said 'oh Gordon, I'll be able to look it back' but I said you'll need to give me the time. And I had to try and think, we were not long, up in this house because I had to phone home and say I'm no gonna be home…I just had to look through two or three years, because I had to think back ... And I had to try and work out my age, how long I've been retired, when I worked at Methyl because I was just there whatever, so many years and then I was back at Leven and then I was Anstruther.*" *(Diane, Diary)*

By contrast, smart journals are much more 'to-hand' – on a ubiquitous smart phone – this referential search and power (and contextual reminders) makes them easier to reference, especially in-situ in social situations.

> *"I like pulling out my phone when people ask questions. 'When did we do this?' 'When did we meet?" When did we go to…? What's was the last time we saw a movie?' '…When was the last time you finished a book?' 'What movie have you watched lately? What do you enjoy? I like the searchability, especially with the tags. So I can say… yeh, we met on that day." (Tyler, Momento)*

Further, smart journals are clearly distinctive in the way they create records passively – whether by importing context, such as location or weather, or content from social media or activity feeds. This blurs the boundaries of authorship and curation, but as noted, this

data appears well placed to support practices of *chronicling* the everyday, and motivations to account for one's life.

The value of these kind of passively generated records varied. Part of the promise of using technology to record one's life is the ability to easily chronicle the mundane and everyday in detail. However, participants were divided on whether such details could provide valued context to burnish and brighten a fuzzy memory; or whether their accumulation represented triviality and clutter that detract from the whole. Participants did broadly offer two values for passively recorded content (e.g. location, time stamps, weather, steps, social media), which was generally positioned as context to the central content (text and/or a photo). The first follows a common conception of more data, bringing more detail and 'more' or 'better' memory. Optimistically, the context is a means to sensitise oneself, or a further cue to a deeper experience of remembering.

> *But for me, when I'm trying to relive the kind of emotional, you know when you're looking back and you're trying to connect to that moment. I think the things like the GPS tagging and what the weather was like, they really add value and they kind of help, I guess they help with the memory to try and bring it back? (Anil, Momento and DayOne)*

Despite these sentiments however**, no participants gave concrete examples of this**, or displayed this sort of enhanced remembering as they reflected on entries during the interview.

A second, more evident value was not that it helped one remember more clearly, but that data lent some further authenticity to the account – where writing and photos were accompanied with another record, or helped situate the account in a particular time and place. In this respect, this digital 'ephemera' might fulfil the role of '*representing today'* that Petrelli et al. (2009) found in the preservation of credit card bills and newspaper articles. Although Andrew kept a hand-written diary, this too included quantitative data, relating to steps and calories. These numbers, and other references like the price of a bottle of wine, work to situate the other more central content, which is likely more narrative driven. As Tyler says:

"This is no longer a short story or exercise in writing, this is now an event that happened." (Tyler, Momento)

Location, time stamps, and social media streams were the most prevalent of this kind of data. By themselves, social media accounts tended to be too censored and curated to meaningfully reflect daily habits or personal feelings. Such accounts were instead reflective of one's behaviour and character in that particular media – showing the way one's public identities have changed. Tyler's remark suggests however that in context alongside something he had written, it becomes a mark of authenticity.

5.5.5. Summary

These findings develop a picture to show how keeping a record of one's life can become a meaningful activity, and suggests implications about the new interfaces to these records afforded by smart journals. Journaling is clearly a distinct and personal activity – no two journals were the same – but there are resemblances from which practices and motivations for keeping and returning to a record of one's life can be understood. A selection of these experiences have been represented here. Perhaps of most interest, are findings that suggest that smart journals, supported by the passive accumulation of daily content, particularly photos, currently best support a practice of 'chronicling' the everyday, especially related to desires to 'account for one's life'. Further, search and tagging features can be leveraged in doing this accounting socially and semi-publicly. Much of the content captured automatically by smart journals may be less valuable, less personal and less emotive. The data or social media posts may fail to show one's 'unique perspective', in the way a written 'stream of consciousness', or 'captains log' style video might. In the concluding part of this chapter, I discuss these together with the findings from Study One, to consider a broader design perspective for remembering a data-driven life.

5.6 Fieldwork Discussion and Design Reflections

Chapters 4 and 5 described two empirical studies, which identified emergent instances of a quantified past through long-term use of personal informatics tools, and the development of smart journaling apps.

These idiographic findings describe many examples of personal experiences in relation to remembering with personal data. It is now opportune to look more generally, and interpret these findings holistically, in light of the core research questions, with a view to the design opportunities to be explored in the final design-led study in Chapter 7.

First, this concerns the experience of remembering a data driven life, and more specifically, the experiential qualities of a 'quantified past'. In particular, this analysis offers resources for subsequent design-led work; it provides a basis to work with the quantified past as a particular way of mediating remembering.

Second, I recognise the values expressed around quantified data and its role as a meaningful digital possession, to inform a design perspective. In particular, I reflect on the way in which data is constructed into *personal accounts* (Section 4.4.3 from Study One), and its particular value in *accounting for one's life* (Section 5.5.3 from Study Two).

5.6.1 Experiential Qualities of a Quantified Past

Working with heterogeneous samples, participants in both studies reflected and remembered with many different types of data in different contexts. Nonetheless, there are common threads that sketch a set of distinctive experiential qualities of a quantified past, which relate to its materiality, and experience.

Passive, Third-Party Recording

Many of the devices and apps that generate a quantified past work passively; they are always on in the background and require minimal user input. A quantified record of one's life is achieved largely by a third party, usually a wearable device, smartphone or sensor. Even those applications like MyFitnessPal, which require users to enter their food intake manually, include processes and transformations, which limit and mediate what can be recorded and how it is stored and categorised. There is a clear contrast here with point-and-shoot cameras, written journals, or a treasured souvenir, where what is recorded is

usually deliberately chosen, framed and directed. The kind of records generated bear closer resemblance to the automated photos of the Microsoft SenseCam.

But while SenseCam was designed as a technology of memory, Study One makes clear that long-term records generated by personal informatics tools are most often a by-product of their everyday use. Personal informatics are rarely designed or intended for nostalgia, and data is rarely personally curated for posterity. As a result, the quantified past is a mix of the very mundane and the occasionally meaningful. The extent that such records reflected their histories and activities was a surprise to some participants. In the case of journal keeping, a passive, third-party record could provide authenticity to other media, to witness rather than narrate events.

Quantitative and objective

Clearly, a quantified past is overwhelmingly quantitative; both as a raw measurement, and often in its presentation (e.g. GPS co-ordinates are usually represented on a map, laden with other qualitative symbols). Data is frequently attributed to certain categories or labels, and used to reach different 'objective' qualitative judgments (e.g. how healthily you eat, or how well you sleep).

Recorded by a third-party, personal informatics data also gains the appearance of objectivity, however this requires negotiation to make sense of the data in relation to one's everyday life. Notably, self-tracking tools employ quite a definite tone - they rarely err on the side of caution, or present any degree of uncertainty. They propose to measure exactly and accurately. It is '8,773 steps' rather than 'around 9000'. Seen in contrast to our own reconstructive (and oft-construed as fallible) remembering, it is unsurprising that study participants experienced a tension remembering with data that depicts the past so quantitatively, definitively and objectively.

Removed from the past-as-remembered

Given all this, a quantified past seems quite different and removed from the past-as-remembered and experienced. Whereas cameras (whether they are automatic and wearable or otherwise) simulate what we see, and written or spoken words might capture how we think, the data captured and represented by personal informatics is often far removed from how we experience and remember events. The manner that these tools

sense is not what people sense or feel. Running is not experienced or remembered as a graph of speed over time, but as scenery flashing by, wind in one's face, pain in one's chest. Good or bad sleep is not experienced in percentage terms.

Furthermore, self-tracking tools also depict the past in far greater specificity than usually remembered. They gather precise (not necessarily accurate) details and facts about everyday life: exactly when you left the house; how long you slept for; precisely how far you walked to work. These largely factual and mundane details are not usually experienced at the time, often overlooked or even unobservable. They are the sorts of details that are rarely remembered in the course of things. As such, personal informatics present a more formal and definitive version of the past, than the past that people flexibly and constructively remember. The data-work described in Section 4.4.3. demonstrates participants grappling with this tension.

There is some nuance here however; some participants in Study One found that their data actually lacked details too. None of the smart journaling participants relied only on self-tracking data to record their lives - it was only a baseline. Perhaps this is indicative of the mismatch between machine and human memory I hint at above – though uncannily precise and detailed, they are not details, which necessarily matter to people. It recalls Bartlett's (1932) claim that most '*literal recall is extraordinarily unimportant'* in peoples' everyday affairs. A fundamental question is to understand when and how such unnaturally precise and mundane details might become meaningful to people.

Ego-centric

The data produced by personal informatics tools appears to be particularly ego-centric, and focused on individuals. The data recorded is largely about one's own body, the bodies of those closest to you, or one's immediate environments. These devices are recording you and your actions directly. Data tends by default to be captured as a 'selfie'. By contrast, cameras, diaries, and mementos tend to record your perspective and thoughts on a world that is shared. Furthermore, the intentionality with which cameras, social media and diaries are used to record includes an awareness of a potential audience, even if that is only one's future self. Personal informatics tools enact no such discretion.

> *"[The data is] really about one part of my life. Photos can get so much more... because it's not just a friend or something... it's always somewhere they've been, or if you're just by yourself or if it's a landscape." (Tanya, Nike +)*

Participants in Study One hence shared the sense that their data was intensely personal, however rather than concerns for privacy, they suggested that they rarely shared their data with others because they doubted people would be interested. In some cases, smart journals, more actively shaped and recorded could be more socially oriented. Tyler had his friends in mind as he noted details of their activities. But it was these written entries or photographs that were much more frequently shared than any data.

Abstraction, Reduction and Commensuration

A consequence of always on, third party recording is the production of masses of data about parts of people's lives which would rarely ordinarily be recorded and would take a lifetime to review. Automatic wearable cameras such as the Narrative Clip attempt to overcome this with algorithms that automatically search and filter for images it believes will be most interesting to the user. For quantitative data - after the activity recognition that transforms the 'raw' data into a meaningful unit such as a 'step' – people's days and activities are presented in necessarily reduced and abstract forms to make the data legible. Daily summaries, graphs, averages and records, all work to package and present data in a manageable form, towards context-specific aims such as - "am I getting enough exercise?" - "is our baby sleeping better?"

Usually, this sort of commensuration is designed to motivate or diagnose, rather than reminisce. However, this same commensuration can result in a tension, as in Peter's case below, with one's own perceived fading memory becoming '*irrelevant bases for judgment'* (Espeland and Stevens, 1998).

> *"A couple of years ago, a ride is just numbers, whereas a few weeks ago, a ride is numbers and your memory of what was happening on that particular…"* (Peter, Strava)

The way that personal informatics reduces and abstracts lived experience clearly has the potential to mediate how those experiences are remembered. Large periods of time can be

represented in single figures or graphs such as Lily's weight loss (e.g. Figure 5). As described in the findings, photographs often literally capture moments of one's life, while curated together in albums they can also represent the period of a holiday or one's childhood. However, personal informatics data relies on summaries and abstractions to render masses of data meaningful and actionable. These operations are a key part of such products, which advertise the self-knowledge and insight to be achieved through the overview and commensuration of diverse aspects of one's life.

Polymorphous

It might seem contradictory to highlight that a Quantified Past is both unnaturally detailed, and yet also subject to processes of abstraction, reduction and commensuration. Rather, this highlights how easily personal informatics data can take multiple forms and representations.

Odom goes as far to describe virtual possessions in general as characteristically *formless* – easily reproduced, reformed and remixed in different contexts (Odom et al., 2014). Photos, for example: can be printed out in different contexts; can appear on Facebook; can be a thumbnail photo; can be digitally manipulated; and indeed, all of these things at once. However, it might be argued that some virtual possessions are more fluid and malleable than others. In all the previous examples, a photo remains recognizably a photo, usually very literally representing a moment in the world.

Self-tracking data seems more polymorphous. We can recognize our data doubles as many different graphs, charts and infographics. These themselves are subject to many possible transformations – Lupton also emphasizes that as new data is added, or data from different sources is increasingly combined, entirely new perspectives can be gained (Lupton, 2014a). Increasingly these can be connected and represented in non-numerical ways through platforms like IFTTT[22] or more critically in projects such as Armitage's 'ghostcar' (2012). Alongside visions of an 'Internet of Things', is the prospect of semi-autonomous devices, which act on the basis of historical data. These too might make aspects of one's past legible in intriguing but potentially challenging ways.

[22] www.ifttt.com

Within memory studies literature, has highlighted a 'connective turn' – distinguishing digital memories by their accessibility, visibility and mobility. This characterization appears especially apt for a polymorphous quantified past. The role of designing with data is about the terms upon the many diverse ways in which it might be materialised.

These experiential qualities are not intended to be exhaustive, but begin to reflect the materiality of personal informatics data, and the distinctive experience of remembering with this data, particularly in relation to other forms of personal media and records. These will provide a basis for the concluding design-led study, which seeks to both deepen and validate the interpretative steps of these empirical studies. Before this however, I will address the common values found for a quantified past, and use these to present a broader design perspective.

5.6.2. Accounting for One's Life with Quantified Data

Both studies highlighted a variety of relationships to one's historical data, but share a common thread; participants used their data to *make accounts of their everyday lives*. The primary value of any historical data, like other objects, was related to its power and relevance in relating an individual's past to their present. Returning to Middleton and Brown, this is closest to their articulation of memory as providing continuity, linking moments and experience in one's life together. I will go on to propose that reorienting the design and use of quantified data around this purpose, is quite distinct from the current paradigm of personal informatics that privileges the objective and explanatory power of data as a model for behaviour change.

The previous analysis of 'data-work' makes clear the subjective work required to make sense of and relate personal experience to a quantified past. Data cannot provide an account of this experience in and of itself, and this account is constructed and situated. Data-work means seeking verisimilitude, usually through contextualisation and negotiation with the data. Beyond instances of reminiscence, data stood out as most meaningful to participants when it could be appropriated to a larger sense of self (Wright and McCarthy, 2004) and made accountable to lived experience. Participants translated their data from numbers and graphs on a screen, to deeply personal stories about becoming a father, moving to a new country or teenage fandom. The data in these cases relates to: important life events; changes in one's life; an expression of identity; or

perhaps an elusive detail. This rendering of quantitative to qualitative is akin to what Davis (2013) has identified as the 'Qualified Self' when she remarks "*narratives and subjective interpretations are the mechanisms by which data morphs into selves".* All of the interviews in both studies revealed just such narratives and subjective interpretations throughout, in order to construct accounts.

This notion of making accounts was transparent in the second study too. While Study Two noted that some diary-keepers and journalers rarely looked back at their records, those who did, did so largely because their diary and journal entries *served them in some way in the present*. For many participants, their lifelogging offered a way to *account for one's life.* This was particularly the case for those who chronicled the day-to-day.

Some participants turned back to their diaries specifically to settle accounts of the past, finding satisfaction in having a record to refer to, and crucially being able to place different remembered events in time. However, this is more than just externalizing one's memory; these accounts seemed more broadly tied to *"keeping track",* especially as one's life changed; and to gaining a sense of a life well lived. Here we find an epistemic concern with keeping a record of one's life – a reality check for 'did-it-happen' (and particularly for *when* things happened). As we have seen, philosopher Henri Bergson (in Middleton and Brown, 2005) describes the past in terms such as a 'mass' and 'indivisible flow'. Middleton and Brown's concept of 'punctualisation' expresses how certain events, objects and places can become an anchor or conduit through which we can 'cut into' and experience this mass of the past. Accounting for one's life seems related. By a variety of means, journals gave participants a number of anchor points through which they could grapple and access otherwise elusive histories.

More than this, journal entries that presented a unique perspective were especially valued in accounting for one's life: as Laura said – *"It's just my history, isn't it? I'm not bothered that it's not terribly interesting."* However, as her own views, and uniquely hers, however mundane, they are of interest *to her,* and perhaps her family. Consider tourists in front of the Eiffel Tower making their own copy of a photo many millions of others have already taken. Beyond photography, Mallon (1986) describes the urge to write a travel journal as an occasional desire to say "*this is what I, rather than the Nikon saw".* This thesis asks rather than the Nikon, what might the Fitbit or the Nest thermostat see? And given that –

"we all have the certainty of our own unique way of seeing places, a sense that the camera can be too objective a recorder of our trips away from home" (p.42) – how might people achieve a unique perspective through data?

5.6.3. Towards a Design Perspective for Making Accounts with Data

To restate then: Study One demonstrated the interpretive work required for people to *make accounts* of their data. Study Two highlighted a strong motivation to keep a variety of records in an effort to *account for one's life*, in a personal way. What does this then mean for the ambitions of this thesis to consider design for the experience of remembering a data-driven life?

The way in which participants made their historical data accountable to the past-as-remembered resonated strongly with Harper's notion of the *"past as a place one ventures into"* (2008, p.278). The past was not merely recalled, repeated and passed down from a veridical record; it was appropriated and reconstructed from the many different traces of the past their data and journals offered. Maps, timestamps, key dates, records and graphs were all resources, which became available to aid, structure and cue situated remembering, focused on the *present* story they were trying to tell.

Participants sought to achieve verisimilitude in relation to their records, but what 'truth' data represented appeared decidedly up for debate for each individual. There is an important implication here: ***personal informatics tools alone cannot produce verisimilar accounts of real life.*** For them to be meaningful, the data must be contextualised, and made accountable to one's lived experience.

This suggests that in designing for experiences of remembering, a techno-centric view – and a drive for simply more or 'better' data – can only ever take us so far. Instead, design should focus *on* ***supporting people in the doing of this data-work*** that contextualises their data and makes it accountable. This means that rather than designing data as objectively truthful, powerful, meaningful and insightful in and of itself, instead effort should be focused to support people in subjectively making sense of their data, and recognising opportunities to use data to account for their lives. Rather than simply trying to persuade, or to support 'checking up' as many current data-driven tools do, their design

might empower people in questioning, trusting, twisting, talking about and sharing data as it becomes entangled in their everyday lives.

While this might seem a radical turn, it can be seen as a further articulation of a more 'lived' informatics (Rooksby et al., 2014). It also resonates with a great deal of previous work on technologies of memory, which in various ways has called for supporting storytelling and meaning making (e.g. Harper et al., 2008; Petrelli et al., 2009; van den Hoven, 2014). Local Meetups of Quantified Self groups themselves are arranged as '*Show and Tell'* sessions, emphasising each individual's story. Yet it seems evident that the long-term quantitative records participants in Study One have accumulated are rarely designed with this in mind. Still, findings across both studies suggest that tools recording, measuring and representing everyday life can, and do, offer far more than only scientific assessments of habits and health.

Likewise, this perspective also offers a key insight for interaction designers considering what it means to design an *interface to the record* as it expands with digital possessions. A current trend in engendering interactions with our accumulated media is to simply evoke annual nostalgia (e.g. Facebook's 'On This Day'[23]) in the hope of eliciting some kind of serendipitous reminiscence. Clearly though, this can fall short – instead provoking anger and even grief in users (Meyer, 2015). The diverse motivations for keeping and returning to a record of one's life shown by participants in Study Two, clearly go beyond a desire for reminiscence. Indeed, it is striking how frequently sites like Facebook encourage spontaneous interaction with historical posts on the site, and yet it remains challenging to actively search through one's past interactions. More specifically then, design for remembering a data-driven life should not only support data-work per say; but should support people in orienting to and capturing quantified data when it has something to say, and can meaningfully account for their lives in some way; by providing a unique perspective, or offering authenticity to other accounts.

In the final section of this thesis, I turn to speculative design approaches, to explore this in a material, design-led way.

[23] https://newsroom.fb.com/news/2015/03/introducing-on-this-day-a-new-way-to-look-back-at-photos-and-memories-on-facebook/

Chapter 6. Speculative Enactments

From the outset, this thesis has sought to maintain a strong orientation to questions of design, grounded by empirical fieldwork. While Chapters 4 and 5 inquire about the emergence of a quantified past *as is*, Chapters 6 and 7 extend this inquiry towards *new* kinds of experience and design for a data-driven life. These chapters hence pursue a series of design considerations (RQ2), and adopt design-led methods to do so. This chapter addresses this methodological turn to design, and particularly the subsequent use speculative methods in Chapter 7.

6.1 Research through Design

Within HCI, there has been a growing recognition of the value of doing research *about* design, by *doing* design. Frayling (1993) provides a foundation: first in recognising the common ground between the practices of artist, designer and researcher; and most famously, in articulating 'Research *through* art and design'. Specifically, Frayling describes three activities as examples of Research through Design (RtD): 1) research as a form of material exploration; 2) research as development work – "*to do something no one had considered before"* with some technology; and 3) 'action research', where the design process from conception to materialisation is recorded and reported. In all cases, communication – being able to tell someone about the research – is an essential feature. Frayling, and subsequently others within HCI (Bowers, 2012; Pierce, 2014) acknowledge that certain knowledge is always embodied in design artefacts – the various outcomes of design research. However, as *research* artefacts, these do not speak for themselves, and require articulation: whether this is a single caption at a gallery show, an annotated portfolio (Bowers, 2012; Gaver, 2011) or a conference paper. To this end, Pierce (2014) further identifies at least three broad categories of design research artefacts and advocates different modes for their presentation: operational prototypes; conceptual and material design studies; and design proposals.

Framings such as these clearly describe the practice and published work of many design researchers working in the field of HCI and conferences such as the 'Design Research Society' (DRS) and Research Through Design (RTD) conferences. RtD or alternatively 'constructive design research' (Koskinen et al., 2011) has since been the subject of much reflection, debate and efforts towards formalisation [e.g. Zimmerman et al., (2007, 2010);

Koskinen et al. (2011); Gaver (2012); Sas et al. (2014); Pierce (2014); Pierce et al. (2015)]. New conferences (Durrant et al., 2015) and pictorial publishing formats (Blevis et al., 2015) have emerged to provide better ways to account for and communicate this kind of work. There are hence wide-ranging and ongoing debates about the integration of design-led research methods in a field such as HCI; particularly regarding to the extent to which design research should conform to follow methodological standards, produce theory and be extensible or even verifiable (Zimmerman, 2010). This thesis makes a modest contribution to such debates by seeking to create opportunities for empirical study alongside design and practice-led research.

The RtD approach in this thesis pursues several ends. Fundamentally, RtD offers a mode of generative inquiry: to do developmental work; to look beyond what currently exists, and to consider new roles and configurations of data-driven services than have been considered before. Further, there is the opportunity to practically work and play with the 'quantified past' *as a material* for design. Finally, Pierce (2014) describes the way design artefacts and verbal articulation can function together as a hybrid, to co-articulate each other (p.736) as 'concept-things'. In such a way, the generation of design artefacts and their articulation here serve to shift a 'quantified past' from its initial concept, to something more "thingly", allowing for a potentially broader range of interpretations and applications.

The design-led work presented in Chapter 7 is carefully informed by and seeks to extend specific threads of the previous empirical work. Given this, participant engagements with this design work draw from the same methodological commitments offered in Chapter 3 – reflecting an attention to idiographic, personal experience with data-driven tools and services. However, the real challenge of this design-led work is to look forward, and tackle the tension at the heart of my thesis. I am investigating a phenomenon that is only beginning to emerge. Anticipating vast future records, and the evolving nature of digital possessions, the core interests of this thesis are essentially anticipatory. Fieldwork of current practice or the brief deployment of current technology may struggle to reflect this anticipatory orientation. Research question1D was crafted to reflect these very tensions:

RQ1D: How can empirical research be undertaken for anticipated phenomena - such as remembering a data-driven life?

Fortunately, within design, and increasingly HCI, there are a gamut of traditions and approaches, huddled under an umbrella of 'speculative design' (e.g. Bleecker, 2009; Cook, 1999; Dunne and Raby, 2013), which offer means to provoke and inquire about different futures. Herein, I will set out a novel methodological approach that draws on these speculative traditions to respond to RQ1D, and lay the groundwork for the concluding design-led study in Chapter 7.

6.2. Speculative Approaches in HCI

It is worth acknowledging that HCI as a whole is already a future-oriented field with a pragmatic drive to discern and shape preferable futures of technology use in everyday life. 'Envisioning' possible futures – through a mixture of fiction, forecasting, imagining and extrapolating – has been a central concern for HCI research (Blythe, 2014; Dourish and Bell, 2014; Kaye and Dourish, 2014; Reeves, 2012).

However, speculative design research goes beyond envisioning as prototyping (Dahlbäck et al., 1993) or scenario building (Carroll, 1995) and instead relies on imagination and fiction to develop critical dialogues and discourse about new, alternative and future paradigms of technology use. The 1960's Italian Radical Design movement (see Bürdek, 2005), Archigram's hypothetical architectural projects, Cook (1999) the humour of chindōgu (Kawakami, 1995) through to Dunne and Raby's Critical and Speculative Design (Dunne, 1999; Dunne and Raby, 2001; 2013) all demonstrate a broadly critical and design-led lineage to this field.

Speculative approaches in HCI have hence been employed in multiple ways. Perhaps most often as *critique* of current paradigms or common assumptions in technology design, (e.g. Blythe et al. (2015); Blythe et al. (2016); Buttrick et al. (2014); Dalton et al. (2016); Lawson et al. (2017); (Lindley, 2015); Linehan et al., (2014) ; Near Future Laboratory, (2014) – and especially in opposition to perceived technological 'solutionism' Morozov (2013). Speculative methods can also be a way of exploring a specific, anticipated, 'upstream' technology, such as tracking tools for pets (Lawson et al., 2015); IoT devices which communicate only with each other (Wakkary et al., 2017); or gestural interfaces (Nova et al., 2013) . Lastly, they might try to open new fertile areas for future research: (Hauser et al., 2014) urge consideration of long-term sustainability; (Pierce and DiSalvo, 2017) seek to expose various network anxieties in relation to IoT; Blythe et al.

(2015) produce Design Fiction for 'positive aging'. The speculative work in this thesis tends towards the latter cases, of investigating upstream technologies, and identifying rich areas for future research.

This selection of work exemplifies speculation as both a mode of RtD; and as a form of provocation that can used in different contexts to *"create a discursive space"* (Lindley and Coulton, 2015). Bleecker's 'Design Fiction' (2009) in particular has come to typify this approach of *"making things that tell stories"*. Here, speculative design work is undertaken to produce and present artefacts and materials (or 'diegetic prototypes'), which communicate a wider story-world (or 'diegesis'), and are embedded with its values. Design Fiction at its best, allows the designer to tell stories through their own design practice, to create a compelling story-world, which is both provocative and open to interpretation, hence generating valuable discourse about what kind of futures are preferable, and how to design towards them.

6.3. Towards Experiential Futures

Such provocation, and the discourse it creates often seeks a broad impact, and wide audience - a way of commanding the attention of, for example, policy makers, research councils, industry partners, communities or other publics. The use of films, catalogues and other promotional formats (e.g. Brown et al., 2016; Near Future Laboratory, 2014) reflects these efforts to attract broader public engagement.

However, the aims and research questions in this thesis are geared towards individual experience. Beyond a provocation to imagine alternatives, my inquiry here endeavours to use speculative methods to give participants the opportunity to consider and make meaning from the way data could document their lives. One approach in this case might have been to produce a series of speculative design proposals around data-driven technologies of memory, and present these as provocations for broad consideration. However, in keeping with the idiographic, and experience-centred roots of this work, I want to pursue speculative inquiry that actively engages individuals in a kind of anticipatory experience, and hence offers a path to extend and reflect on my prior empirical work.

Some foundations for this ambition can be found in the work of futurists Candy and Dunagan. In a series of papers and exhibitions (Candy, 2010; Candy and Dunagan, 2017) they broadly propose a practice of 'Experiential Futures' to *"engage people more viscerally in futures conversation"*. Specifically, they identify the significant challenge of discussing the future, which remains abstract from experience, and always at a distance. Instead, they propose speculative work should attempt to:

> *"...bridge the experiential gulf between inherently abstract notions of possible futures, and life as it is apprehended, felt, embedded and embodied in the present and on the ground."* (Candy and Dunagan, 2017, p.137)

Yet, although such language clearly resonates with the experiential turn in HCI (Wright and McCarthy, 2006) and its attention to 'lived experience', I want to argue now that current speculative methods at work in HCI tend to fall short in bridging this gulf. From here, I will then introduce a novel approach of 'Speculative Enactments' which seek to address these shortcomings, and underpins the approach ultimately taken in Chapter 7.

6.4. Engaging Participants in Speculation

There are clearly many speculative approaches in HCI that do seek to involve audiences and participants more directly. Primarily, there are methods that engage participants with fictions or scenarios, of varying fidelity. Notable examples include Mancini et al.'s (2010) 'Contravision' – short films showing dystopian and utopian futures of a technology; Vines et al.' 'Questionable Concepts' (2012) - provocative design proposals presented as part of participatory design workshop; or Lawson et al.'s (2015) fictional quantified pets websites used in focus groups with pet owners and animal behaviour experts. Of course, 'Wizard-of-Oz' prototypes (Dahlbäck, 1993) might be considered an earlier example of this tradition. These all clearly generate discourse and commentary that offers insights into people's values and orientations to new technologies. Further, Wong et al. (Wong and Mulligan, 2016) and (Dalton et al., 2016) demonstrate analyses of broader public discourses emerging from fictional product concept videos and online science fiction stories as they occur 'in-the-wild'. Yet, Reeves (2012) and Sterling (2010) both note a vital caveat in all futures work; however sophisticated, any envisioning necessarily reflects our *present* concerns projected onto visions of the future.

6.4.1. Design Fiction

Lindley et al. propose to stretch this temporal boundary however, through the concept of 'anticipatory ethnography' (Lindley J. et al., 2014, 2015) – primarily the study of an audience's engagement with Design Fiction. Lindley J. et al. (2015) contest that good design fiction (giving the example of the Spike Jonze movie *Her)* can "*situate the audience vicariously within the world of the film"* and as such they may "*harbor the knowledge necessary to glean ethnographic insights".* Practically speaking, what is proposed is an 'afterglow' interview method, or larger scale audience analysis (e.g. (Quirk et al., 2008)) having watched the film.

What this seems to suggest is that one can somehow skip ahead of time, and become vicarious participants in the futures represented. While the medium of film is a powerful tool for world-building, and the audiences might empathize strongly with characters and experiences in the film, the familiar real-world experience the audience have (the experience I seek to study) remains that of watching a film. Much of the prior knowledge they bring to that experience is likely of watching other films. They are necessarily one step removed, always an audience to a fiction, rather than a participant in it.

6.4.2. User Enactments

An alternative approach to researching anticipatory experiences, User Enactments (UE), is offered by Odom et al. (2012c, 2014b). Proposed as a *'fieldwork for the future'*, this invites participants into a fiction of a kind, and requires *"users to enact scenarios in which they get glimpses of several potential futures and to use their own experiences to critically make sense of what they encountered"* (Odom et al., 2012c, p.346). These encounters bear some resemblance to high-fidelity Wizard-of-Oz (Dahlbäck, 1993) or more scripted experience prototyping (Buchenau and Suri, 2000). Props, dialogue and staging are very intentionally designed, in a lab setting, for carefully scripted encounters between participants, researchers, confederates and technologies. For example, in one user enactment, a 'smart home' proposes schedule changes in order to accommodate an unexpected school run. Participants must suspend disbelief about the scenarios and technologies presented to them, and experience several 'what if?' or 'what would you do now?' encounters in the environment.

In some ways, UE allow the participant to interact with a carefully developed, but unresolved Design Fiction. However, the scripting used to probe particular values perhaps limits the participant's role and freedom in co-constructing the fiction. Further, the lab setting (however disguised) and the rapid shift between multiple potential futures, risks breaking the suspension of disbelief, upon which the method partially relies. There is a suspicion here that the experience of participants is primarily one of playing along – they are exploring different roles and situations, but with limited real-world implications to their actions. Like Lindley's 'Anticipatory Ethnography', this is fieldwork for how-people-react-to-and-talk-about futures – rather than analogies to their experience of these futures. UE and Design Fiction remain powerful generative methods. However, the essence of my critique here is that we could be more ambitious in how participants can become meaningfully involved with speculation, and in Candy's terms (Candy and Dunagan, 2017), utilize the whole *"continuum of human experience"*.

6.4.3. Material Speculation

In some contrast to these approaches that rely on fiction, and suspension of disbelief, Wakkary et al. (2015) identify their speculative work as 'Material Speculation'. The authors argue for actual, functioning artefacts, occupying space in the everyday world or participants, as a way to establish a *'perceptual bridge'* (Auger, 2013) between audience and fiction. With a clear lineage to Critical Design (Dunne and Raby, 1999) design artefacts such as Pierce's inaccessible Obscura 1C camera (Pierce and Paulos, 2015) or Selby's Photobox (Odom et al., 2012b) are described as *counterfactual artefacts*, which deviate sharply from familiar technologies. Over long periods of time participants are hence forced to speculate, reason and make sense of the actual presence of such artefacts in their lives. Wakkary et al. (2015) argue that these counterfactuals force participants to reason about the *possible* worlds in which such artefacts would make sense; in what kind of world does an inaccessible camera seem plausible or even preferable? Hence, such interaction with these technologies in real-world contexts is viewed as generative of speculation on behalf of participants and researchers. While undoubtedly these artefacts frame lived experience as the object of study – and this experience is one of bridging present and possible worlds – the approach still relies on the actual and independent functioning of an artefact. There are practical limits about what kind of artefacts can be made and deployed like this. Indeed, much speculative work aims to explore a design space without the overhead of making and deploying functional technologies.

6.4.4. Performative Speculation

Moving away from the demands of a functioning technology, HCI also has a rich history of performative work (see Spence et al. (2013) for a review) that can be used to widen the terms of participant engagement and experience. Most notable perhaps, is the collaboration between performance artists Blast Theory' and the Mixed Reality Lab at Nottingham University. Creating carefully staged and immersive performance art, they describe research that is '*in the wild in the sense that [it] engages "real" users with emerging technologies in "real" settings under demanding conditions of actual use'* (Benford et al., 2013, p.14). Mixed reality games such as '*Uncle Roy'* (Benford et al., 2004) or '*Can You See Me Now?'* (Benford et al., 2006) compose multiple trajectories of experience for public and participants around novel configurations of technology. These performances are compelling for participants because they are encouraged to act and make choices, which they can see to have meaningful outcomes. They do not simply observe a performance, but take part in it.

Nonetheless, these tend to rely on participants (often members of the public) trust in the experience, setting aside of scepticism, and also being unsighted as to what might happen next. This sort of immersive theatre adds compelling drama and suspense to the experience, but one where the participant is often in a reactive mode; they might not be able to add to or construct elements of the story-world in which they are taken through. User Enactments (Odom et al., 2012c) are similar in this regard – participants have to rapidly respond to different scenarios, such as a smart home intervening to rearrange the school run. This carefully refined scripting is advantageous for empirical study, as it encourages probing particular values and responses. However, it can diminish the range of actions available to the participant and their stake in the overall narrative of the experience that they are being led through. An obvious strength of the approach is in pushing the limits of technology like GPS by deploying it in such ways. However, once again, the practical challenges, resources and expertise required in successfully staging such performances should not be understated. There is therefore a distinction to be made here between approaches that rely on fiction and imagination – where the design artefacts are speculative – and those which actively deploy existing technology, in speculative ways.

6.4.5. Summary of Critique

All of these approaches highlight the challenges in bridging the *'experiential gulf'* (Candy and Dunagan, 2017*)* when engaging participants in speculation. This thesis seeks to make a precise methodological contribution by going further to generate meaningful and personal experiences for participants, as part of a speculative inquiry, and in so doing, create a site for empirical research of anticipated phenomena - such as a data-driven life.

The critique above does offer some anchor points to take this forward. The aim is to harness the speculative and design-led approach of producing Design Fiction artefacts, but to be able to 'deploy' these in an engaging way in the real world and in so doing bridge the 'experiential gulf'. User Enactments highlights how the careful design of settings and scenarios can probe particular values and research questions. Material Speculation show how individuals can appropriate speculative artefacts, to co-construct a story-world in the context of their own lives, rather than following or playing along with a grander, more dramatic narrative. Performative approaches such as Blast Theory's work emphasises how giving participants the opportunity to take actions amidst speculative circumstances can create a heightened visceral experience. This opportunity to act in a meaningful way shifts their role from one of passive audience member to active participant; from abstract observation, to lived experience.

Herein, I will introduce 'Speculative Enactments' - a methodological approach which seeks to bring these qualities together. The roots of Speculative Enactments derive from a collaborative project that I led, undertaken alongside the research presented in this thesis. This project – Metadating – is now presented as an exemplar and case study of the Speculative Enactments approach. Reflecting on the success of this approach, it was then adopted and refined for the design-led study in Chapter 7.

6.5. Metadating: A Speculative Enactment

Metadating was a collaborative project which I led alongside colleagues David Chatting, Bettina Nissen, Andrew Garbett and John Vines at (what was then) Culture Lab, Newcastle University. The project began with informal discussions in the summer of 2014, working collaboratively towards a one-off event in December 2014. The project sought to explore a mutual interest in how quantified data relates to identity, and in particular how people would rehearse and perform identities around their data with

others. What follows is a summary of the main methodological points of the project: a more exhaustive account and the findings have been published in Elsden et al. (2016).

6.5.1. Anticipated Phenomena

Primarily, we wanted to hear people talk *about* and *with* their data: to make jokes with it, to brag about it, to disavow it or defend it. We understood these everyday social interactions with data likely to exist, and likely to become more common, but felt they were challenging to engage in a research context in the wild. This is effectively a near-future, and anticipated phenomenon. We turned to speculative methods. Recognising the practice of dating as a concentrated site of identity work, and with the success of many online dating sites, we speculated about a service for *dating-with-data.* This kind of speculation raises questions about what kind of data would be attractive? How would people embellish data on a date; or use it to check someone out? What would and wouldn't people want to share? Importantly, these questions all clearly pertained to our original interests in data, discourse and identity.

6.5.2. Enacting Speculation

This speculation could be taken in several directions. Actually, developing a functioning dating website with quantified data was too great a practical and ethical challenge for our team. We also considered designing diegetic prototypes – perhaps speculative dating profiles, an advert or short film – as parts of a Design Fiction, which we might use to generate dialogue around data and identity. However, this seemed too abstract and removed from our particular interest in talk and discourse around data.

Instead, we chose to run a speed-dating event, where participants would be asked to 'date with data'. Crucially, this put live social interaction with data at the heart of our study, alongside a *consequential* and hopefully heart-racing experience. Metadating was promoted as a singles' dating and future-oriented research event. Ultimately, 11 [7M, 4F] single participants were invited to *'explore the romance of personal data'*. After expressing their interest through a website, participants were posted a personal and semi-formal invite that included a blank 'data profile' to be crafted by hand in the week prior. Printing on high-quality card, and delivery by post, helped raise anticipation and communicate the seriousness of the speculation – that this would ultimately be a real event.

These data profiles (Figure 7) worked as a form of cultural probe (Gaver et al., 1999) to sensitise participants, but also became the key functioning artefacts at the event. Consisting of three A5 pages, the profiles had one ‘my self’ page of structured biographical details. This first page mimicked common dating websites and profiles by eliciting personal details with a quantified twist (e.g. walking pace, heart rate, the furthest distance travelled from home, number of listens to favourite songs). The other two pages were simply titled ‘my data’, and provided a range of empty graphs, tables and visualisations. The profile invited participants to fill out these empty graphs to statistically represent any aspect of their life they wished to. In this way, the profile was carefully designed both to clearly communicate the premise of the speculation (providing some suggestions for possible data to capture) yet it was also open to broad interpretation. As a hand-drawn profile, participants had complete freedom over the data they chose to record, and how accurately, and honestly, they chose to represent it. Participants found themselves in dialogue with our speculation, and subsequently would have to account for this engagement (or lack thereof) on each date.

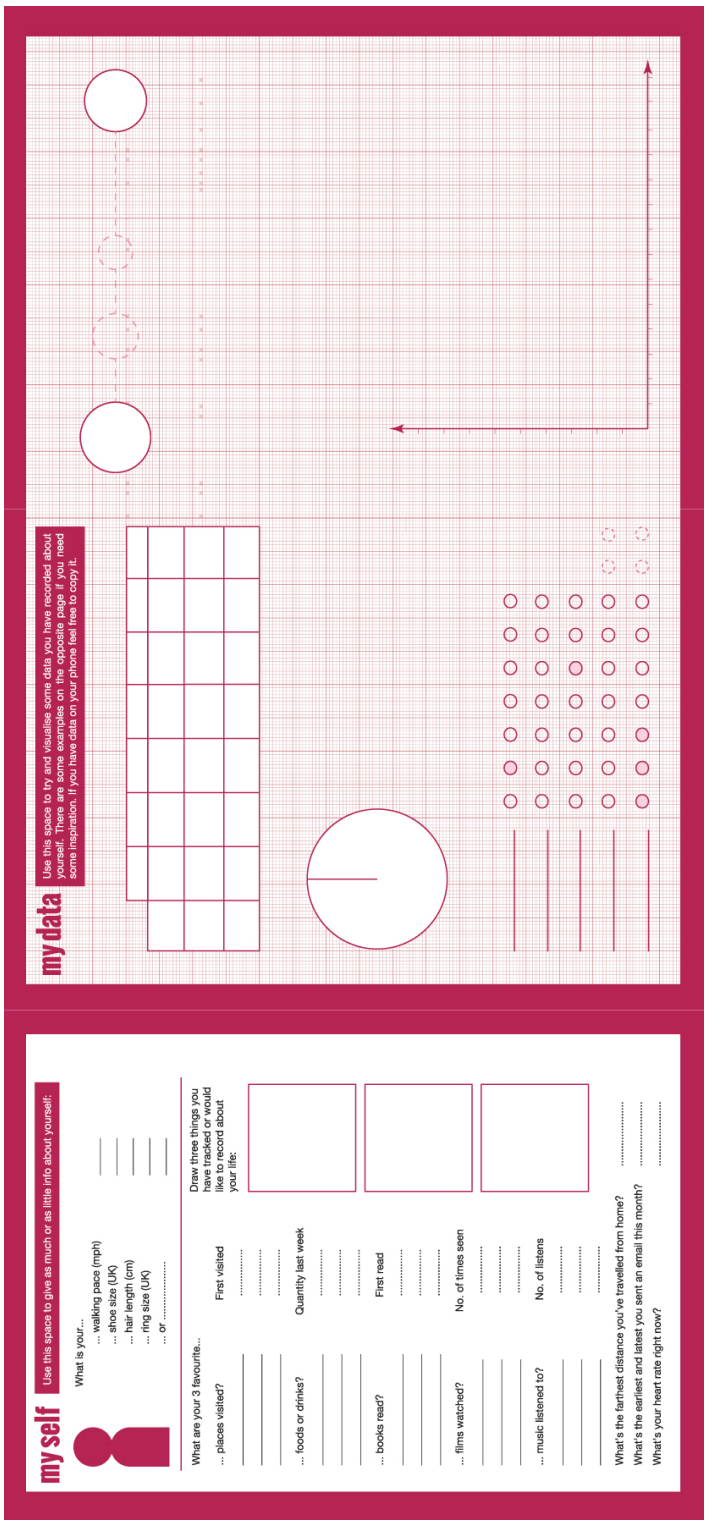


Figure 7: Blank 3-page Metadating profile posted to participants ahead of the event.

On a Saturday evening guests were greeted with wine on arrival to a softly lit performance space on our campus. Metadating was principally a dating event from the perspective of attendees. First, a mixed activity involved sharing first impressions of others' data profiles. Next, 28 four-minute speed-dates took place (Figure 8). The dates had no set structure, besides our suggestion to swap their data profiles at the start of each date. 24 of the dates were audio recorded (after one recorder failed).

Figure 8: Couples speed-dating with their data profiles.

Choosing data to represent oneself in an appropriate light for this event required significant personal investment and identity work. Our participants were largely quite deliberate in how they went about this. Importantly, they could relate to the dating context and had prior experience of it. The success of the Metadating event turned on the candidness of participants on their dates. Something was really at stake in the context of the date to give a good impression of one's self; these were, after all, real speed dates. This immediate reality, grounded the wider speculation at play. Underscoring the authenticity of the dates, one couple that met during the event began (and at time of writing I believe continue) a long-term relationship.

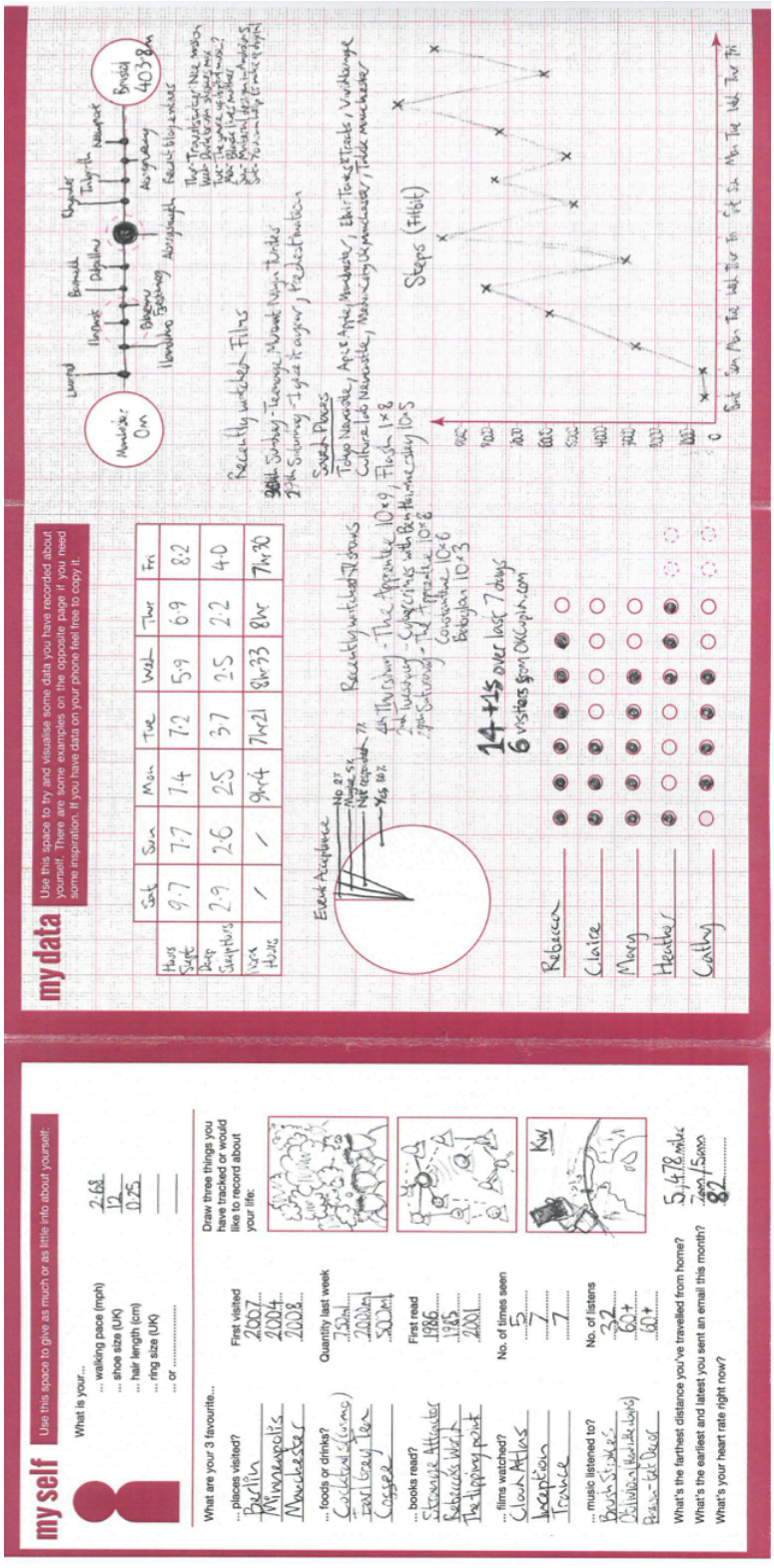


Figure 9: Sample data profile completed by a participant.

6.5.3. Analysing Metadating

The event was a great success. Participants data profiles (Figure 9) showed great creativity and diversity of data. Metadating briefly, and intensely, brought to life a range of possible human relationships to data, which otherwise we could only speculate about. As research, all of the dates, discussions and eight further follow-up interviews were audio-recorded. Copies of each data profile were preserved. Ultimately, this corpus seems much richer data than the opinions, or ideas which might have emerged from an interview about the concept, or the dialogue around Design Fiction artefacts. The social reality and liveness of the event invites an ethnographic and particularly a discursive analysis of the way participants played with identity and data. A full account of the findings have been published in Elsden et al. (2016). Therefore, while the project was clearly speculative (we never created, nor intended to develop, a functioning Metadating service or application) such a future could be briefly enacted and made real for 11 participants on one evening.

6.5.4. Methodological Reflections

We reflected subsequently about what made this 'work' – as an event, and in producing a rich corpus of data. A key feature that emerges is the consequential nature of the dates; something was really at stake for participants engaging in the speculation. On the night itself, this felt real. Further, they had considerable freedom to act amidst the speculation, particularly in relation to how they interpreted and appropriated their data profiles on their dates. For this reason, it was our participants who elaborated the resulting narrative, dialogue, and 'content' of Metadating. Our role as design researchers was mainly *to create a set of circumstances* where such speculation was anchored in a familiar and relatable activity (speed dating) with meaning for the participants beyond simply taking part in research. This not only produces richer research data, but this 'content' now constitutes a 'story-world' for the Metadating speculation. The profiles, and snippets of the dates could now be presented as a kind of co-constructed Design Fiction (Bleecker, 2009).

To recap: 1) We began with an interest in an anticipated, hard to reach, phenomenon concerning data, identity and discourse. 2) We developed a speculation about 'dating with data' which was both provocative, but most of all created a crucible to explore this anticipated phenomenon. 3) We designed a way to 'enact' this speculation with individual

participants in a consequential and meaningful way. 4) We analysed participants' interactions and visceral experience with familiar qualitative HCI methods. Such interactions are of interest in of themselves. However, their real value lies in the extent to which they might be considered analogous to the anticipated phenomena that prompted the investigation. This should be the subject of quite careful, measured and reflexive interpretation.

To be clear, the aim of Speculative Enactments is not to skip ahead and deliver experiences from the future. Instead, the core proposition is that we can design performative contexts to experience, which we might reasonably find analogous to some aspects of an anticipated future. In this case, the live experience of Metadating engages participants in a way that allows us to reasonably speculate about the experience and design of a world where quantified data is more prevalent and woven into people's identity.

6.6. Chapter Summary

Metadating, a collaborative project that I led, provides the template for the methodological approach taken in my final design-led study. Without relying on functioning technological artefacts, we were able to do genuinely speculative work, which drew elements of performance, to generate the circumstances for a visceral participant experience. The aspiration is that this experience brings forth a deeper understanding of the anticipated phenomena we were interested to begin with.

This chapter began by extolling the prevalence and virtues of Research through Design as an HCI method. The work on the part of the designer/researcher in this case was to carefully design the data profiles and settings for the Metadating event, which sensitised and created the occasion for participants to act amidst speculation. The event transformed the unusual and potentially abstract notion of dating with data, into an actionable, even everyday, experience. However, the main attention of our analysis was on the social interactions that were recorded, rather than the overall design process. In this regard, Chapter 7 will extend the template of Speculative Enactments set out here, by engaging in a longer, more generative design process, and explicitly consider the broader design of a speculative service, punctuated with empirical data collection.

Through a critique of existing speculative methods, and the Metadating case study that provides the blueprint for ‘Speculative Enactments’ we are surely getting closer to answering RQ1D. More immediately however, these methodological reflections have developed the language and framing necessary for me to introduce the iterative design process and rationale for the final design-led study in Chapter 7. Through that chapter, and in the discussion of the thesis as a whole, I will then return to consolidate understanding about how Speculative Enactments work to bring anticipated phenomena into empirical focus.

Chapter 7: A Quantified Wedding

7.1. Introduction

I concluded the fieldwork section in Chapter 5 by setting out the case for a broad design perspective based on making accounts with data:

> *"…design for remembering a data-driven life should not only support data-work per say; but support people in orienting to and capturing quantified data when it has something to say, and can meaningfully account for their lives in some way; by providing a unique perspective, or offering authenticity to other accounts."*
> (Section 5.6.3, p.156)

My final study sought to explore this perspective by adopting the generative and speculative design-led approach I outlined in Chapter 6. To do so, I turned to an already rich context for technologies of memory: contemporary weddings.

7.1.1. First Steps: Developing Design Briefs

The choice of this context emerged initially from a short workshop organised with both of my advisors, and four other colleagues with an interest in quantified data. In a three-hour session, I gave a broad introduction to the findings and design perspectives from Study One and Study Two, with the intention of communicating the 'quantified past' as a design space. Printing out many aspects of my findings and attaching these along several walls as a 'gallery', I conducted this introduction as a walk-and-talk. Inviting my colleagues to use any aspects of these findings as inspiration, I then asked them to work in pairs and respond by drafting 2-3 short 'design briefs' that I might use to guide my speculative exploration of this space. I encouraged my colleagues to give their briefs a title, some context, and outline any particular constraints or specific points of interest for the brief.

Short design briefs were valued here for three reasons. They offer a developed, but constrained expression of a design consideration or opportunity; they are easily shared, communicated and edited; they can be a means to direct a subsequent design process.

Many ideas emerged from this process, 13 briefs were proposed and discussed. These included services to package personal data after death, ambient experiences of historical data in the home, and data that could only be viewed sometime after its capture. I took the most complete and coherent of these briefs away, and formalised and edited them for clarity and relevance. These briefs were also given keywords to sum up the research interests they probed, and some consideration was given to the kind of speculative and design fiction work that might be appropriate for each brief. After consideration, and further discussion one brief emerged as a particularly compelling context – weddings. The final brief I composed is shown below:

A Quantified Wedding

Wedding's are frequently conceived of as the best day of one's life, the biggest party you will ever have. As such, they have become carefully staged and recorded and one of the most memorable events. An official photographer and videographer is hired, and a unique physical album curated. Special books are signed by attendees. Dresses are kept, honorifically as a legacy of the event, in the attic. An official registry is signed. Disposable cameras are often distributed amongst guests, in addition to the photos and videos they take and share with their smart phones.

Weddings, and the rituals that surround them, can be increasingly recorded through personal informatics tools. In one case, a man recorded and later presented his heart-rate monitor data while proposing to his girlfriend (she said yes).

As an intrepid wedding planner and photographer, **design a premium 'Happy Quantified Couple' wedding package, to 'know thyselves' and mark the big day.**

Pay particular attention to moments that need to be captured, and how to make this data feel personal and unique.

Keywords:
Capturing experience, legacy, emotion, shared remembering, curation, event, unique perspective, projective remembering

Possible Design Fictions:
Catalogue, presentation at wedding show, performance

Figure 10: Original Quantified Wedding design brief.

7.1.2. Rationale

This brief was initially compelling as a provocative but plausible and easily understandable concept. Technologies of memory are a well-established part of wedding cultures. In an interview study around technology use and contemporary 'Western' weddings, Massimi et al. (2014) describe the multiple roles performed by documenting a wedding. A variety of records are used, for example: to assert the 'magic' of the day after the event; acknowledge those who were there; to personalise the wedding; and to create easily encountered reminders of the day. Although weddings are somewhat unique and one-off events in a person's life, attending and remembering weddings is a practically universal experience. The brief draws on these traditions, and considers how quantified data might compare and become situated within them.

This context also brings into view multiple threads from the fieldwork. Primarily, weddings are occasions where remembering matters. They are events that people deliberately seek to account for in diverse ways. Couples and families anticipate the need to remember and detail what happened at a wedding over generations, with multiple audiences in mind. As weddings often become a venue for a couple to express their new identities, records of the day tend to reflect the innately personal and unique nature of the day. Wedding records are also deeply social, shared at the very least between a couple, and usually much more widely. This brief hence raises questions about the ways data might be made social, challenging the ego-centric nature of personal informatics.

The various records of the day are often carefully curated and edited. First professionally, and then through ongoing social practices in which particular photographs and mementos are marked out and become part of the 'organised settings' (Bartlett, 1932) which structure remembering. Certain records typically become deeply meaningful and treasured possessions. This offers an opportunity to understand how quantified data might be reimagined as having long-term personal value, rather than only immediate utility. This might also reveal the work required, practically and rhetorically, to edit and appropriate data as a meaningful account of one's life.

Perhaps most importantly, documenting and remembering weddings is actively pursued. Couples conceive of the kind of records they believe will be valued; they endeavour to capture those (often at great expense) with respect for the overall experience of the day;

and then find appropriate representations of those records and media with which to remember the day.

Although an acute example, as a potentially once-in-a-lifetime event, the wedding context really pushes at what it could mean to document and remember one's life with data. In so doing, this stretches the very notion of what personal informatics could be for, as set out by Li et al. (2010a). In Rooksby's (2014) terms, rather than being prospective and goal-oriented, this brief suggests a case of almost purely documentary tracking. This brief effectively poses the questions: What would it mean to prioritise these *documentary uses of data,* in the design of personal informatics tools? How might we reconfigure the design of data-driven services for longer-term self-expression and remembering, rather than only to monitor, regulate and motivate?

Further, while it's not possible to capture remembering with future data, what this project can probe is participants' decisions and orientations to documenting their lives with data. I seek to do this with the Speculative Enactments approach already outlined in Chapter 6. Here also, the context of weddings is fertile. Weddings, particularly for engaged couples, are already rich sites of speculation and imagination as people dream about, discuss and ultimately plan their wedding. As Massimi et al. (2014) suggest, there is something 'real but glossy' about weddings – suggesting the deliberately permeable boundaries between reality and fiction.

7.2. Design-Led Inquiry

Pragmatically, this study was an iterative and generative design-led inquiry. The brief, and much of the initial exploratory work can hence be understood as articulating and constructing the terms of a speculative social reality, which both colleagues, research participants and I could explore together. Continuing a theme of empirical inquiry, this creative design practice was complemented by linked empirical studies and interviews. This broader speculation was then focused towards the design of Speculative Enactments, with two engaged couples. These enactments were themselves generative of both a rich participant experience, and speculative design artefacts. Herein, I describe each stage of this inquiry in a loose chronological order. In practice, these activities were iterative, frequently overlapping and mutually informing over the course of nine months. I will subsequently unpack separately the findings and design reflections that emerged.

7.2.1. Developing Speculation

Design Ethnography

My inquiry began with a design ethnography (Salvador et al., 1999) through which I broadly sought opportunities to document quantified data about a wedding. I took a particular focus on several UK wedding magazines (e.g. Brides, Rock and Roll Bride[24], Perfect Wedding). These monthly magazines are aimed especially at brides-to-be, and offer ideas and inspiration to help engaged couples plan their 'perfect' day. Their commentary, adverts, advice, and profiles of 'real' couples and wedding vendors encompass all imaginable (and many unimaginable!) aspects of wedding planning – from clothing, to venues, refreshments, entertainment, and of course photography and documentary. Like many magazines, a significant proportion of the content is advertisements or sponsored content, often including promotional pull-out brochures or flyers. Technology is also covered, particularly as an aid to organised wedding planning, but also as a source of potential novelty or entertainment on the day. Magazines hence present an idealised, but comprehensive picture of the scope of contemporary UK weddings.

I photocopied and annotated relevant examples and pages, surrounding myself with resources for design. I supplemented these observations by collating online material from popular wedding blogs and wedding vendors' websites. Blogs tended to emphasise more real weddings and authentic experiences. Alternatively, they were a means for wedding vendors to express their personalities and unique services, from photography, to wedding cakes. Similarly, clippings were printed and annotated, or gathered in a notebook in 'Evernote', a digital note-taking application.

I was particularly attentive to the practices of wedding photographers, and the way they marketed their work as a service. Wedding photographers variously promise of peace of mind, and professionalism, combined with distinctive artistic approaches, from fine art styles to more candid photography. They frequently positioned themselves as artists, to distinguish themselves from competitors, and emphasise the care (and hence value) in choosing the *right* photographer, who will share a couple's vision of the day. Besides the rhetoric, I was also curious about the pragmatic work of wedding photographers – how

[24] https://www.rocknrollbride.com/

they approached, met, understood and assured couples throughout the process. Of particular note was the drafting of a 'shot list', of all the photographs the couple want to ensure are taken during the day. This is often introduced by the photographer, and then negotiated with the couple, in the interest of time, and family politics. Hence, as a directorial presence on the day, and responsible for a precious, one-off product, photographers establish themselves in a position of considerable trust and value.

As the project developed, I also visited a wedding fair in Newcastle, to understand the promotion of wedding vendors. In particular, to recognise the kind of artefacts and representations made to provoke an imaginary with for couples about the potential of their wedding day if they used this photographer, that wedding band, or these decorations.

Altogether, this scoping work helped map out common patterns and values in a modern wedding, their fashions and aesthetics, and particularly the many sites and occasions for documentary. These observations of wedding culture were then supplemented by looking into diverse and esoteric applications of self-tracking and wearable technology. I sought to look beyond the consumer fitness tracking market to gain core understandings of the potential of self-tracking and sensor technology. This included devices for extreme and professional sports, smart jewellery and novel forms of data visualisation.

Design Workbooks

Over time, I formalised and shared these broad observations through the use of design workbooks (Gaver, 2011). These were, quite literally *"collections of design proposals and other materials drawn together during projects to investigate options for design"* (p.1551). By elaborating and sharing initial ideas and concepts from this ethnographic work, these gave a focus to exploratory activities and demonstrate the creation of a design space around wedding datagraphy.

Developed over several weeks, through different stages of the project, these three workbooks (included in full in Appendix G) set the scene, and became a frequent source of reference, discussions with supervisors and colleagues, and directly feeding into a number of the subsequent design activities. In practical terms, the workbooks were assembled through a mixed practice of photocopying and illustrations in Adobe

Illustrator, which were assembled and annotated as a Powerpoint deck, and subsequently printed and shared.

The first workbook was primarily a collection of initial ideas and directions. For example, these included a timeline of a traditional wedding day (Figure 11), and related events. This effectively enumerated a list of possible occasions for datagraphy.

Figure 11: An example of early design workbook content; a timeline of important wedding activities.

Other pages offered early design proposals, such as coasters portraying data, maps of guest travel (Figure 12) and an interactive data booth (Figure 13); some of these ideas evolved through the project, others were discarded.

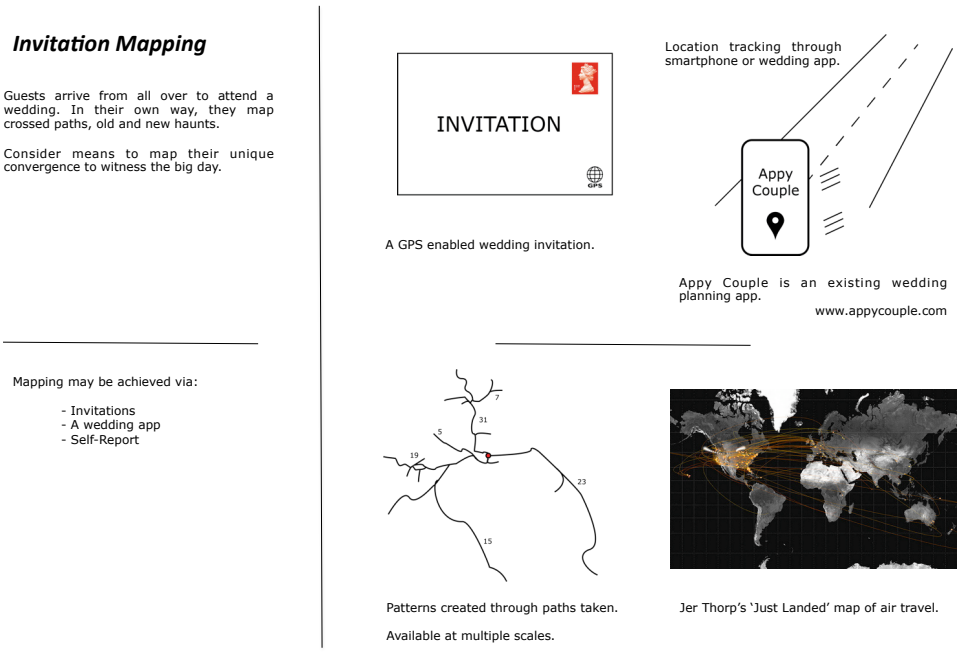


Figure 12: Example of early design workbook; a proposition for mapping guest travel via their invitations.

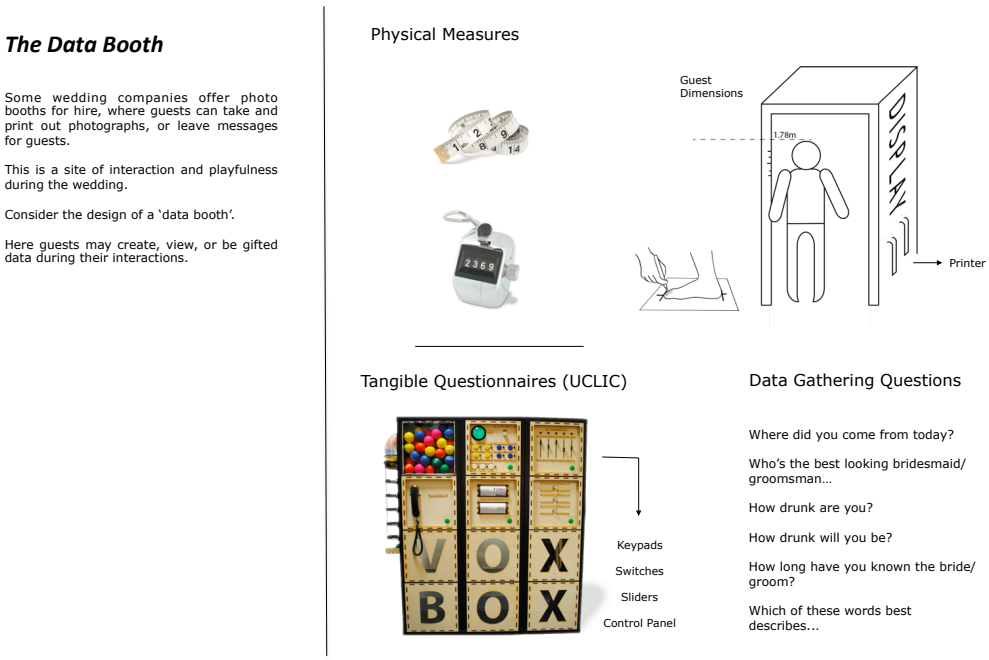


Figure 13: Example of design workbook; a proposition for an interactive data booth for guests to create data with during a wedding.

'Wedding Datagraphy'

Through this initial ethnography and workbook, I also crystallised the idea of a 'datagraphy' service, analogous to the role of photographers. I began to consider how the whole service could work; different touchpoints with the couple; which parts of the service were most relevant to the overall research; and which could be meaningfully enacted and materialised in greater detail. The wider service was refined throughout, but imagined a datagrapher working to *collect*, *process* and *curate* a couple's data. Considering these trajectories raises questions about how involved couples might be in curating their data; the final products a couple might receive from their datagrapher (e.g. Raw data on a USB? A wedding album? Personalised objects?); and opportunities to distinguish between a standard or more premium service.

Logo

At the same time, I undertook the design of a brand and logo for this datagraphy service (Figure 14) drawing on the aesthetics of wedding culture, and self-tracking startups. I chose the name 'Abacus' to recall counting, and in mind of technology companies reclaiming familiar objects (e.g. 'Nest' Thermostat, Alphabet, and Google Glass). Similarly, the logo focused on an engagement ring, which begins the whole process of marriage. This branding exercise helped commit to and give authority to the concept of wedding datagraphy – to solidify its position as a speculation.

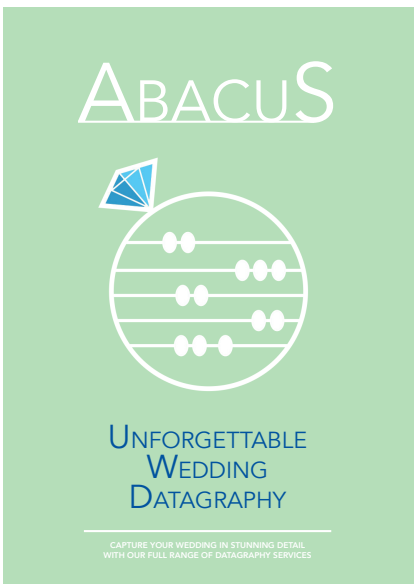


Figure 14: Final branding and logo developed for Abacus.

7.2.2. Abacus Data Cards

Engaging Participants

The second workbook began to explore ways of engaging participants empirically with initial ideas and concepts around wedding datagraphy. Drawing inspiration from the promotional pull-outs included in wedding magazines, and building on the initial service and logo design I developed early designs of a possible brochure advertising Abacus' services.

However, I realised the need to develop a more playful and flexible way to introduce the wedding datagraphy concept. Initial drafts of the brochure that required some closer reading left readers contemplative rather than discursive. For initial engagements with participants I sought more light-weight and open-ended materials to prompt discussion. A third workbook explored this directly through a series of datagraphy postcards (see Figures overleaf). These included simple visualisations, annotations and photos overlaid with data. Several of these succinctly portrayed a concept or idea from the original workbook. The limited size of a postcard provided a useful constraint to communicate an idea as clearly as possible.

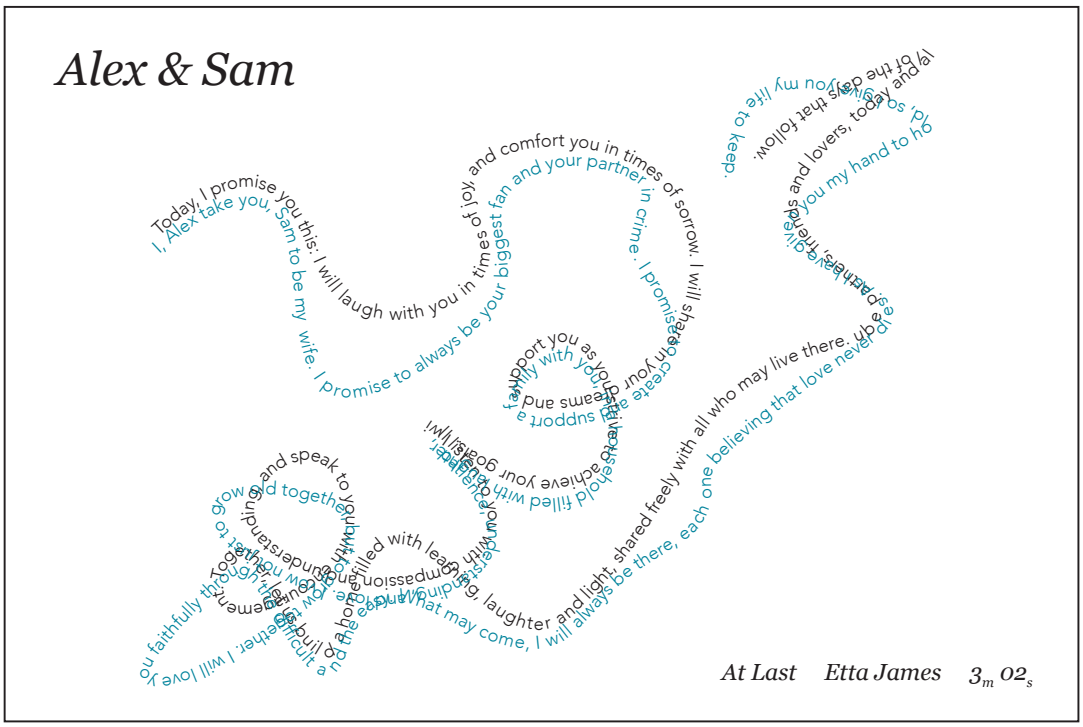


Figure 15: A data postcard, depicting song lyrics along the path of a first dance.

Figure 16: A data postcard experimenting with data overlaying photographs.

Wedding Playlist

52 guests danced to 'Strip the Willow'.

Beyoncé was your most played artist.

'Mr Brightside' was your top singalong.

The oldest song played was from 1953.

90's dance music began at 10:32pm.

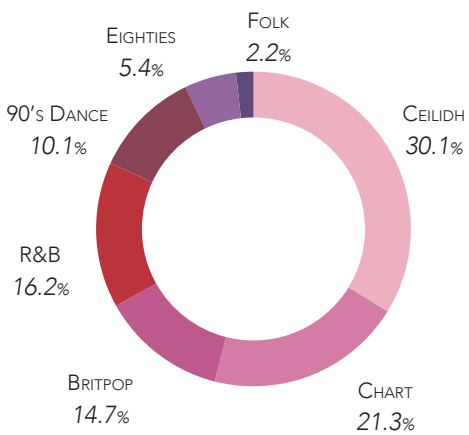


Figure 17: A data postcard showing a pie chart and related facts about the wedding playlist.

A Data Catalogue

Alongside all three workbooks, I had been building up a large catalogue of the kind of examples of quantified data I imagined could be collected at a wedding. These examples set aside any immediate technical or practical barriers to collecting this data, and instead tried to unearth the potential meaningfulness of data as a record of a wedding. I wanted to understand what data could have to say in this rich and already highly documented context. When would data matter? Where might it gain purchase in an account of the day, or punctualise the experience in a compelling way?

The examples in this catalogue (like some of the postcards) were developed as prose statements or statistics: *'28 steps down the aisle'; 'Your guests travelled 2,347km; A map of your first dance; 13:01 – your first kiss'.* A comprehensive list is shown in Appendix H. These simple statements were an effort to arrive at some essential meaning or potential in the data, unconcerned with flattering representation. As such, this work attended to the form of the data, and the language used to present it; how assertive or playful its presentation might be. They also reflect a concern with discourse and how data might be understood as meaningful or authoritative.

Abacus Data Cards

Refining this further, and affording more tactile, rapid and 'guerrilla demonstrations' (Bennett, 2016), I developed these statements as a deck of 52 'Abacus Data Cards' (Figure 18). Partly inspired by the wealth of existing card-based ideation tools, these were printed double-sided on high quality card, and laser cut to the size of standard playing cards. The backs of the cards were branded with the Abacus logo; the fronts of cards each contained an example of wedding datagraphy, drawn from the data catalogue. I took care in the typography, to emphasise the numerical nature of the subject.

Figure 18: Scattered Abacus Data Cards, front and back.

This deck rapidly summarised and communicated the potential breadth of wedding datagraphy. These cards became a go-to method for introducing and explaining the service – to colleagues, participants, wedding vendors and friends. Over time, I developed a familiarity with them and began to rehearse different stories, questions and ideas with them in conversations. In so doing, I was exploring the role of a 'datagrapher' and means to plausibly and invitingly present the project and concept.

7.2.3. Initial Interviews

I set out to formalise these conversations as a set of initial, lightweight interviews. These were recorded to allow for a deeper level of analysis, and were an ongoing source of inspiration for the project. They were also a means to pilot activities and questions, which I might later use as part of a longer enactment.

I conducted 12 such semi-structured interviews (P1-P12, 7M, 5F). This was a convenience sample, recruited through word of mouth and internal mailing lists. It included two practicing wedding photographers, eight recently married individuals (within past five years), one married couple, and one engaged individual. At interview, I invited participants to describe their own wedding, probing in particular about their efforts to document the day, and their use of photographs, video, mementos and social media. I asked the photographers to describe their role and practice on the day, seeking opportunities to ground the role of the datagrapher.

In the second half of each interview, participants were given a pack of the Abacus Data Cards and asked to pick out examples of data that they would have found compelling to record about their wedding. As a twist, they were asked to choose five cards for themselves, and five cards for their partner, as well as any cards they found inappropriate. Their choices scaffolded a broad conversation about the kind of meaningful data that could be captured from a wedding.

These interviews extended initial insights from the design ethnography, and in particular insights into actual practices of wedding documentary, particularly around photos. They were intended primarily as informing that initial ethnography, and inspiring further design work and preparations for a Speculative Enactment. At the time, I listened back to each interview, taking field notes on the practices described, and transcribing any quotes of particular interest. Subsequently, sections of the interview concerning the Abacus Data Cards were transcribed in full, and contributed to the reflections on the service as a whole, developed in Section 7.6.

7.2.4. Summary

This section has described a broad programme of design research to develop the speculative design of a ‘Wedding Datagraphy’ service. This began with different sources

of design ethnography, which was steadily materialised and shared through design workbooks, the branding of the 'Abacus' service, the production of Abacus Data Cards, and their use in a series of pilot interviews. In the main, these served to probe areas of interest, as a kind of horizon scanning, and develop a sensitivity to the aesthetic and values of weddings and their documentary.

7.3. Speculative Enactments

7.3.1. Enacting Speculation: Meeting a Datagrapher

Following the initial broad outlook to develop the speculation, I then focused on developing one feature of the wedding datagraphy service in-depth as a Speculative Enactment. To recall from Chapter 6, the effort here is to design consequential and social circumstances in which participants are invited to *act amidst* and *experience* speculation. Pragmatically, I sought a setting where I could meaningfully engage a couple in wedding datagraphy.

In conversations with photographers, I had been drawn to the meetings that engaged couples have with their photographer to discuss and plan their wedding photography. At this stage of planning, couples are already excitedly imagining, disagreeing on and deciding how to document their big day. I recognised these kinds of interactions could support a rich dialogue about the expectations for data to meaningfully document the experience of a wedding; and the practices and services this would entail.

While I conducted many of the initial interviews with married individuals, I saw engaged couples as potentially more viscerally involved in an active consideration of what wedding datagraphy would mean. However, I was clearly not intending to work as a datagrapher at a wedding – to do so with any fidelity, would have been technically and indeed ethically beyond the scope of this research. Instead I hoped to attract imaginative couples who would enjoy speculating on the service. As a speculative enactment, I sought ways to make the encounter meaningful for participants, and give them the scope to act and shape the nature of the speculation themselves.

In the earlier design ethnography, I had been inspired by the 'real-wedding' style articles, particularly in Rock and Roll Bride magazine. From the initial interviews, I was also

aware of the considerable work many couples undertook together in personally designing invites, websites, thank you cards and even posters which represent themselves as a couple, and their wedding. Many of these are kept as mementos. I drew parallels here with the kind of personal, infographic representations exemplified by Felton's 'Feltron Report' (Felton, 2014) and the Dear Data project (Posavec and Lupi, 2016).

I therefore proposed writing a 'real-wedding' article about (and edited by) an engaged couple. Such articles combine a personal narrative and quotes from the couple, striking profile images, and personal and original touches from the day. In a promotional tone, the article would not only profile the couple, and their wedding (as they anticipated or wished it to be) but also their attitudes to the proposed application of datagraphy.

Datagraphy would be brought to the fore in the article, through images of three bespoke designed 'data artefacts'. These were imagined as mementos that a datagrapher would design for the couple to represent their data; much as a photographer would prepare a wedding album or particular prints. These artefacts would explore the type of curatorial work, which might be required or expected of a datagrapher. As largely graphic design, the design of several artefacts could be lightweight, yet maintain a high-fidelity, and be easily understood and edited by couples. This also helped developed a sense of a client-service provider relationship. This led to me directly assuming the role of a datagrapher, as well as a kind of journalist in writing the article.

Written about, and designed bespoke for them, the article and artefacts would clearly not be anonymised, and would be intended for presentation to many different audiences. It was hoped that this potentially public-facing nature, would further stimulate a sense of consequence to the way in which they engaged with the speculation.

For each engaged couple, this article and the data artefacts were intended as: a) A tangible outcome, and perhaps even a curious or valued memento for the couple; and b) A dialogic, boundary object around which to co-articulate the speculation with them. Finally, by bringing two of these articles together, in a pull-out brochure, their stories could be used as promotional material for the concept, and work as a kind of Design Fiction for future engagements with the concept.

Figure 19: Promotional image used to publicise Abacus.

7.3.2. Recruitment

Following the broad sweep of initial work, I sought a deeper and more personal engagement for these speculative enactments, by working very closely, and in a bespoke manner, with just two couples. This resonates with a phenomenological focus on individual cases, and the smaller, more in-depth engagements typical of RtD.

To recruit these couples, I created and staged a 'competition' (below) to meet with an 'Abacus Datagrapher'. This was advertised through an Abacus website, promoted through social media, mailing lists and local wedding vendors.

The competition text read:
Come and imagine the future of wedding recording with us. We are seeking TWO engaged couples, to feature in a concept brochure for Abacus. We want to imagine and tell the story of your future wedding, as it would be captured with data. Our chosen couples will meet exclusively with an Abacus Datagrapher to discuss their wedding, and how they would capture and represent it with data. Our datagrapher will then produce a four-page

feature article on your imagined wedding, featuring data and mementos from the day. They will share this with you for a final edit, before publishing in a 12-page concept magazine about wedding datagraphy.

Figure 20: Advert displayed on the Abacus website

The competition was intended to raise some anticipation and curiosity about the service, which would attract an imaginative couple. As an enactment, it was important that the couples really wanted to take part and invest in the idea. On this basis, I would carefully choose couples to work with who were enthusiastic, reasonably geographically close to Edinburgh and the North East of England, and with the time to commit to the project, at an already busy time in their lives. Three couples emailed an interest in the project, but one of these could not take part as they were to be married imminently. The two couples who ultimately took part, Annabelle and Calum, and Rowan and Julia, are described in much more detail in Sections 7.4 and 7.5.

7.3.3. Procedure

The same procedure followed for each couple. I will describe this here first, and then detail and analyse the specifics of the enactments with each couple subsequently.

Introductory Pack

Following introductory emails, I arranged a date for an initial meeting with each couple. Ahead of this meeting, each couple were sent an 'introductory pack' by post, including two 52-card decks of neatly packaged Abacus Data Cards, along with some instruction cards, and two envelopes (Figure 21). These were intended as a sensitising artefact, similar to a kind of cultural probe (Gaver et al., 1999). As in initial interviews, each partner was invited to look through the cards and choose cards they found compelling as a form of documentary: five for themselves in one envelope, and five for their partner in the other. They were encouraged to do this individually, and reveal their choices when we met. I was hopeful this would generate insightful discussion and raise intrigue and meaning in the exercise. There were also some blank cards, and each couple was invited together to include any ideas of their own for data or events to record, following a series of prompts such as 'some data to keep secret' or 'some data to put on a graph'. Finally, these packs also contained a cover letter, information sheet, release form and consent form (Appendix I) (these forms were also sent by email).

Figure 21: Packaging for the Abacus Data Cards, sent as probes to each couple ahead of our first meeting.

First Meeting

I met each couple twice, at their homes, in the role of wedding datagrapher/researcher. Both meetings were audio-recorded in full, after initial introductions and collecting consent forms. I also introduced myself, and shared a template of the style of article I wanted to write (Figures 22 and 23), as well as a copy of Rock and Roll Bride, the magazine that had graphically inspired the template. At the first meeting, I got to know the couple, their wedding, and attitudes to datagraphy. We first discussed their relationship and particularly their wedding plans. I sought to establish a clear narrative of the day, any especially personal aspects of the event, and the details that mattered most for them to record. Once again this is similar to the kind of conversations that photographers have with clients. I also probed them directly on their choice of photographers and/or videographers.

Figure 22: Template spread to be shown to prospective couples, and introduce the style of the article I wanted to produce for them. With headline and profile image.

The second part of the interview then focused on their choice of data cards. This was quite a playful conversation, with each partner intrigued by the other's choices. Their

explanations of why they chose a particular card were therefore articulated both to their partner and I simultaneously. There was guessing, surprise and satisfaction when they had picked the same cards. Underneath this, the cards effectively scaffolded an open-ended conversation about the meaning and value of different kinds of data in relation to their own anticipated wedding.

Figure 23: Template spread shown to each couple at our first meeting to introduce the style of article I wanted to produce for them. With quotes and data artefacts.

The exercise generated twenty cards (10 each), some of which were the same, or addressed similar topics. I then asked couples to highlight a selection of the cards that represented data that they would like to see appear in the article, or become the basis of their data artefacts. Any cards they had written themselves were also discussed here. This fostered a discussion about the representation of data, and couples occasionally offered particular ideas about how they imagined using or sharing their data in the future.

Finally, the article required a striking profile photo of the couple. As this photo would not be taken at their wedding, I asked each couple to pose with two photo frames, on which

they could write their own data card. We then took a series of photos at their homes, the best of which I would use as the cover image for their article.

Second Meeting

I arranged to meet each couple a second time, around two weeks later, when I would discuss with them a draft of their article and data artefacts, for them to edit and reflect upon with me.

In the time between meetings, I responded to the initial conversations, characters and choices of data from the couple. I began by considering the design of three bespoke data artefacts. The series of design workbooks were a further source of inspiration here. At this point, I stepped strongly into the role of datagrapher, working for a client. Previously I had explored the design of wedding datagraphy guided mainly by research interest. However, in this case, I was primarily concerned with producing artefacts that appeared professional, and that each couple would like, find personal, and want to engage with. I was, myself, becoming viscerally involved with the speculative world I had set up.

There were clear constraints on the design of these artefacts, each of which I will describe in greater detail in sections 7.4 and 7.5. The only form of the artefacts would be as an illustration or photograph as part of the article. I illustratively depicted fictional data that seemed plausible, or which the couple had already described in our initial conversation. They were then invited to edit and reflect upon what this data meant during the second meeting.

Alongside these, I drafted a 500-word article, modelled on the tone of Rock and Roll Bride magazine. This included a headline, sub-header, and some brief description of the couples, focusing on individual parts of their day. Several parts of the article were long ’quotes’ - paraphrasing the couple’s remarks, or relating them to the bespoke artefacts. The text also included several statistics that speculatively suggested an everyday use of data in conversational terms. As a testimonial about the service, the article had a clearly promotional tone. Finally, I chose and edited a cover photo of the couple for each article. An A3 proof of the article was then posted to couples ahead of our second meeting, and with a second letter (Appendix I.3.) they were invited to suggest any edits to the text, or the data.

The second meeting was a little shorter (lasting around an hour) and focused directly on the article and artefacts. I asked for each couple's general impressions of the whole article, and for any specific changes they would like to make. These were largely limited to a change of tone, rather than substantial changes to the narrative or meaning of the text. I also confirmed their satisfaction with the cover image, offering to take another photo if they preferred. We then discussed each of the artefacts in turn. I sought their impressions of these, and discussed the rationale for their design. I probed on how they imagined they might use or share such artefacts. I also asked them directly to consider what the data artefacts would say about them and their wedding, and if they wanted to change that data in any way; either for perceived accuracy, or to better reflect their hopes and expectations.

These conversations allowed the couples to identify and represent themselves through the data, and speculate about its prospective use – both as an *imagined* artefact and as the *actual* brochure to be published. In this respect, couples were engaged both in speculation about the service, but more immediately in impression management, with me, the datagrapher, and through the article.

Brochure

Following this final meeting, I made any requested changes, and sent a final proof to the couples for a final approval. I did not meet them this time, but simply gave them the opportunity to flag anything I had overlooked. Finally, I assembled both articles into a glossy promotional brochure. The final 16-page, B5 brochure (presented in full in Appendix J) evolved from earlier designs, and consisted of: a front and back cover; an introduction to the Abacus service; and both 'real-wedding' stories. The introduction (Figure 24) promotes the service and gives a broad suggestion of a service in three parts; 'Collection; Processing; and Curation'. Ultimately, the brochure functions as a Design Fiction artefact; it communicates a possible world in which Annabelle and Calum, and Julia and Rowan, were married with Abacus Datagraphy. Indeed, the couple's stories are introduced with the strapline: 'In This Issue: Real couples and their Abacus weddings'. With thanks, the couples were each posted a copy of this brochure to keep, delivered inside the latest edition of 'Rock and Roll Bride' magazine, a way to situate the fiction that they were a part of (Figure 25). More than one hundred of these brochures have since been printed, for distribution in design and research contexts.

Figure 24: Opening page of the Abacus Brochure, introducing the issue, and describing the concept of the service.

Introducing Datagraphy

Datagraphy is a new way of seeing and recording your life. Supplementing photographs and videos, we combine the latest sensor technologies, with a keen attention to detail, to create a beautiful modern record of your day that you can cherish forever.

Imagine beautiful maps of your guests who have traveled miles to be there. The story of your partner's heart rate as you walk down the aisle. The path of your first dance. A whole new layer to your wedding album.

At Abacus, we offer a full suite of datagraphy services, always personally tailored to you. Our services can help you plan, collect, manage and curate your personal data into beautiful products and memories to share with friends and family.

We know how stressful wedding planning can be. Our professional datagraphers employ cutting edge techniques to seamlessly collect all of the data you want, while letting you get on and enjoy your big day with peace of mind.

We pride ourselves on offering a professional and bespoke service. No two weddings are the same. Our datagraphy can help you capture, represent and visualise the personal moments and details that matter most.

Once collected, the data is yours. Forever. We hope to help you make it one of your most beloved possessions.

Read on to learn about our services, and meet two of the first couples to try Abacus Datagraphy at their weddings!

Our Services

We offer a full range of data services, always tailored to your vision. Our datagraphers will help you decide the data you want, make sure everything runs smoothly on the day, store and deliver your data securely, and work with you to curate beautiful mementos to share with friends and cherish for generations.

Collection

1. ***Your datagrapher*** will meet with you in advance of your wedding to understand the data that matters to you and how we can blend in seamlessly with your day.
2. ***We liaise*** with you, your venue, and vendors to put in place everything needed to collect your data.
3. ***On the day,*** we give you peace of mind and let you focus on the things that matter. We're on hand to make sure all your data is collected as planned.

Processing

4. Our expert team ***carefully hand-clean*** and prepare your data so it is ready to be transformed into beautiful products.
5. Your data is ***securely stored*** and backed up in the cloud, so your memories are always safe.
6. You will always ***receive a raw copy*** of your data (in .csv format), and samples of agreed products within two weeks of your wedding.

Curation

7. You can share any data you want with friends and family through an ***online gallery*** and store.
8. We love working on bespoke projects with our couples. Our data curator will meet with you to craft beautiful mementos unique to you, your story and your style.
9. Your data is something for you to cherish and explore for years to come. We keep your data secure, and can work with your data again for anniversaries or special occasions.

In this issue, two couples and their weddings with Abacus!

Figure 25: Example of glossy final brochure produced and distributed.

7.3.4. Ethics

This project was marked as ethically low risk by Newcastle University, and approval granted on April 14th, 2016. Regular protocols for informed consent, and the withdrawal from the study were in place. However, a key part of this engagement was its personal nature, and that the brochure and participants would be non-anonymised. This was made to participants through the information sheet, and a key part of making the enactment a personal, consequential experience. By avoiding anonymity, the project sought to give participants genuine value for taking part. They were not paid to participate – it was hoped that the experience and resulting artefact would be fair exchange for their time and candour. This reflects another key point of Speculative Enactments, in contrast to other speculative methods – participants are 'in' on the fiction. Rather than suspending disbelief, participants are entirely aware of the speculative nature of the project and its position as research. Lastly, it is worth remarking that in this case, the Speculative Enactments approach offers a much lower risk study, than to practically carry out datagraphy at a wedding.

7.3.5. Limitations

It is worth acknowledging some limitations to the speculation and the enactment. In lieu of actively remembering with data (as participants did in Studies One and Two), I engaged couples in a situation where they were expected to make choices about how they would like to record and remember an important life event with data. This reflects the long-running view in this thesis of remembering as actively reconstructed, and in particular the conclusions in Chapter 5 remarking how people make accounts with data. Nonetheless, this is a choice to focus on occasions of active meaning-making, pursuing data as a documentary medium and prospective remembering; ahead of studying the implications of encountering data as a 'past next door'.

Second, by putting myself in a position of advocacy, promoting datagraphy, the speculation as designed adopted a less critical perspective than perhaps other design fiction work, inspired by Dunne and Raby's critical tradition (1999, 2001). The resulting brochure is clearly promotional, and deliberately overlooks any possible issues arising from conducting datagraphy at a wedding. While acknowledging this, it should become clear that the subsequent analysis, and its position in this thesis, resume a more critical view.

7.3.6. Analysing Enactments

This procedure sought to sharpen diverse design inquiry, into a rich and meaningful engagement with two couples. The process as set out was the same for both couples, but their weddings, orientations to data, and experiences of the enactment were quite individual.

At first, listening back to the enactments, I took field notes, and made sketches oriented to the design of their article, rather than making a full transcription. In between the meetings with the couples, my overwhelming concern was towards producing engaging artefacts. Following the final production of the brochure, and its delivery to couples, I then took a more distanced analytic stance, to reflect on and analyse the enactments and their resulting content. Along with the twelve pilot interviews, each of the couple's initial engagements with the Abacus Data Cards were transcribed externally. I then subsequently integrated these with my original extensive field notes, and listened again to make a much fuller transcription of each couple's significant remarks and discourse across both

meetings (around five hours of audio); in relation to their wedding, the representation of data artefacts, and the resulting article.

This then afforded a mode of Interpretive Phenomenological Analysis (IPA), in keeping with the methodological commitments set out in Chapter 3. By meeting couples together, they were in conversation with each other, as well as with me, stimulating a richer discourse than a one-on-one interview might. Once again, with its idiographic focus, IPA is well suited to studies of limited samples and unique circumstances, as well as admitting the analysis of a range of material beyond the transcript.

What follows then may be read as extensive vignettes. In these I introduce the couple, their weddings, their orientations to wedding datagraphy, and the conversations that led to and surrounded their data artefacts. These serve as a rationale for the artefacts themselves, and afford a deeper analysis of the perceived meaning of the artefacts, and their data, for each of the couples. These also provide strong illustrations of wedding datagraphy – and the creation of, and reflection on, a quantified past. Unlike Studies One and Two, I have not undertaken systematic efforts to describe the unique enactments and artefacts thematically. Rather, I conclude with reflections on datagraphy at a higher level, alongside the pilot interviews, and the development of the project as a whole.

7.4. Annabelle and Calum

7.4.1. Introductions

Annabelle and Calum lived together in Edinburgh, and were due to be married in October 2016, two months after my first meeting with them in August. Annabelle worked as an administrator in another university (she heard about the project through an internal mailing list); Calum was a chef and a stand-up performer in his spare time.

When I met Annabelle and Calum, their wedding was already substantially planned out; Calum was able to describe the entire day chronologically (with some gentle, playful prompting from Annabelle). With family and friends coming from afar, the wedding had a strong focus on its Edinburgh locale. Notably, Annabelle would arrive at her wedding in a big red bus that would later take guests on a tour of the city, en route from the ceremony to their reception venue. This arrival would remain a surprise to guests, summing up the playfulness with which Annabelle and Calum seemed to undertake their wedding planning, and their involvement in the Abacus project.

The couple were working with a tight budget, taking a creative 'do-it-yourself' attitude for invitations, music, and decorations, which became an opportunity for many personal and expressive touches. Annabelle described herself as sentimental, and had already set aside copies of the invitations and decorations to keep. Like many couples, they took considerable time and expense in choosing a photographer. Annabelle first identified six potential options, from which Calum independently chose three favourites. They quickly settled on a fine-art style photographer.

> *We based it on her style. She had quite stylised photos - they almost look like they were taken a while ago even for modern weddings you're doing, she has a way of making it look a bit olde*r. (Calum, Meeting 1)

Annabelle contrasted this choice in part with the fact that *"everyone's got a cameraphone, so I know that from all the guests, I can get all the photos of exactly, what they saw at what time."* Their photographer had even suggested an 'unplugged' ceremony, during which guests would refrain from taking their own photographs.

They were both excited to see a unique artist's impression of the day. Their conversations beforehand (discussing logistics and important group photographs, and sharing a 'Pinterest' board of wedding inspiration) offered some input into this vision. Unable to afford a videographer for the day, they have asked a friend to record the speeches, as these are *"the memorable bit we would like to relive"* (Annabelle, Meeting 1).

As was also apparent from the pilot interviews, couples like Annabelle and Calum were balancing many factors in documenting their wedding. With a limited budget; they needed to ensure: the important details and moments of the day are captured; without diminishing the experience itself; and ideally after a fashion that is expressive of the couple and the wedding itself. This is the context for Abacus Datagraphy, and the choices couples would make about its potential role in documenting their wedding.

Annabelle and Calum were enthusiastic about the concept of datagraphy. They had engaged deeply with the Abacus Data Cards before my visit, and as they revealed their choice of cards to each other, one by one, ("*Like a penalty shootout")* there was great anticipation and curiosity about their choices. To their satisfaction, several of their cards were the same. Much like individuals in the pilot interviews, their choices of cards reflected personal interpretations and translations onto the data, explaining how data such as "bar spend" or "cigars smoked" might have a personal resonance. These choices were the primary motivation for the content and design of their article and data artefacts.

I will now introduce each of the data artefacts, and finally the resulting article, reflecting on the discussions leading to each. The article and artefacts as they were printed in the brochure are shown overleaf in Section 7.5.

7.4.2. Bus Infographic

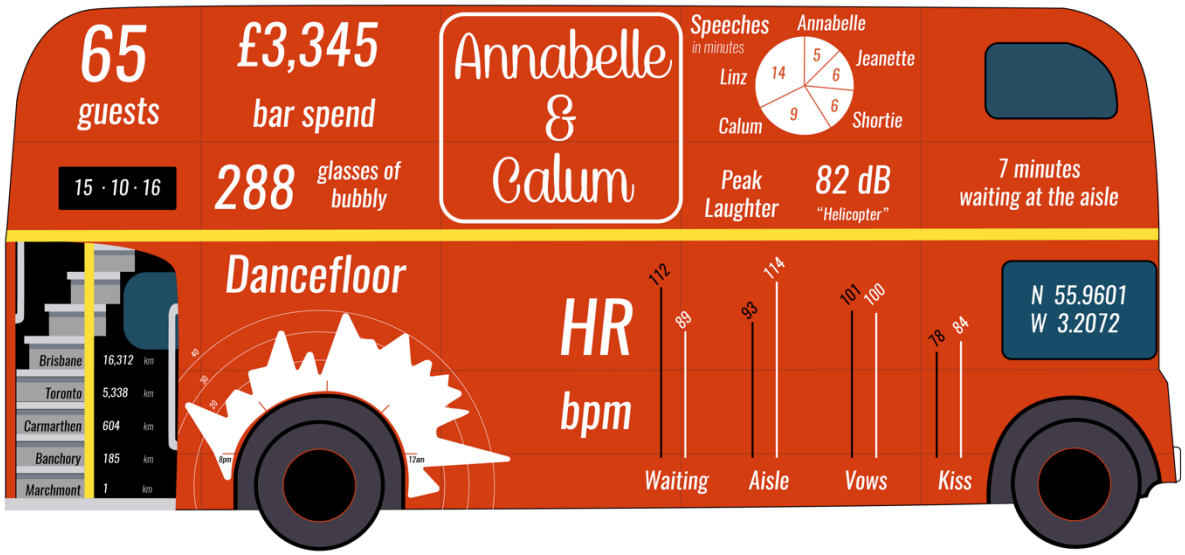


Figure 26: A variety of imagined data from Annabelle and Calum's wedding, printed in an infographic on the side of an illustrated red bus.

The central artefact for Annabelle and Calum was an infographic printed onto the side of a big red bus (Figure 26). The many representations of data it included served to index several different parts of the wedding. At the first meeting, Annabelle had imagined *"all the data on a big, kind of print, and we could frame it and be like 'this was our wedding"*. Combining this idea with the most striking element of their day – her surprise arrival by bus – led to the infographic as a kind of statement piece. Annabelle and Calum were excited about data and artefacts like this that could be a 'talking point'. The framed bus was imagined to hang proudly in their living room, or in the hall.

The bus allowed me as the datagrapher to acknowledge many of the different topics and ideas we had discussed through their cards. Much of the data was aggregated, such as the number of wedding guests, glasses of bubbly, and the total bar spend. Annabelle and Calum could in fact be accurate about some of this data (they knew how many guests they had, and how much champagne they had ordered). Data like the distance guests travel from home could be researched. Other data which they edited was guessed at, according to how they hoped their day might play out – the bar spend even playfully became a target for them.

The total bar spend was chosen initially by Annabelle, for Calum, as it referenced his history of working in bars. But this metric was also remarkable because Annabelle still had a copy of the receipt from her parents' wedding in 1971. Her parents paid £17.34 for 72 glasses of sherry and 12 bottles of wine. Of course, accounting for inflation, this metric allows a playful comparison between the two weddings, and a way to relate directly to some existing history in their family. Overall however, the alcohol consumption is taken here as symbolic of another value; the wedding being a good party:

> *"It's representing that solid few hours after all the traditional parts of the wedding are out of the way, the ceremony, the speeches, the cake, all of that's kind of out the way… and it's followed by a party." (Annabelle, Meeting 2)*

Data plotted over time offered a narrative. Annabelle and Calum projected different stories and songs onto the graph of the dance floor activity: guests joining them on the floor after their first dance, the popularity of a '*Five megamix*', and everyone linking arms for the traditional singing of Loch Lomond. The anticipated value of this data was that it might be read quite literally as an accurate index to their experience,

Annabelle and Calum intended to record a video of the speeches at their wedding; but they also imagined collecting data about them. Annabelle suggested that as a part-time stand up, Calum would be interested about when 'laughter peaked'. While video was intended to help them relive the moment, data was imagined as a familiar but subtle prompt.

> *"[Speeches are] really funny at the time, but then you can't really remember why. Or they're really touching but you can't remember why. […] so those words could be little prompts. So there could be maybe one strange word just once."*

In the pilot interviews, participants resisted the idea of a direct transcript of their speeches, although data about the speech might require this as a starting point for processing. Instead, prompts, statistics or word clouds were imagined as a route to remembering a speech personally. The effect here is to probe and prompt, rather than describe in its entirety. Words such as 'Helicopter' then act symbolically, only understood

or to be explained by those who were there, preserving somewhat the integrity and experience of the moment itself.

Like many others, Annabelle and Calum were taken with representing the great efforts guests took to come to their wedding. With diverse backgrounds, and international connections, they were proud of having guests travel from as far as Brisbane and Toronto to come to their wedding, but also wanted to acknowledge family arriving from Banchory (near Aberdeen) and Carmarthen in Wales. The direct distances of these locations, and their own home in Marchmont, was included subtly as part of the steps of the bus. This detail was overlooked by Annabelle on first glance, but when recognised, she found it 'cute', an intriguing adjective for data.

The last part of the bus infographic was a minimalist bar chart of their heart rates at key moments during the wedding ceremony. This procession of eight lines portrays at first glance an idealised narrative of Calum's nerves and excitement prior to Annabelle's entrance, her elevated heart rate as she walked down the aisle, and their heart beats coming closer together as they say their vows and share their first kiss. Heart rate, though a common physiological measure, is a curious subject for documentary, as it is an embodied feeling one would rarely know in such detail. It seems to convey a strength of feeling or emotion, yet there is no substantial basis or understanding for this correlation, especially without a sense of one's resting heart rate. In this respect, heart rate is an understandably romanticised measure. While heart rate might well be captured throughout the day, here it is curated to show change. Clearly an 'average' heart rate across the day would hardly speak to the kind of narrative and remembering which might be constructed around these moments.

Overall, the bus lived up to Annabelle and Calum's visions of a summary infographic of their day. They even asked for the original image so that they might rework it after their wedding with data they anticipated they could feasibly capture, a request which also demonstrates the depth of their engagement with the artefact and the scope of a Datagraphy service.

"We love the bus, big time. Like actually, I was saying to Annabelle, an image like that for us to keep would be great, of just the bus, for the wall or something would be really cool." (Calum, Meeting 2).

7.4.3. First Dance Coasters

Their second data artefact was a set of coasters (Figure 27), overlaid with the path of their first dance. A map of their first dance had interested both Annabelle and Calum from the cards, and it was clear they valued physical representations of data ahead of digital ones.

"I don't think we would look at it if it was digital. I don't think I'd ever be on a computer. Or be like 'let's get on a computer, let's all look at our…' (Calum, Meeting 1)

I imagined the coasters as an everyday artefact in their living room, which would put their data to hand; and be easily encountered, with different pieces drifting in and out of attention. Taking inspiration from dance notation, the coasters depicted turns, holds and

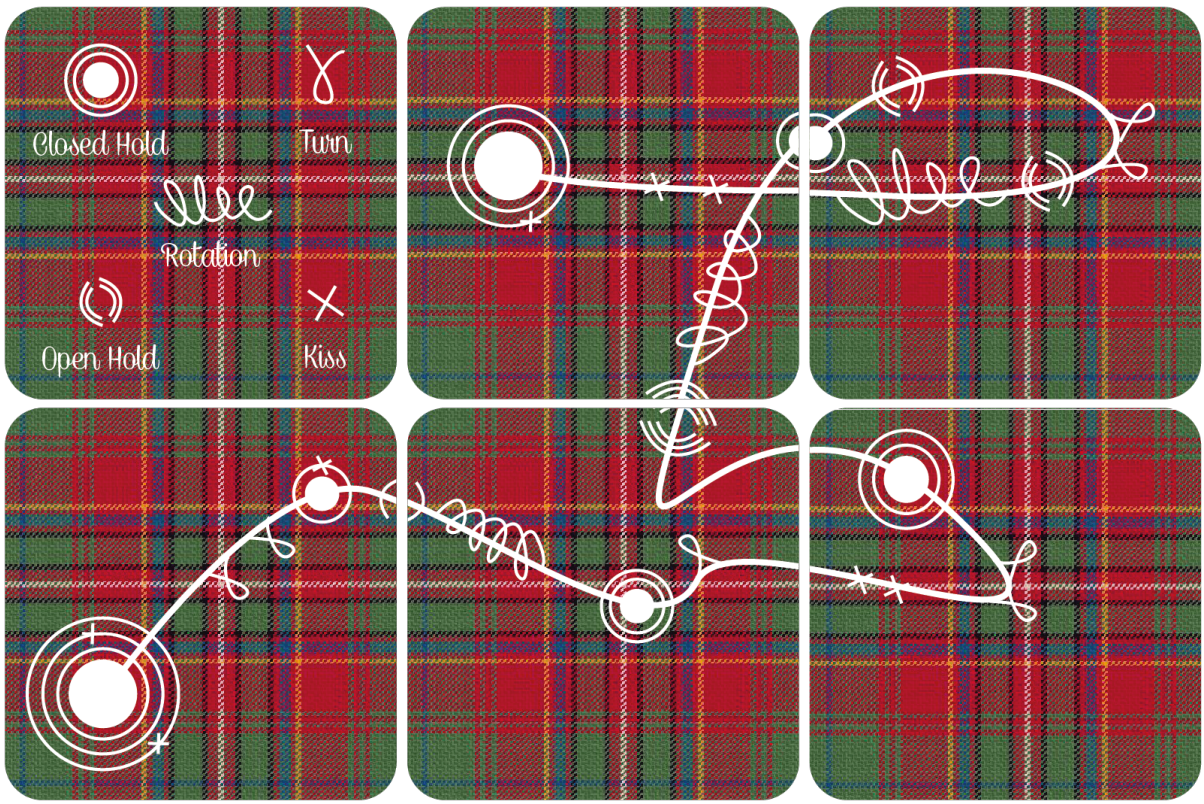


Figure 27: A set of coasters, portraying the path and significnat actions of Annabelle and Calum's first dance.

kisses according to a key. Of course, when separated, like jigsaw pieces, as they would be when in use as coasters, the data becomes highly ambiguous. Annabelle and Calum imagined these as a conversation starter around which tales could be spun.

> ***"A:** Because the first time anyone saw them, they would be very intrigued and say oh what's this?*
> ***C:** You could leave it as a game to them. Leave them to work it out. "*

Such ambiguity also opens up an evolution in the meaning and interpretation of the data over time:

> *"It's the interpretation of the data, isn't it? Because, 'map of our first dance' we could look at it afterwards and be like, "Oh look, we were going all around the dance floor". And then 10 years later I could be like, "Yes you wouldn't let me go, you were pulling me around everywhere!" (Annabelle, Meeting 1)."*

The background of the coasters was personalised to Calum's family tartan, and matched the colours of the wedding as a whole, which Annabelle frequently, emotively referenced. The dance and these colours might even form a kind of signature, to personalise other correspondence from the couple.

> *"I could see how it would be something you could share because if you think about sending thankyou cards, but you could get a post card made with the pattern of your first dance, and that would be your personalised thankyou card." (Annabelle, Meeting 2)*

In this way, the coasters were aesthetically pleasing, with a *"simple line"* which they imagined they could relate to at a glance and represented their desire to be able to share and make conversation with their data.

> *"If it was me doing this, it would be important that we could share this kind of information, for the same reasons you share your wedding photos." (Annabelle, Meeting 2).*

Indeed, when discussing where they might hang the framing of the bus, they made comparisons to friends who had many (too many) wedding photos in every room of the house. The coasters perhaps offer a more ambiguous, and understated nod to the day.

7.4.4. First Kiss Playing Card

Lastly, I depicted for Annabelle and Calum a playing card (Figure 28) declaring the precise time of their first kiss. The couple had actually included these decorative playing cards in their invitations to their guests, as they matched the colours of the wedding and referenced Calum's love of card games.

Figure 28: An image of a personal playing card, annotated with the time of Annabelle and Calum's first kiss.

The time of their first kiss was chosen by both Annabelle and Calum through the data cards and discussed extensively.

> *"I just thought that was a nice thing to remember, when did we have our first kiss as husband and wife. I thought you'd really like that, that's all." (Calum, Meeting 1)*

Interestingly, while the timings are hugely important in planning a wedding, they were not interested in a detailed timeline of the day, rather: "*it was that particular event, rather than knowing the time of everything." (Annabelle, Meeting 1)*

In this way, the time of the first kiss is chosen specifically, ahead of other parts of the ceremony, as a means to mark the occasion.

> ***C: "****I thought that particularly, of all the things that happen during the day, I think if you could get than one down to quite an accurate [time].*
> ***A:*** *Because that's the romantic part of it. It's not the time the register was signed or anything… But that's the romantic side to that, it's not knowing the time of everything it's knowing the time of that one thing that you've chosen on that card." (Meeting 1)*

Marked out in this way, the measure is romanticised, and chosen to symbolise the whole ceremony. Playfully, they imagined this extending to the celebration of their anniversary, where kissing at that specific time might become a small ritual and form of commemoration. It is notable how simple and memorable this data point is; it does not require elaborate representation, and might come to be innately known.

Such data need not necessarily be on display. Leveraging the playing cards, which were a theme of their wedding stationary, was an effort to reflect the intimacy of this data. Simply having something physical would help solidify this fact about their wedding. Nonetheless, spurred by their interest in playing cards, Annabelle and Calum thought about how embodying data in physical things such as cards could afford their collection, curation and the display of different aspects of the day.

> **A: "***Seeing what you did with the playing cards, I thought gosh, you could have a set of the playing cards with different data on it. In a set framed. Like first kiss, bar spend, longest whatever. All the different things, you could have it in a set.*
> **C**: *I might even push that idea further and say it was Ace, 2, 3, 4, 5 of hearts. You could have it like sequential of things that happened through the day." (Meeting 2)*

Recalling earlier remarks about the polymorphous nature of data, the implication here is that physical sets such as playing cards can be used to structure the interactions and impressions taken from that data.

7.4.5. Final Article

Overleaf, I include the final, printed six-page article designed for Annabelle and Calum. It includes a profile image, title, a description of their imagined wedding day, and the three data artefacts introduced.

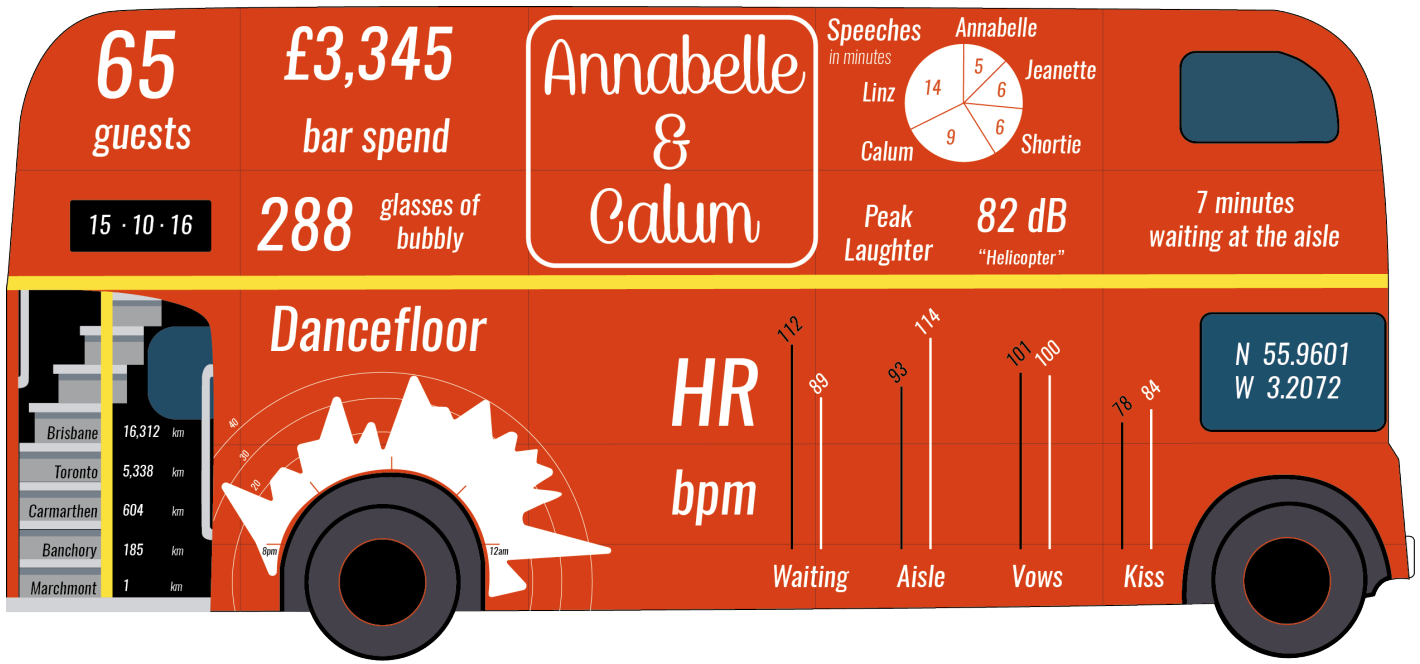
THE MAGICAL MYSTERY TOUR

WRITTEN BY CHRIS ELSDEN

Annabelle & Calum embraced the beautiful City of Edinburgh in their wedding, arriving in a big red bus, and taking guests on a magical journey.

Calum's heart rate peaked as he strode the short 0.8 miles across Edinburgh's Meadows, towards Lothian Chambers, on the Royal Mile. "Somehow, walking in my kilt through this public park with my groomsmen was the moment it all became real."

The big surprise for the guests was yet to come. The bride Annabelle arrived in a 27'6" long, red London bus! "So many of our guests came from beyond Edinburgh. It's such a beautiful city, we decided to take them on a tour between the ceremony and reception." It was only a short 45 steps from the bus to the end of aisle with her dad. "He wasn't 'giving me away' as such, but it was really a lovely moment to share. I really just remember how proud he looked."



The pair opted for an 'unplugged' ceremony but it was their first kiss (at 14:52), which has become part of the way they would commemorate their day. "Maybe to some people the time doesn't matter, but once the ceremony started, we weren't aware of it at all, so it's nice to have this marker. The kiss is the romantic part of it. 14:52 is probably now the most important time of our anniversary."

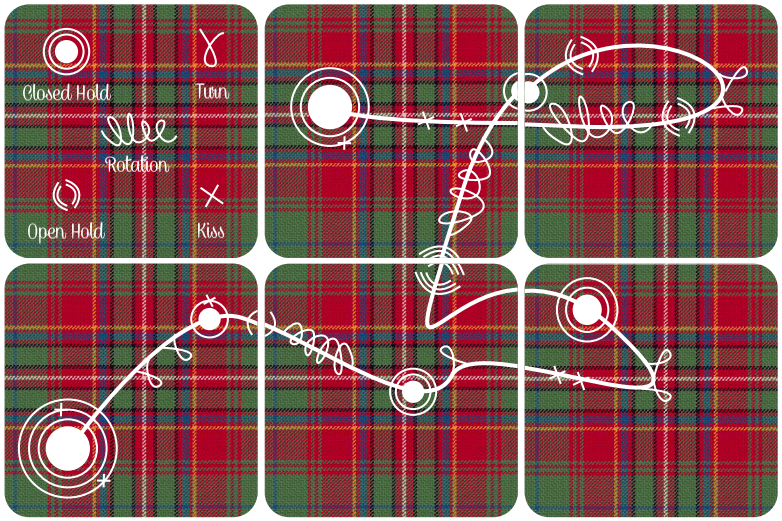
"We chose a fine art style photographer and trusted her to capture a unique interpretation of the day. The data Abacus can provide feels like another interpretation again. When we first sat down with our datagrapher, we realised just how much we could record. We really tried to pare it down to things that would represent us and our wedding in an interesting way. Some are just quite funny, like the bar spend. Others are talking points. Heartrate is like - who was the most excited or nervous?"

Figure 29: Annabelle and Calum's final six-page wedding article, printed in a B5 brochure.

Neither Annabelle or Calum had recorded any data about themselves before, but were instantly taken with the idea for their wedding. "Even smoking cigars, it's just a small detail, but it tells its own story of the ebbs and flows of the whole night." It's a different way to remember than just photographs. "We asked our guests to suggest songs, and made a Spotify playlist. We've listened back to the playlist a few times, and with the data captured from the dance floor, it helps us remember those highlights when everyone was dancing."

"14:52 is probably now the most important time of our anniversary."

Calum



"We wanted it to be something we could share."

Annabelle

"The difficult part was deciding what to do with our data. We couldn't imagine firing up the laptop to look through it. We wanted it to be something we could share, and that people might actually talk about when they came round!" The coasters of their dance, and the bus infographic are now both proudly on display in their home.

Still, they aren't the first in their family to hold onto data about their big day. Tucked inside their wedding photos, Annabelle still has the receipt from her parents wedding venue. "They were £17.34 for 72 glasses of sherry and 12 bottles of wine in 1971. Our guests managed to spend £3,345 at the bar at our wedding - I wonder what the bill will be in another 45 years!"

• • •

7.5. Julia and Rowan

7.5.1. Introduction

Rowan and Julia heard about the project through a mutual friend of an Open Lab colleague. They also lived together in Edinburgh, and both had recently given up professional careers, to begin their own bakery business. They were planning a 'rustic and relaxed' wedding in May 2017, (eight months after our first meeting) in the grounds of a stately home in Yorkshire. Seeking to avoid *"stuffy"* formality, their wedding reception would take place in two tipis. As caterers themselves, food was central to their wedding – they chose their date based on the availability of their favourite caterers, the Hog and Apple Food Co. A smaller wedding, expecting around 40 guests, their wedding breakfast would also be informal, based around hog roasts, and sharing platters. So while finer details such as the table settings and timings were still to be decided, *"the big things"* such as the venues, their guest list, the dress and the photographer were all planned. However, as part of their relaxed day, they had in mind several *"quirky"* details: pimms and lawn games in the afternoon, a silent disco and 'cheesy chips' later in the evening. Rowan comes from a smaller family; Julia calls Yorkshire home and has more family nearby their venue. Her sister is a florist. Before the wedding weekend, they planned to go with her bridesmaids to Leeds Flower Market and do all the decorations and floral arrangements for the wedding together.

As for documenting the wedding, in Julia's words *"we're not photo people"*. So the couple wanted to prioritise naturalistic, candid photographs, and avoid the formality of corralling and lining their guests up. Instead they wanted a photographer who *"just takes pictures of, you know, the best man having a good laugh with one of the bridesmaids." (Rowan, Meeting 1).*

Their photographer will simply provide them with the photos, which: "*suits us, because we don't know what we want to do with them yet."* Like many other couples, they are also unsure whether to employ a videographer as well.

> *"Basically, I really want [a video], I think it's quite important. I think it will give a much more real view of what the day is actually like. But yeh, it's really expensive, and it's one of those things you don't need? And we've got the photographer, so… (Julia, Meeting 1)*

Video is an extra expense, and comes secondary to the arguably more official documentary of the day by the photographer. They would prioritise recording the moments of performance – the ceremony and speeches – because *"in 10 years' time, those will be the things where it will be 'I can't remember what they said.'"*

They described other examples of their photographer's work as *"quirky and interesting"*, which could be used to summarise much of Rowan and Julia's approach to datagraphy. More so than Annabelle and Calum, they had an analytical view of data; they were more interested in detail and 'breakdowns' of different aspects of the day. They imagined data being used to settle good-natured arguments about just how long they took to get ready. Like the video, it was another way to achieve a 'real view' of the day, but rather than being focused on moments of ceremony, their focus was more on bringing out interesting or unusual details about their day. Faith in a data-driven recollection of the day, was then counterbalanced by this focus on playful topics.

> *"The times and everything, I just think it's funny. I don't want it to be that serious. I think all the ones I chose are a bit like it's going to be a bit of a laugh." (Rowan, Meeting 1)*

The Abacus Data Cards helped them see broad possibilities for the data they could collect. In particular, they were drawn to datagraphy they perceived as providing detail they would not otherwise have had, especially regarding time. Once again, many cards were chosen that reflected aspects of their identities. Rowan being a bad dancer ("*a bit of a shuffler"*), or having a higher heart rate because he dislikes attention; Julia coming from a large family and having Yorkshire roots.

However, Rowan and Julia flirted many times between data that was 'interesting' and data they would want to remember, (or remember with). Clearly in the midst of planning, and anticipating the day, much data which offers detail about what 'actually' happened would seem of interest, but it might not be meaningful in the longer term. Discussing the work of a datagrapher to either curate their data, or simply hand it over Julia remarked:

"I prefer to have all the data, and then pick and choose from it. But that's because I find that kind of stuff really interesting. Like even the boring stuff would be interesting for your wedding. But that's probably because I'm a little control freak." (Julia, Meeting 1)

But what is 'interesting to know', and what is 'to be remembered' are clearly more related. It is interesting to compare how one remembers and event, with data that depicts it. Talking about being 'into' weather, Julia goes on:

"[The weather] is something that I would remember anyway, but it would be nice to know. 'Oh, remember what a beautiful day it was. Or remember when it rained and soaked everything!" (Julia, Meeting 1)

Julia's remark suggests a distinction for her between remembering the weather, and knowing what it was like. As if the data about this would give authenticity and validate the way she remembered it, and then be an index for the further recounting of those memories.

Julia and Rowan also frequently related remembering to detail, and they perceived data as very specific, detailed information about their day.

"Because this information is so specific, I think it really helps you remember stuff more. I also think that a lot of pictures will be of moments that you don't necessarily remember […] I think this will be a little bit more like 'oh yeh, that was that time, that was how long it took me to get ready'. Do you remember? I think it will help us remember stuff a lot more." (Julia, Meeting 1)

Julia suggests here that because data is so specific, it helps or even forces a more detailed remembering, perhaps in contrast to the impression formed by a photograph. So, while a photo might not associate with any specific memory, data would clearly point to and structure remembering about the day. They are hence, arguably, achieving different things.

7.5.2. Wedding Timeline

The first data artefact designed for Julia and Rowan was a timeline (Figure 30) of *"interesting little things" (Rowan, Meeting 1).* More than just the traditionally important events, the timeline portrayed amusing, unique or infelicitous moments that reflected their aspirations for the relaxed and informal nature of the day. Like Annabelle and Calum's bus, Rowan and Julia had envisaged something that they could frame, and display, as summative of their wedding. It was also an opportunity to incorporate interests they expressed through their choice of cards. The timeline, and its specificity, is perceived as an authoritative record of what happened, to be contrasted with the timings as they were anticipated, or as they were remembered in a blur after the wedding.

> *"That would be interesting, especially your timescale of the day, you think it's going to happen in this time. How late actually were you? How long did everything take?" (Julia, Meeting 1)*

Data about time in particular, was hence seen as fixing and structuring an impression of the day, which would otherwise be very fluid. The couple saw this as particularly interesting for those who weren't there, such as kids, and as something to put other mementos like photographs into a better context. Clearly other data besides the time could be included here. Julia has an inherent curiosity about weather, but she proposes that weather data would be valued where it evidently related and indexed other events.

> *"It would depend on what the weather was like during the day, which is obviously hard to know. But say it was raining, until it was time for the lawn games, and the sun came out, that would be interesting." (Julia, Meeting 1)*

Hence, a timeline such as this, would presumably be carefully curated by the couple and the datagrapher sometime after the wedding day. Each of the chosen events, clearly signals particular values (being alone together) or references particular stories (granny interrupting the speeches). It would also be constructed to reinforce and remember the parts of the day that were most meaningful for them. And the choice of more infelicitous moments is not only more interesting and amusing, but offsets any potentially imposing formality or sense of an agenda.

So, while the timeline is taken as an authoritative record of the day, this is literally reframed by a very particular construction and presentation of this record.

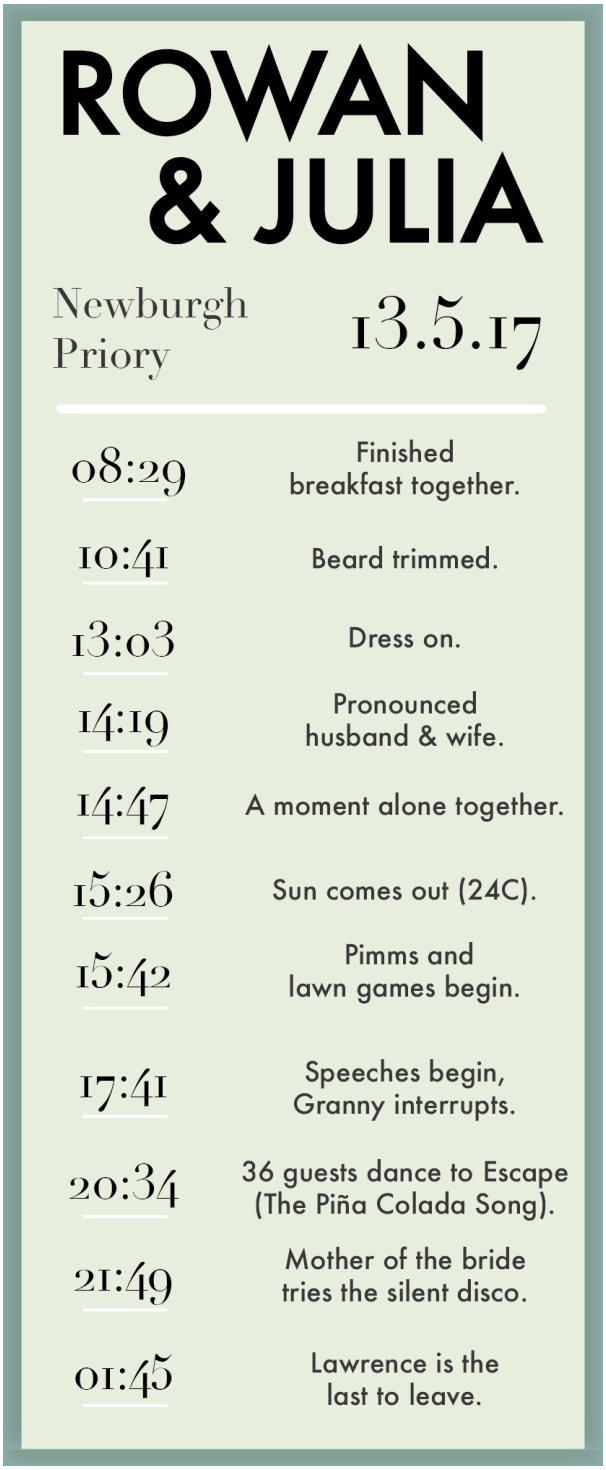


Figure 30: Playful timeline highlighting specific events during the wedding day.

7.5.3. Interactive Guest Travel

Like many couples, Julia and Rowan were drawn to their guests travel as *"kind of a sweet thing, to know how much people care" (Julia, Meeting 1).* They had fewer guests coming from far-flung locations, but were intrigued with the notion of people converging on their venue, and how they all got there. Rowan quite directly imagined this as an interactive map.

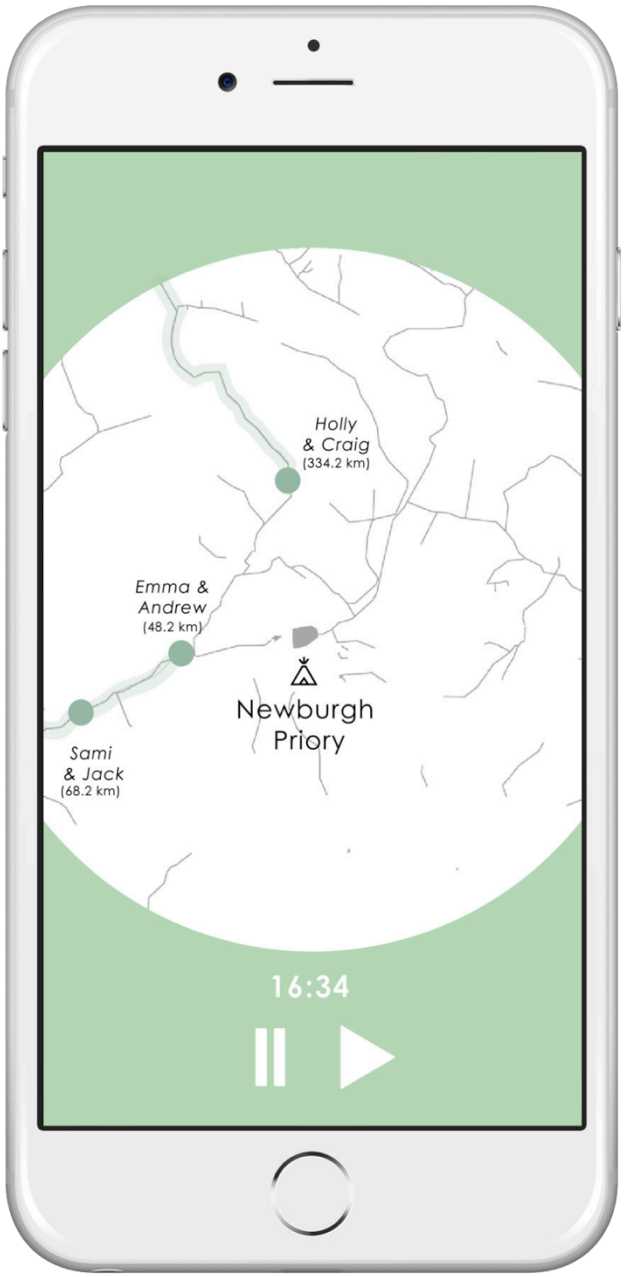


Figure 31: Imagined mobile application to watch the travel and arrival of guests to Rowan and Julia's wedding.

> *"The travelling of the guests – if there was some sort of interactive map, almost a google maps thing that shows the routes of everybody. Every individual. And then it would be funny you know because it's quite a small wedding, so most people know each other, or know of each other, and know what they're like. It would be nice to click on the routes. It took them this long, for these reasons."* (*Rowan, Meeting 1)*

Evident in this data artefact (Figure 31) is a focus on detail, data about individuals, and making something interactive, which could be explored by them or their guests. The couple imagined the detail of some of this data to be quite amusing, as guests took circuitous routes, or stopped multiple times. Such a representation also recalls travel as a frequent conversation starter, and even of interest before and during the wedding itself. In this way, *"it would be really fun to watch people" (Julia, Meeting 2),* and this would be interesting "*because we knew about them" (Rowan, Meeting 2).*

The interactive map could be played back as a video, and was imagined through a website or app. It might alternatively be imagined more ambiently, as a slow technology (Hallnäs and Redström, 2001). This reflects how Rowan and Julia imagined more of a digital life for their wedding data than Annabelle and Calum. Their data is hence seen as something exploratory, and even an alternative way to access or structure the many photographs from the day.

> *"The other thing with this map is you could have the individual routes for people and then when you click on that route, the pictures of them from the wedding could come up." (Rowan, Meeting 2)*

However, beyond exploring records through the app, turning to a physical form was once again proposed as a way of curating the data. At different times, the map, like the wedding, would bring quite different groups of people into relation, recognising the unique convergence of a wedding, as the *"first and probably only time we will have our friends and family (Julia) – all together. (Rowan, Meeting 1)".*

"If you had like an hour when there was a good amount of people who were quite close by, then that would be a nice thing to print out. Yeh it would be a nice sort of thing to be like oh look, that was 2 hours before the wedding!" (Julia, Meeting 2)

Therefore, snapshots of this map, would frame the event, and particularly the anticipation leading up to it.

7.5.4. Flowers Photoviz

As Julia's sister is a florist, the flower arrangements for their outdoor reception would be a significant and shared part of the event. The couple felt this could somehow be captured with data.

"Especially because me and Sarah will be doing them all. It will be nice if we could see how much work we'd put into it." (Julia, Meeting 1)

In this respect, the total number of flowers as an aggregate would be a basic reflection of *"Och, wow, we did loads!" (Julia, Meeting 2).* Following this, the "*breakdown"* of the different types of flowers would be of interest. Probed on what this data would add to the way the flowers were remembered, Rowan again saw data as another level of detail.

"*Some people remember things by what they see. But to actually have the detail of it would be a lot more vivid... I think the picture would be clearer in your mind if you knew exactly how many flowers there were." (Rowan, Meeting 1)*

Rowan is proposing that the detailed nature of data would actually make the image clearer in the mind; that data is iconically drawing attention and making clear what the flowers looked like, beyond a more general impression. Julia made a similar argument in relation to the graph of the dance floor:

"A thing like a graph of dance floor activity – you could look at that and be like, remember when that song came on and everyone started dancing and it was great. I think it would help you remember that more than if you didn't know that - otherwise just 'it was a great night, everyone danced all night'. But actually, no." (Julia, Meeting 1)

So bringing detail, Rowan and Julia imagined data about the quantity and variety of the flowers being bound up with photos of the flowers themselves, perhaps in an album together. My initial design response to this was quite simple (Figure 32) and required further iteration.

Discussing this further at our second meeting, we considered a closer integration of image and data.

> ***J:*** *The other thing you sometimes you see in magazines, is if you have like a kind of a graphic, like a drawn version of a flower, and you could have them different sizes, depending on the quantity.*
>
> ***R:*** *Like a bar chart, but it's the pictures.*

Figure 32: Original placeholder image proposed for a visualisation of the flowers at Rowan and Julia's wedding.

Nicholas Felton's examples of 'photoviz' (Felton, 2016), which illustrate the potential of this visual mixing of photographic images and data. I took a similar approach, in relation

to the particular flowers Rowan and Julia anticipated at their wedding, including Yorkshire roses, and Scottish thistles (Figure 33).

Many questions remain here: about how flowers are counted, by stem or flower head say; about what other photos and images this might relate to; and about how directly data like this annotates and burnishes detail about the flower arrangements in the way Rowan suggested it could. These aggregates reflect the work put in by Julia and her sister, but currently fail to capture the nature of the arrangements themselves. With authentic photos of the flowers from their wedding, it's also clear how the aesthetics of flowers could be better woven into a visualisation. Nonetheless, this data artefact illustrates well the potential for 'photoviz' as a more complex relationship between images and data than simply annotation or indexing.

Figure 33: Final 'photoviz' showing the range and number of flowers at Rowan and Julia's wedding.

7.5.5. Final Article

The final, six-page, printed article for Annabelle and Rowan is shown overleaf, containing a profile image, title, commentary and each of the aforementioned data artefacts.

THE BAKERS' BIG DAY

WRITTEN BY CHRIS ELSDEN

Rowan & Julia shared fabulous food under canvas in a rustic and relaxed setting.

Rowan & Julia were married at Newburgh Priory, North Yorkshire in May. "The venue was a beautiful stately home but our reception was in two giant (10.3m) tipis which really set the relaxed tone for the day. Beers in bathtubs, lawn games, a silent disco and gourmet cheesy chips."

Being bakers, food was a huge deal for the couple. "We actually chose our wedding date based on the availability of our favourite caterers, The Hog & Apple Food Co. It was all sharing food. We had Italian canapés, because we were engaged in Sicily, 15.8kg of different kinds of roast pork, and (of course) 52 individual Yorkshire puddings."

The happy couple used Abacus to record both the silly and the sentimental. "The time we spent together just after the ceremony was some of the most special, just taking it all in" said Rowan. "We found out later from our datagrapher that we only actually spent 9 minutes alone together throughout the day."

Julia's sister is a florist. "Doing all the flowers together was such a lovely part of the preparation. We really wanted something to reflect that. The data about the flowers signifies their place on the day and we remember them quite vividly."

"We liked data that gave a sense of how fun and relaxed the day was."

Rowan

"Data gave a kind of authenticity to these stories."

Julia

Figure 34: Final six-page article printed for Rowan and Julia in a B5 Brochure

ROWAN & JULIA

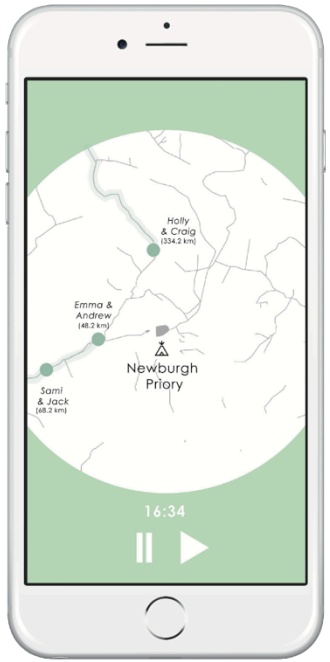
Newburgh Priory — 13.5.17

08:29	Finished breakfast together.
10:41	Beard trimmed.
13:03	Dress on.
14:19	Pronounced husband & wife.
14:47	A moment alone together.
15:26	Sun comes out (24C).
15:42	Pimms and lawn games begin.
17:41	Speeches begin, Granny interrupts.
20:34	36 guests dance to Escape (The Piña Colada Song).
21:49	Mother of the bride tries the silent disco.
01:45	Lawrence is the last to leave.

Before having heard of Abacus, Julia already knew that recording the weather was important. "I'm really into weather! I loved the way that we were able to integrate that into some of the mementos we have from the day."

15.8 kg of Roast Pork
81 glasses of Pimms
39 cheesy chips

"Our wedding was quite small and intimate, so most of the guests knew each other. We liked the data that picked out individual stories that we might have missed and made the day what it was. Our friend Holly had EIGHT slices of the cheese wedding cake. Lawrence was the last to go to bed at 1:45am. That kind of thing has been fun to share."



Guests who accepted their invite via the Abacus app could share their journey to North Yorkshire with Rowan & Julia. "The map was fun at the time, it added to the anticipation. But it's quite special to be able to play that back now, and see all these people converge on our wedding."

A detailed timeline of the day is a similarly tongue-in-cheek memento. "We don't have lots of pictures around the house, but the timeline is something nice and personal that people still talk about. There are important things like the time we got married, and our first dance, but also some more funny events, which give a sense of the day."

"Everyone has stories from their wedding that are embellished over time, but sometimes it's important to know what really happened – especially for people who weren't there. The data gave a kind of authenticity to these stories that get passed down – 'Yes your mum really did take that long to get ready!'"

◆ ◆ ◆

7.6. Reflections on Datagraphy

These Speculative Enactments with each couple were the culmination of a broad range of generative and speculative inquiry. To conclude this chapter, I wish to develop a higher-level analysis, reflecting on both my engagement with the speculation as a reflective practitioner (Schön, 1983) and my participants' responses to it. I begin by reflecting on the central values and motivations for documenting a wedding with data, which emerged particularly through participants and each couple's engagement with the Abacus Data Cards. I go on to discuss the distinctive qualities of 'datagraphy', and how quantified data was appropriated by couples to document their weddings. Lastly, I reflect on the importance of curating data that surfaced throughout the project.

7.6.1. Data as A Resource for Wedding Work

It is worth first considering the context of what it means to remember one's wedding, before considering the implications of data as a particular mode of documenting it. In general terms, all the participants who were engaged with the project painted a picture of weddings as wonderful but overwhelming experiences. Those already married variously described how the event flew by so quickly; it took a long time to truly appreciate and make sense of the day. Over time, memories of the day will settle into a series of anecdotes about key moments, and particular photographs will come to stand out. There are desires to relive parts of the experience, but this often unfolds slowly, in the months and years following the wedding, through many different instances of remembering with friends and family.

Hence, in a number of different ways, multiple forms of documentary and memento are approached as a means to simply gain some purchase on the most bewildering and remarkable day. But alongside this, the way their wedding is remembered, serves many purposes for a couple; to express and cement their newly married status; to carry on the celebrations; to share their experiences with friends and family; to relive some of the magic; or even to thank their guests. All manner of materials, mementos and documentary are brought to bear on this imaginative reconstruction. The necessity for this is heightened given the anticipation and spectacle generated around contemporary weddings, and their considerable expense (Otnes and Pleck, 2003).

There is therefore work to do, in relation to remembering one's wedding. But in return, these records do what one might call 'wedding work' for the couple. In this sense, to recall Harper et al. (2008): remembering a wedding is not simply a question of reminiscence, or reliving the experience, but becomes a resource for action. Couples have these actions at the forefront of their minds in documenting their day. The numerous decisions couples make before and after their weddings, about which photographer to hire, for how long, whether to record the speeches, which photographs to frame and so on – are all oriented towards accomplishing remembering that they anticipate being important for them.

But what this also means, is that the purpose of *documenting* a wedding is *not* simply to obtain a complete, unerring record of the day, but as a resource for particular kinds of remembering. This is an approach to documentary recognising that a complete representation of the entire wedding is inevitably beyond reach. The experience is always unfinalised, and is continually open to being made sense of by others, from a multitude of perspectives that evolve over time. As we shall see, this has important implications for the concept of datagraphy.

Photographers do not promise clients 'the most accurate record of your wedding', nor do they see their work as producing mere 'evidence'. Many see their documentary photography as an art – producing just one possible representation of the day. One photographer who took part in the pilot interviews described his role as *"taking the whole wedding, and breaking it down into small little moments, which together make the entire wedding"*. Another photographer prioritised taking *"one killer image"*. Indeed, some couples eschew too much documentation altogether, lest it diminish the experience *as remembered* or disturb their own *"holistic memory"* as one groom put it. Annabelle and Rowan's 'unplugged' ceremony suggests a more intimate affair, and prioritisation of the unique shared experience ahead of its capture. I became aware of avoiding data that has a totalizing effect or presenting things as unequivocally so, designing artefacts which actually created space for imaginative reconstruction.

On reflection, the real nub of the inquiry has been exploring how my participants and I could appropriate quantified data as a new resource with which to achieve this 'wedding work'. The bus infographic is expected to introduce *"this was our wedding"*. The ritual of

an anniversary kiss reaffirms their commitment to one another. The flower photoviz acknowledges Julia's sister and her unique role in the day. I propose that by analysing just how quantified data was imagined to do this, reveals different qualities of data as a documentary medium emerge, and offer design considerations for remembering a data-driven life.

7.6.2. Datagraphy as an Alternative Lens

Quantified data was viewed as offering an additional and alternative lens on the day's events. Datagraphy at the very least could be looked to as a further way to grapple with and pin down the momentous and defining experience of getting married. In the course of the speculation, datagraphy was rarely presented or interpreted as competing with other media. Of course, in practice, in terms of a couple's budget, space and time on the day, this may not be so. However, through the project, distinctive qualities of data became clear.

Presenting Detail

Datagraphy, and the suite of sensor technologies it presupposes, offers previously unobtainable detail about the day. Some of these capture details other media lack - playlists, or the distance of guests' travels, as one bride said *"photographs, it doesn't capture that at all"*. But more often, data provided another focus on the details already captured by photo or video, by highlighting the exact moment of marriage, the colours of the day, or the precise number of steps down the aisle, or a first dance. In the case of Julia's flowers, the aspiration was that such detailed data might make remembering clearer and more 'vivid'.

However, it's also clear that on many occasions such details are simply 'of interest', (especially to those in the midst of planning, and excitedly imagining their wedding) rather than a particularly meaningful way of remembering the day, or connecting with one's experience. 'Steps down the aisle' was a commonly discussed example, but on reflection appears somewhat arbitrary, and disconnected from the momentous felt experience. As detail, data has explanatory power, but the challenge lies in identifying when such explanations are valued.

Contextualising

Relatedly, data could be a way of providing context, to the day as a whole, or particularly other media. Presentationally, data was frequently imagined alongside photographs, and perhaps to encourage an alternative reading or lens on the event. Indeed, photos and data mutually inform each other. Else, data as context might lend some authenticity to the way something had been remembered or recorded. It would embellish events remembered in more general terms, like a playlist; and crystallise those details that were remembered, like the weather.

This context could also play a more directive role in navigating one's records. Whereas photo albums or wedding videos entail a more traditional chronological narrative, data could provide a non-linear mapping to other media. Rowan and Julia's interactive guest map was proposed as a platform for photos of their guests; an interactive dance floor graphic could function similarly. Annabelle and Calum speculated about digital photo frames that might be related to their data.

So, data as context can be used to further situate particular interpretations of media, or it could be used to suggest a new orientation or perspective.

Pointed and Specific

However, in some contrast to offering explanatory context, data was also recognised for being particularly pointed and specific. Data might expansively be used to document every moment of the couple's whereabouts on the day – but this was largely eschewed. Instead, its value was to deeply and succinctly cut through to particular aspects of the experience. Couples pointedly directed and curated the cards and artefacts towards certain kinds of remembering. Annabelle and Calum were uninterested in their heart rate throughout the entire day, but valued it during the ceremony. Both the timeline and the bus represent a marking out of certain moments of spectacle ahead of others.

A contrast with video are illustrates the distinct specificity of data. A video demands performance at the time (Rintel et al., 2016), and dedicated attention to sit down and watch it later. One wedding photographer described video as "*impressive – it impresses emotion on to you"*. By contrast, he suggested photography was more extractive, and

candid photography allowed people to remember being in a particular moment. A number of others reflected this sentiment – that photographs, especially candid ones, could "*stretch a moment out"*, according to another photographer. In this way, they generate an imaginative space around them, which invites reflection.

The specificity of data, that it could be used to pick very particular details out, could work in a similarly extractive way. The form of the coasters literally breaks a visualisation up into smaller pieces, creating a playful ambiguity. The coasters are a quite precise, but much reduced resolution of the first dance, when compared to a video, which captures every shuffle. But such a video could not be on display in a living room the way that the coasters can; it would demand much too much attention. Several of the data artefacts, show the value of things which can be encountered easily, but are open to a range of responses, from ignorance, to speculation or a vivid recollection.

7.6.3. Data as Icon, Index and Symbol

Another approach to understanding how data is interpreted towards remembering comes from Charles Peirce's semiotics (see Atkin, 2013). Like Petrelli et al.'s (2009) time capsule study, engagement with the Abacus Data Cards and through the enactments, probed participants on approaches to intentional capture. This invites an analysis of how data was considered as an icon, index or symbol for remembering a wedding[25]. In practice, a single artefact might possess elements of all three of these. Rather than a definite categorisation, this reflective commentary really considers the relationships construed between data, some phenomena, and a remembered experience.

Data as icon

To recall, icons resemble or imitate the object they signify. A photograph of the wedding dress or bouquet would be iconic. What does it mean for data to resemble or imitate aspects of the wedding day? Especially when data is already a form of abstraction? (Peirce reportedly recognised that 'pure' icons were rare if impossible to find, (Atkin, 2013), as all representations admitted some form of abstraction).

[25] Peirce's typology of signs offers many further sub-categories of signs, to reflect the diversity of possible relationships between a signifying element, the object and its interpretant, but these are beyond the scope of this analysis.

Examples might include the coasters map of the first dance, which closely imitates the path and actions taken. The notion of representing flowers data with 'photoviz' seeks to resemble the aesthetic of the flowers themselves, through their visualisation. Rowan's aspiration that this detail makes their memory more vivid relates to the data aiding an iconic representation. Other details such as the illustration of the bus itself, or the incorporation of the colours of Calum's tartan, or even a colour wheel of the guests relies on their resemblance to the objects they represent. These were used here primarily as a means to offer a personal touch.

Data as index

Often the result of a measurement of some kind, much data was interpreted as an index, which relates causally to a phenomenon. Artefacts like the bus and the timeline were indexes in a more literal sense too, as they provided a summary, and referenced many different aspects and events of the day. Similarly, a graph of dance floor activity was hoped to index highlights of the playlist. So too the heart rate, which was expected to index excitement or nerves of each partner in the run up to the ceremony. An index like this might be viewed as explaining or evidencing a phenomenon, especially as an annotation or context. Representations of guest travel were an index to recognise their efforts. These too, could literally index photographs and other datasets.

However, a key factor here is the extent to which data really does indicate a phenomenon. How well would dance floor activity as a metric of popularity truly capture memorable experiences of dancing? The travel of elderly grand-parents might mean much more than that of youthful international cousins. How could data be crafted to reflect such distinctions?

Participants were quite aware of these troubles. Annabelle and Calum had a long discussion about the potential meaning of data about cigar smoking. The initial measure of just the time taken to smoke a cigar was disregarded, because it was seen as more arbitrary – it couldn't be taken to index, or symbolise anything of note. Instead, a measure of '*what times people were going'* was proposed that could support an interpretation about the flow of the evening. Hence, data needs to be captured and represented in a way which indexes values and experiences that actually matter or can be made meaningful.

Data as symbol

As a symbol, the data is only meaningful when couples could recognise and interpret another, less direct meaning. The bar spend is an index of alcohol consumption, but this was intended to be symbolic of the extent to which people partied and enjoyed themselves beyond the ceremony. Playful details from Rowan and Julia's timeline were together symbolic of the rustic and relaxed values they aspired to for their wedding. Data about individual guests was often imagined in a symbolic way –reflecting that they were a glutton, or a wild one. But it would require knowing Holly, for example, to know what her eating eight slices of the cheese wedding cake *really* meant. Annabelle and Rowan's first kiss was constructed as a romantic symbol for the whole ceremony. Kissing again at that time the following year would only mean something to them, because they recognised it as a commemoration of that ceremony. In this way, symbolic data like this was constructed and invested with meaning by the couple.

Lastly, we can reflect that data as an icon, index or symbol also reflects how much data requires interpretation. Icons almost illustrate their own literal meaning, while symbols require a great deal more 'data work' to translate and develop their meaning and relation to the phenomena they signify.

7.6.4. Realism, Magic and Poetic Data

This question of interpretation and symbolism also relates to the extent to which couples seek realism in remembering their wedding. Massimi et al. (2014) describe the fine line couples tread between the 'magic' and anticipated spectacle of the perfect wedding day; and being authentic, pragmatic and real. Hence according to one groom: "*you want it to be real, but glossy"*. This applies to the way a wedding is documented and remembered too; aiming to portray the magical nature of the day, and make the magic last, but also to capture who they really are and what really happened on an overwhelming day.

Data approached as an icon and or an index sees datagraphy as a source of realism. It produces a potentially authoritative account of the day, which could make memories, about for example the weather or how much people danced, feel authentic. Such realism might also be a source of contrasts, and a way to explore a different perspective to the day, or even contest one's own memories. These both reflect a desire for some record of what the day was 'really' like.

Nonetheless, reality clearly has its limits. Just as a photographer would avoid photos of people eating and unflattering dress mishaps, so datagraphy would be expected to show the day in its best light. For example, data about anyone "*having a bad time" (Calum, Meeting 1),* or which focused too much on money, or someone leaving early would be avoided. Datagraphy was of course to be oriented to what people wanted to remember or portray; but the more authentic this could be the better.

In particular, data which was more symbolic, or carefully constructed, reflects an effort to align the sought-after ideals and values of the day, with the way it is recorded. Rowan and Julia's timeline, offers realism as a direct account of when particular events happened, but the choice of those events as the playful rather than formal parts of the day, aim to portray the 'rustic and relaxed' nature of the affair.

The coasters, an illustration of the path of their dance, allow the couple to idealise and romanticise their actual potentially awkward or unimpressive dancing. Julia imagined framing a particular moment from their map when most of their guests arrived. The rising heart rates on the bus construed a narrative for Annabelle and Calum, but were the reality that their heart rates changed little, perhaps they would not be portrayed on a statement piece like the bus.

These examples all recall Bartlett's characterisation of remembering as being "*the relation of our attitude […] to a whole active mass of organised past reactions"*. The data now arguably forms a part of these reactions, and their framing in these mementos is in relation to an anticipated and situated set of values, or 'attitude', of the couple.

However, despite the subjectivity in what data is picked out and how it is represented, there remains strong expectations that the data retains some basis in reality. Within reason, the actual time of Annabelle and Calum's first kiss, does not hold any particular meaning. It could be 14:19, or 14:29, or 14:39. But couples would absolutely expect that this would be based in reality - that it was essentially true. These differing approaches raise questions about how much *realism* couples demand from data, and when this realism comes to matter in remembering. Helping couples navigate these lines of the real and the ideal, with different data sets and artefacts, would be a key skill of a datagrapher.

Poetic Data

In the role of a datagrapher, I found this balance in what one pilot participant described as a 'poetic response'. This is not simply to romantically propose *data as art*: rather, to highlight the way data can succinctly distil some essence of the experience. Masses of data could be constructed as 'true' and based in reality, but evoke almost nothing of the experience, hence meaning little in this context.

Cartier-Bresson (1952), French master of candid photography, describes his work as searching for the "*decisive moment"* to take a photograph. This would recognise *"the significance of an event as well as of a precise organisation of forms which give that event its proper expression."*

The wedding datagrapher is not a scientist or a technician, mechanically logging each event for a detailed analysis. Just as the job of a wedding photographer and a police photographer are utterly different. Part of the datagrapher's presumed skill is being able to capture and present data that *"give that event its proper expression".* This data could be very specific, or subjectively presented in a way which magnified an ideal aspiration of the day. Likewise, Massimi et al. (2014) emphasise the recording of *"special moments of spectacle that act as indices into the event.* The forms of data chosen for Annabelle and Rowan's bus seek to do this. Like a collage, we imagine a new detail drawing attention at each glance, offering numerous talking points. The data should be real, but its meaning is presented poetically so as to be properly situated and determined.

Cartier-Bresson's perspective emphasises the art in cutting out these decisive moments. The interaction couples had with the cards, and the imaginative construction of their wedding through a series of data points reflects such a cutting out. Further, as the couples sought to turn documentary to wedding work, datagraphy was more concerned with the experience of remembering than with its precise recall. Most of the strongest examples of the potential value of datagraphy stem from those memories that bring joy, comfort, or a shared sense of identity, even if the details might become hazy, or change over time. Hence representations of data that seem to aptly sum up a couple, or that chime with visceral experience-as-remembered, became more valuable than even data that gives a more purely 'accurate' picture of the day.

7.6.5. Curating Data

Taking the notion of poetic data further really concerns the way data can be curated. In the wedding context, curation particularly concerned marking things out as worthy of recording in the first place; such choices already invest meaning and expectation in the data. Secondly, curation was about the way data was represented and shared.

There is a clear contrast between the vast capture and analysis presumed by a Quantified Self, and the much more selective approach taken here. Even prior to the wedding, there was a sense that datagraphy would be clearly focused. While technical discussions were largely avoided (and might entail vast data capture for example from the venue), these data flows were seen as a range of sources from which to produce particular data-driven accounts of the day. This is resonant of the way Smart Journals were a way to curate an account of experience, from many potential flows of data and content.

Still, it is curious to consider the extent to which couples would be aware of this data collection on the day. A photographer's shot list is a similar exercise in determining the documentation couples want. But in practice, the photographer and ushers carefully orchestrate getting people in the right place at the right time to take those photographs. Datagraphy was assumed to be less obtrusive, and perhaps more objective. The enactments though did not explore the experience of datagraphy capture, rather what that capture would mean.

Curation through representation was most apparent in the extent to which couples turned to physical forms of data in order to give it a fixed state. Of course, this aped the tangible nature of the project, in regards to Abacus Data Cards and the production of an article and brochure. It also met existing cultural expectations around printing, framing and displaying wedding mementos in the home. Nonetheless, it was striking how committing to a particular physical form enforced curatorial work, and making active, subjective choices about data's embodiment. In so doing, these forms became invested with meaning and personality – they were very directed towards particular kinds of wedding work. It's clear that data could then *settle in place* (Taylor et al., 2015) as part of the rituals and anecdotes, which develop in the couple's practices of remembering their wedding.

Neither couple expressed much serious interest in a dashboard for example, or returning to their wedding data for in-depth analysis (even if they might assert that they would like to possess all of their data in some form). Data in this state seems too complex and too unresolved to have a settled meaning, upon which remembering could be constructed. Like the past itself, this data seems like a 'whole active mass', much of which, in Bergson's terms (Middleton and Brown, 2005) is necessarily held back, in producing any clear account. Curation then means simplifying, resolving and articulating particular meanings from this data, which then become more stable as personal records, and embedded in the 'organised settings' which structure remembering.

Considering the service as a whole, the project raises intriguing questions about *who* plays this curatorial role. A photographer is usually trusted to take, edit and curate the best few hundred photos, but some go further than others in producing albums or framings for these. And when photographers give couples 'all' the photos, this still precludes significant processing work in 'cleaning up' and the removal of duplicates, test shots etc. Such laborious work would obviously be required in processing data, whatever its outcome. Yet of course, just as a photographer chooses their 'best' shots, to what extent would a datagrapher be expected to showcase the best or most compelling data, or to validate or show their work?

Through the enactments, the datagrapher was imagined to work in quite a bespoke way with each couple, helping them carefully decide the data they should track, and how it might be materialised. Differing degrees engagement in this process can be imagined. Couples might artistically work or direct the datagrapher or they might simply choose from a range of pre-selected products, upon which their data is overlaid. Both couples raised the prospect of returning or reworking data to produce data artefacts for an anniversary, reflecting an imagination for an ongoing role for a datagrapher in stewarding and curating their wedding data.

7.6.6. Summary

This commentary has sought to bring together the experience of participants in the study, with the design-led understanding I developed through the course of the project. Speculative Enactments offered a template for creating meaningful experiences for participants, amidst this speculation.

In summary, the choice of cards (Appendix H) and resulting data artefacts, showed couples engaging with data as a resource for doing different kinds of ‘wedding work’. Largely complementing other media, data was viewed as an alternative lens. Its quantified nature was perceived as being detailed, but couples sought to leverage this as specificity. In different instances, data was recognised as an icon, index or symbol; sometimes all three. Each of these entails differing degrees of interpretation, which reflects how couples tread a fine line between the real and ideal in planning and remembering their weddings. Data in particular was expected to be a source of realism, but both couples crafted their data to reflect their ideals and the anticipated magic of the day.

Making sense of my response to this, I describe a more poetic approach to data. This reflects that the real art, skill and meaning of datagraphy would be in subjectively choosing and framing particular configurations of data, in a way which gave an event its ‘proper expression’, while aligning with the values and ideals of the wedding day. This highlights how much the discussion and work entailed in documenting a wedding with data is curatorial. However real, or accurately portrayed, data became most meaningful to remember when it had been curated, and could develop a settled place in an unfolding and imaginative reconstruction.

As acknowledged previously, weddings are simultaneously expected, but extraordinary events in the course of one’s life, and perhaps the most recorded. Their special status provided the foundation to explore an exclusively documentary role for data. In my final discussion, I want to extend these comments above to consider data as a documentary medium in the everyday, in relation to the Studies 1 and 2, and the aims of the thesis as a whole.

Chapter 8: Discussion

8.1. Introduction

This thesis set out to explore more complex relationships between people and their data, through studies and design-led speculation about the experience of remembering a data-driven life. A data-driven life, epitomised by the Quantified Self movement, is notionally founded upon rational scientism, allied to faith in pervasive sensor technologies. However, a weight of sociological work shows not only the constructed, contested and situated nature of data, but also a recognition that "*...the relationship between so-called objective data and so-called subjective experience is hardly a zero-sum game for many QSers, but rather a tension and a negotiation that produces meaning, a process that QSers are often aware of partaking in." (Sharon, 2016, p.114)*

In contrast to more short-term and goal-oriented stage-based perspectives, (e.g. Epstein et al., 2015b; Li et al., 2010a), this suggests a wider continuum of experience through interactions with data. Rooksby et al. (2014) argue this through identifying a range of 'styles' of self-tracking. Of particular note, they remark a documentary style of tracking, where the focus was documenting activities, rather than changing them. Together, these styles articulate a 'Lived Informatics' perspective, which recognises that – whatever else they are ostensibly *for* – interacting with self-tracking tools can and will afford all sorts of other experiences.

One of those experiences is remembering. Remembering in this thesis was understood through a broadly socio-cultural lens, drawing particularly on the work of Bartlett (1930), Middleton and Brown (2005) and Harper et al. (2008). To remember was presented as an imaginative reconstruction, which is present-oriented, situated, and a resource for action. Setting this alongside quantified data, my inquiry has focused exactly on the tension and negotiation with data that produces personal meaning.

Fieldwork in Study One demonstrated how the long-term use of personal informatics tools can accumulate a quantified past, which can be appropriated and made meaningful through data-work. A second study of smart journaling applications studied those who record their lives more intentionally, and increasingly draw upon a flow of different

media to do this. The final design-led study turned to an acute documentary context, weddings, to directly address the question of how personal informatics can be appropriated and designed as a technology of memory.

The progression of these studies reveals a growing focus throughout the thesis on more intentional efforts to record one's life. This choice reflects the value of remembering as something active, and present-oriented, rather than a more inert and purely retrospective act of recall. It also invites an alternative, experience-centred design of personal informatics tools, rather than countenancing only the implications of the current goal-oriented paradigm.

To that end, I want to use this discussion to introduce more directly a proposition for a new class of informatics that I coin as *'Documentary Informatics',* which reconsiders personal informatics tools as technologies of memory. This extends the notion of Lived Informatics by suggesting not only that self-tracking takes place over lived activities, but questioning how personal informatics can really address, and meaningfully portray lived experience. A data-driven life prioritises and presents broadly scientific answers about one's life. However, as contemporary philosopher Ray Monk wrote in Prospect Magazine:

> *"There are many questions to which we do not have scientific answers, not because they are deep, impenetrable mysteries, but simply because they are not scientific questions. These include questions about love, art, history, culture, music – all questions, in fact, that relate to the attempt to understand ourselves better."* (Monk, 1999)

Hence, despite the vaunted ambitions of data-driven life and work, there seems little opportunity to be artistic or perform with data, and for data to be used to express, reflect and appreciate the nuances of everyday life. By inquiring about the experience of remembering I have sought to pose these different questions of data; 'Documentary Informatics' is a design perspective which endeavours to reflect this.

8.2. Documentary Informatics

Documentary Informatics are tools that use quantified data primarily to document aspects of one's life, rather than to necessarily diagnose or change it. I will first set out the aims and priorities which distinguishes Documentary Informatics, I will then offer more concrete recommendations and opportunities for the design of Documentary Informatics (responding to RQ2), and reflect on the limitations, future work and novel methodology of the thesis.

8.2.1. Documentary Informatics as Selective

The idiographic approach pursued throughout this thesis shows the remarkable diversity of data that can be meaningful to remember. And like other records, participants drew on their data for all manner of reasons. In Study One for example, a quantified past could be a source of motivation, a way to recognise progress or to account for an illness. In Study Two, diaries and journals affirmed a life well lived, offered perspective, or familial reminiscence. The final design-led study saw couples look to undertake a variety of 'wedding work' through datagraphy.

However, whatever the intention, there was a common practice in the way people related their data to experience. Almost universally, participants were selective and extracting. They would pick certain data out (e.g. a graph, a figure, a date, a pattern, a statistic), be specific, and resist views or portrayals of data which was exhaustive and deterministic. As such, meaningful remembering with data was rarely subject to calculations and analysis, rather it was related to specific qualities and events – as an icon, index or symbol.

When making meaning from quantified data they had accumulated, Tanya highlighted her first run since moving to the UK; Leanne picked out a birthday lunch; Peter recalled 'certain stats' from some of his rides; Joanne identified data from a triathlon victory. Data which could not be extracted and specifically related in this way otherwise remained *"so anonymous"*. For diarists and journals, even where its use was limited, quantified data was a way of extracting detail – the date of a bank robbery, the map of a road trip, the price of a bottle of wine, golfing scores and records.

Indeed, Middleton and Brown (2005) describe extraction and dissociation of events from the whole mass of the past as a key feature of remembering:

> *Our memory of events, then, involves reconstruction – we artificially extract or dissociate past events from the otherwise interconnected tissue of duration in order that they can be reinserted into the demands of current circumstances.* (p.141)

Similarly, then, remembering with quantified data means selecting a particular framing of data, and creating new relations towards present circumstances.

This is a significantly different approach to the way 'big data' is analysed, or the production of a quantified self is motivated. Typically, the emphasis is on gathering more data, and greater integration between applications and data sets. Through such integration, data is made more abstract, more commensurate and further from lived experience. In this way, entirely new metrics are fashioned. Such collation then affords new kinds of analysis, correlations, comparisons. But while analytically powerful, such an assemblage – abstraction upon abstraction – seems antithetical to remembering personal experience. Rational insights are quite different to imaginative reconstruction.

As records, the largely passive accumulation of data, often from a third-party perspective, contrasts with point-and-shoot cameras, journals and mementos where people can consciously choose, frame or develop particular constructions of the past, ahead of others. As Lily in Study One remarked, photos *"pick out particular moments and episodes"*. When confronted with a quantified past, participants undertook data-work to *rhetorically* select and then negotiate and construct meaning from their data, in the context of the interview.

Documentary informatics can hence be understood as an effort to *materially* support such selecting and framing as a poetic and personally expressive activity. In so doing, data-driven accounts of the past which maintain a real purchase on the present can be constructed.

8.2.2 Documentary Informatics as Constructive

It was rarely enough just to be selective. Recall that the data from personal informatics tools alone cannot produce verisimilar accounts of real life, and certainly not accounts

which bear present meaning and relevance. Recalling Sharon once again (2016), participants demonstrated *"an open-ended aesthetic [from their data], one, where identity is constructed and curated, the product of quantitative and qualitative piecings together" (p.23).*

Remembering with data is equally a product of such 'piecings together'. Specific data, such as that embodied by the Abacus Data Cards, is recognised as having a potential weight or meaning, and then provides a structure or foundation for remembering. Perhaps the data provides a series of anchor points, an intriguing contrast to familiar opinion, or simply affirms the authenticity of an account. Photographs and other mementos also act in this way, and one reading of couple's understanding of wedding datagraphy would be as an effort to transfuse quantified data with some of the qualities of familiar technologies and objects of memory. The distinction of quantified data was to be a source of detail, specificity and to have a summative and condensing effect which photographs or objects occasionally lack.

The way participants made accounts with data, and the resulting data artefacts from the final study, offer some basis for how Documentary Informatics can support the framing and reconstruction of remembering. Firstly, by constructing data as something that is easily to hand, or even on display; rather than in 'deep storage', or indistinct logs. For Tyler, immediate access to his journal in Momento, transforms the way and occasions on which it can mediate remembering, especially socially. Annabelle and Calum wanted to create 'talking points' which would simultaneously settle in the fabric of the home, but drift in and out of attention. With current personal informatics tools, data that has been screenshotted or shared on social media potentially gains new life, simply for having been marked out as somehow exceptional from other records. But a screenshot remains quite a rudimentary mode of doing this.

Artefacts like the bus infographic, the timeline, or a set of playing cards, suggest the role of curation in not only picking certain data out, but then presenting it alongside other data or media. The curation of heart-rates at four instances during the ceremony, suggests particular narratives, and framing of what that data might mean. Hence, one's heart rate shouldn't be considered in isolation, but in relation to other select moments, and the heart rate of ones partner. Smart journal users had a similar practice in curating the mass of

photographs in their mobile camera roll, selecting the best, or most appropriate for each day or journal entry. As participants made sense and meaning from their personal informatics data, the rhetorical work was in highlighting particular parts of the data together.

Lastly, the wedding project also sincerely pushed questions about the representation of data towards remembering. In Study One, participants remembered and worked with the data as it was presented and recorded in their self-tracking apps. Different views might be afforded to support remembering (for example Lily's graph of her historic weight loss over several months), but for the most part, there was little participants could do to craft, curate or be creative and expressive with this data as it was. Only one participant (Aaron, Study Two) had the experience and interest to actually work with his 'raw' data more directly, and make a map of his monthly Moves activity.

The wedding project explicitly sought to give quantified data particular material forms, oriented to remembering. Consolidating insights from the analysis this form-giving was putting 'data-in-place' (Taylor et al., 2015), and situating it for the purposes of remembering a wedding. Taking selected data, and making it matter, in both senses of the word. Taylor et al. (2015, p.2863) hence called for *"a reconceptualisation of data, one that accounts for the ways in which it is contingent on very particular circumstances"*. Remembering is often about being able to reconstruct some aspect of those particular circumstances: how many guests were up dancing; how tough it was cycling Coast to Coast; how far one walked sightseeing.

Documentary Informatics is about constructing data which is small, personal and particular, rather than something which has an *"intrinsic generality"* (Taylor et al., 2015, p.2863). The data appropriated in the wedding study was meaningful because it resembled something personal, indexed particular events they experienced, or offered some deeper, personal, symbolic meaning.

In particular, creating a physical form, did not only create an easily encountered memento, but forced curatorial choices to be made about the particularities and meaning of data and its circumstances. Once again, this was not an exercise in scientific objectivity, or even producing a fair representation. Participants in Study One used their

data poetically as the basis for remembering all manner of details about their lives, far beyond what the data itself portrayed. Couples sought to strike a balance between the real and ideal of contemporary weddings. This was a subjective, poetic and expressive activity to choose particular circumstances, meanings and relations they wanted to amplify and display as the 'proper expression' of some phenomena.

I now want to turn more practically to considerations for the design of Documentary Informatics which support selecting and constructing meaningful accounts of the past.

8.3. Designing Documentary Informatics

Documentary Informatics pertains to both the design of new curatorial interfaces to the record; and to design that motivates the production of data which is documentary from the outset.

8.3.1. Curating Documentary Informatics

The notion of personal curation has been a recurrent theme throughout this thesis, which I described in the literature review as a long-recognised challenge in research on digital possessions. Participants in Study One showed few examples of curating their data, and little 'curation-through-use' (Zhao and Lindley, 2014). As much self-tracking is passive and automatic, the role of exactly what to record and how is largely passed onto the device and software. While different kinds of social media might set a high bar for the content which is posted and maintained, personal informatics tools typically advocate the collection of as much data as possible, often without the user's active and subjective selection. Such comprehensive and effortless tracking is clearly a significant feature for the everyday use of personal informatics tools. For many, deleting or editing data would be antithetical to the aims of their objective self-tracking.

However, for Documentary Informatics, curation means being able to be select and frame particular facets and perspectives of one's data.

Navigating Data

In the first instance, data should be navigable to pursue and seek out particular *threads of history.* When developing a narrative account of one's data, the presentation of several apps made this challenging. Participants frequently sought and oriented to specific

remembered events, but these were often hard to distinguish. In some interfaces such as Moves and MyFitnessPal, the 'daily lifelog' view made locating unique events quite laborious. These apps are designed to support daily monitoring rather than looking further back. Frequently, as in Tanya's narrative of running, it was firsts, and times of change that evoked rich narrative. Novel and one-off events were evocative, but there was also an inclination to pursue particular strands of history. For example, Darren desired a view of all of his listens to one particular band, rather than a somewhat random weekly snapshot of past listening. Such a view would reflect a personal history, with that band, and open up a range of narratives about when he had listened to them and why. Records can be important too, and are one of the key ways of encountering historical data, but other distinctive features might be drawn out, such as all instances of running in one location, or timezone; or some other user-defined category such as 'Munro Walking' or 'Meals Out'. While the overall chronology of the data would likely remain important contextually, a daily chronology emphasises routine much more than anything else. For Documentary Informatics, navigating around and then demarcating this routine into distinctive events should form a basis of a personal curatorial practice.

Selecting and Editing Data

Beyond this, there are opportunities to consider separating or breaking data down into constituent elements, so that it might be remixed and mashed up. The focus here is on making data small and particular, and affording novel, expressive interactions with it. In many current Personal Informatics tools, data is presented largely as is, with the intention to motivate, or support a quick check up. The aesthetic and emphasis of the interface in such cases if often to offer clarity and precision. But what would it mean for people to be able to question, twist, reshape, filter or make playful their data? The Metadating study (Elsden et al., 2016), which was formative for the development of Speculative Enactments, invited the hand-drawing of data, and afforded much more expressive, and particular orientations to data. Consider the way that Lily consistently reshapes the graph of her historical weight loss to emphasise her initial successes. Although the same data, it is this particular view and framing which is meaningful to her to revisit. So functions as simple as zooming in and out, setting data along different timelines, or filtering data for particular features or records offers means to be more selective, and to extract data such that it better fits the cloth of the present at hand.

Taking this further, manipulating ‘raw’ data to create novel visualisations may seem beyond the ken or interest of many users. Still, using Adobe Photoshop would have seemed (and still is) beyond most mobile phone users 10 years ago; yet many of the features of Photoshop are now commonplace through basic editing, and the application of filters. In short, rather than being taken as given, if the data that was produced by personal informatics tools could more easily be picked apart, edited and remixed then it could be put to many more documentary uses.

There are opportunities to consider automated actions or ‘curatorial agents’ (Gulotta et al., 2015) to this end. The HeyDay journaling app appeared especially effective at encouraging curatorial engagement and self-expression with an accumulated camera roll – turning photos into attractive and easily edited montages for each day. There is an opportunity then to explore curation of data which is more rewarding than simply ‘data cleaning’ – to give people a sense of crafting and authoring their content, perhaps supporting various aggregations and (temporal) resolutions on the data.

Alternatively, there may be space for professional services which support such editorial actions. Digital jewellers Meshu (meshu.io), use location data and check-ins to ‘*turn your places into beautiful objects’*. Clearly Abacus’ services would be in this mould, especially in offering anniversary products, which reinterpret and enliven historical data. Of course, these new editorial roles raise questions about the extent to which authorship or curation of documentary informatics can be distributed.

Narrating Data

Besides editing, we can consider more constructive actions. Triptychs have long been a way of presenting narrative or communicating an idea with art and photography. Few such applications exist for data. What would a ‘data triptych’ resemble? Modes of annotation, captions, drawings and means to relate data to other media, particularly photographs, would all extend their documentary power. The collective effect of these constructive actions is to develop one’s unique perspective on what the data depicts and represents. To recall Mallon’s invocation about journal writing, to say “*this is what I, rather than the Nikon saw”*.

If we think further about the kind of content this might engender, it may well become more shareable, as data is grounded and made more personally and locally meaningful. It might not be so egocentric, so mundane and so anonymous. Many of the examples of records that were meaningful for diarists and journalers were those that could be shared, or arose socially. Related work on remembering has urged the design of '*technologies for telling'* (Harper et al., 2008, Lindley et al*.,* 2009). Of course, were data shared more widely like this, it may also become curated-through-use.

A Documentary Informatics Journal

The curatorial features to select, edit and construct personal accounts of a data-driven life could be integrated into existing personal informatics products. But the networked position of smart journals also offers a model for a distinctive documentary informatics product. There are already many mobile apps (e.g. Gyroscope[26]), which seek to aggregate multiple data streams, towards new or better insights. 'Google Fit'[27] and Microsoft's 'Health Vault'[28] are similar propositions.

Participants' uses of smart journals was clearly situated alongside a range of other practices of creating, viewing, posting and sharing content on a smartphone, particularly photographs. As smart journals could be configured to draw upon multiple sources, participants frequently made nuanced decisions about how to bring these together into a coherent, curated, personal record. These range from 'cleaning up' to more attentive actions in choosing particular photos or data to include.

In contrast to a total capture or lifelogging perspective, smart journals suggest a more sophisticated approach to handling richer and ever expanding media and data archives. As what could be considered personal content expands, the idea of an entirely comprehensive archive feels increasingly out of reach. Instead, for smart journalers, the flow of media is one which they dip in and out of, whilst also choosing what to keep public and private. The value provided by smart journals as a technology of memory is sitting above this huge array of content, while providing a means of expedient access and organisation, as

[26] https://gyrosco.pe/
[27] https://www.google.com/fit/
[28] https://international.healthvault.com/gb/en

well as the opportunity to curate more meaningful collections. Being both expressive and more private, smart journals can become an alternative site for self-expression.

A journal for documentary informatics could be imagined to function in a similar way. As a separate, expressive place for documenting one's life with data; situated and working alongside individuals existing self-tracking practices (and their use of apps already oriented to behaviour change, health monitoring etc.). Some participants used multiple journaling tools for different aims and audiences. The extent to which participants were exclusive about what they recorded varied, and each journal maintained a unique aesthetic. A documentary informatics journal might be expected to express all these qualities.

8.3.2. Snapshot Datagraphy

While existing personal informatics tools and data can be appropriated and curated like this in a documentary way, there is a bolder position I would like to advocate. That is, to consider ways in which quantified data, and the act of quantified sensing and tracking might be conceived of as documentary in the first instance.

The rationale for this, emerged through refection on the actual practice of the Abacus service – what it would be like to actually practice datagraphy. It became apparent that preparing to capture data about the wedding event would often require anticipating things that would happen. For examples couples suggested that cigars were important, or that they were interested in the activity on the dance floor. Practically, these would then need to be attentively set up for measurement or observation of particular phenomena.

This marks a distince contrast with the much more flexible and responsive practice of wedding photographers. Akin to Cartier-Bresson (1952), the roving candid wedding photographer is attentive to key moments, and receives specific instructions to capture certain details, but is also able to pivot, and capture events as they unfold. These impromptu moments – like grandparents playing with their grandchildren – are often some of the most valued. By comparison, the datagrapher seems constrained. Whereas photos can be conceived of, and taken in an instant, data capture seems to require over a much longer period of time, and commitment to the measurement of certain events and variables.

Indeed, an early implication from Study One was to consider ways to remember very specific events or moments with personal informatics. With scientific roots, Personal Informatics tools can lack flexibility, and are often set up and designed to record quite narrow and pre-conceived things. Leading from this, can we imagine new ways in which one might take more spontaneous 'snapshots' with data? Data which is conceived of and captured in the moment, in response to phenomena as they unfold?

Besides hyper-instrumented venues and brides, what kind of tools might a wedding datagrapher carry on the day? Fundamentally, these might be tools to rapidly count with; ways of making categories; means of following movement perhaps. Wilkens (Wilkens, 2010) gives a sense of this when he asks *"what if we could record special moments with a weather camera?",* imagining a device which records rainfall, wind, air pollution and other weather data. Nicholas Felton's own self-tracking app 'Reporter'[29] offers a highly customizable reporting interface to regularly quantify things people care about, in self-defined terms. What might a more real-time, in the moment, approach to applications like this offer? Data analytics and graphics company Chryon Hego employ analysts to capture live data from sports events using Xbox controllers[30]. The latest GoPro wearable cameras now overlay telemetry data in real-time[31]. This sort of functionality, channeled through a consumer smartphone app, could create intriguing new possibilities for 'snapshot' datagraphy.

Glimpses of such a future are present in some applications of Augmented Reality (AR) filters which overlay data from a smartphones camera or accelerometer onto images or videos. Snapchat includes filters which overlay speed in real-time from the device, or draw in weather data, to create literal snapshots, annotated with data. Apple's recently released ARKit[32] includes examples like a measuring tape, which digitally measures space through a smartphone's camera. Although this has prosaic uses, such as measuring

[29] http://www.reporter-app.com/
[30] https://www.indy100.com/article/heres-what-the-man-with-an-xbox-controller-at-st-james-park-was-actually-doing--Zk5NjoxLBg
[31] https://www.theverge.com/2016/11/20/13680300/gopro-hero-5-data-overlay-telemetry
[32] https://developer.apple.com/arkit/

floor space to fit a new kitchen, it offers an intriguing example of how AR could usher in a new way to view and document the world with quantified data.

These proposals, to reimagine personal informatics tools as expressly documentary, are exciting as they propose quite new user experiences and interactions with data. Rather than being passively subject to data capture, and then making sense of the data-as-given, generating data becomes something artful and expressive from its very conception. A CCTV camera could produce an 'accurate' reflection of the physical activity in one's home; but holding the camera and looking through a viewfinder offers an entirely different experience. Whereas personal informatics tools are by default ego-centric and turned on the individual, this proposal suggests a more outward-looking perspective.

This way of thinking also gets to the heart of questions about what it could mean to quantify and represent the world and one's life with data. In section 5.6.1, I highlighted the inherent abstraction, reduction and commensuration of phenomena that are performed by regimes of quantification. In terms of remembering this can produce a record of the past which is somewhat removed from the past-as-remembered. Data can also be uncannily detailed, creating awareness of phenomena which were overlooked or could not be appreciated at the time. But perhaps more interestingly, there is also a summative, compositional effect at work. This resonates with the reconstructive work undertaken in remembering, and the way that many distinct events such as child hood bath times become layered in a composite image.

One of the attractions of documentary informatics appears to be in the possibility of metrics and representations that are very succinct, but nonetheless sharply portray, indicate or symbolise much of an experience. The representation of the first dance on Annabelle and Calum's coasters are likely quite removed from the remembered physical experience. But in a glance, the whole of that first dance can be represented and become a basis for remembering. A photograph could portray only a snapshot, while a video takes time to view in full. The skill and art of a datagrapher and the tools supporting them are in being able to identify and carve these details out which prove compelling. I believe there is a considerable opportunity for technologies which offer and make apparent these new orientations to sensors and data.

8.4. Limitations and Future Work

There are of course limitations and much scope for future work to be accounted for alongside this proposition for Documentary Informatics.

Primarily, I acknowledge that the speculative work in this thesis chose to address an acute documentary context, to push the boundaries of the use of personal informatics tools. While a bespoke service to document data about a wedding might seem appealing as a one-off, how well does this translate to documenting everyday life? Study Two shows the different motivations people have for creating dedicated records of their everyday lives, and these desires to account for one's life, or portray unique perspectives are open to translation.

Still, there is a clear opportunity for future work addressing this directly, to consider the design of documentary informatics in the context of the home, the street, travel or many other contexts. The wedding project relied on graphic design skills to formulate, communicate, and prototype ideas – to practice research through design. This was lightweight, exploratory and flexible approach in the context of interviews and enactments. However, clearly digital implementations of these interfaces and services would reveal new implications and challenges.

It's also notable that throughout this thesis, I have approached memory from a very personal perspective, focusing on the individual experience of remembering, and the way that remembering makes the past meaningful in the course of present action. This necessitates making data small, very local and personal. This thesis has considered some elements of how people share their data, and the wedding project worked with couples, who had expressly social aims and practices in mind for their data. However, there remains much scope for understanding more about how people would share and undertake documentary informatics socially, in a way that is distinct from existing research about the way people share their personal informatics data on social media (e.g., Epstein et al., 2015a, 2013). This investigation could look more fundamentally at how documentary data might be used communicatively, shared co-presently or even becomes embedded into shared ways of knowing.

But more than this, there are potentially much wider societal implications of a quantified past, implicated in a data-driven society, which are broadly overlooked in this thesis. On an individual level, people are able to negotiate with, and even disregard or sometimes simply forget their data if it is inappropriate, or fails to capture context. Documentary Informatics explicitly envisages individuals being empowered to be selective, and develop quantification as a mode of personal expression. But what about the quantified past of larger data sets, of institutional or societal histories as they are portrayed in numbers and graphs and records. Credit histories, geodemographics and their potential discriminatory effects (Burrows and Gane, 2006), give a flavour of the much more political and complex implications to such a quantified past. While on a personal scale, data can be made discerning, and is easily contextualised - at societal, institutional scale, the reduction and abstraction risks becoming more problematic. Indeed, this becomes a question about how we write, understand and acknowledge our history.

The field of Memory Studies does often look at contested social histories, most notably the ongoing social remembering of the Holocaust. One might provocatively ask, that if such a tragedy took place today, what dynamic would modern data and sensor networks contribute to the way this was recorded and remembered?

In fact, the focus on personal rather than societal remembering cuts to the heart of some of the ontological commitments made in this thesis about the nature, and materiality of both memory and data. Drawing first on Bartlett (1932) and subsequently on Middleton and Brown (2005), I consider remembering as an imaginative reconstruction. Implicitly through the fieldwork, and explicitly during the wedding study, I propose that what it means to remember well, is to be empowered to draw upon reconstructions of the past, in ways that serve individuals' current actions and values. In the context of weddings, a record is explicitly constructed to do particular kinds of wedding work, intended to serve the couple in enacting their newly married status. Documentary Informatics effectively demands that individuals are given more means to craft particular representations of the past, with data, as it suits them.

However, it is important to acknowledge here that what it means to remember well as an individual or couple, may be distinct from what it means to remember well as a society. This seems inherently more political, and contested. It likely requires greater recognition

of the multiplicity of lived experience, and how that past experience is then pursued as a resource for action. In short, there is a far wider inquiry necessary to consider the implications of Documentary Informatics as a form of public remembering. This is particularly the case when we consider the importance of data work, and the individual contextualisation and negotiation through which data becomes meaningful. How is data-work – as bridge-building between a particular representation and multiple experiences of some event – then performed publicly and socially? How could technologies support data-work at this scale?

Clearly, this societal scale, goes beyond the frame of this thesis. By focusing on personal remembering, and ultimately the intentional act of documentary, the approach here broadly follows much existing HCI work on digital possessions, and considers individual experience. Arguably this points to a weakness in the field as a whole; does digital possessions as a framing based around identity and ownership actually speak well to public and institutional histories? Could HCI as a whole engage better with sociological work on the societal implications of digital records, both personal and institutional?

8.5. Methodological Reflections

Lastly, I want to consider some brief methodological reflection. Firstly, there is the role of Interpretive Phenomenological Analysis in this thesis. IPA underpinned a holistic perspective that prioritised individual participant's meaning-making with their data. This recognises the situated and idiographic meaning of personal data as a technology of memory. While remarking commonalities across participants, it allowed a deeper, selective analysis of particular participant's experiences, and saw these as a resource for design. This is distinct from previous studies of personal informatics that describe more general *models* or *styles* of use, and recognises the ways any data becomes enmeshed in any individual's life, in quite individual ways. As studies in HCI endeavour to design for increasingly and intimate, lived experiences with data-driven tools, I propose IPA as a valuable approach, especially when working with specific life experiences or individuals.

This focus on the experiences of particular cases resonates with the innovative speculative approaches undertaken in this thesis. Speculative Enactments in fact reflect the methodological stance of the thesis as a whole; through their practice I take a

conceptual, anticipatory starting point, and seek to do speculative design, alongside empirical fieldwork.

There are lessons to be learned from this novel approach, and opportunities to develop it further. Most of all, Speculative Enactments are distinct for being attentive to the social reality of the staging created for participants. I frequently asked myself how participants would make sense of what they were doing, beyond simply taking part in a study, and the existing routines and understandings they would leverage to do this. And while one should be sober about what takes place, this does invite empirical analysis of those experiences, which exist at a rich boundary between speculation and reality.

Importantly, this stage setting is a design exercise in itself. And it requires a constant translating and reframing of the speculation, from specific participants to broader audiences. There are interesting parallels here to Gaver's descriptions of the translational work required when involving on-street marketers, documentary filmmakers or other 'cultural commentators' in their projects (Gaver, 2007; Gaver et al., 2016). Making the speculative materials and enactments fundamentally make sense was a highly productive constraint; as I was frequently forced to *reflect on and rationalize* how circumstances or materials should be designed to become *plausible to real-world participants*.

However, there is a potential downside to this, that the enactments become quite particular; they have an ephemeral quality to them, and bring speculation to life under very specific circumstances. This raises questions about their scalability, and how to do multiple iterations of enactments, or use more complex materials or interactive technology. Relatedly, there are opportunities to consider how the events and outcomes of Speculative Enactments are communicated to wider audiences. The wedding project produced a Design Fiction brochure, which is open to a wide circulation, in public and academic contexts. The enactment itself might be expanded to more public settings, such as a wedding fair.

Lastly, speculative enactments of provide a template not just for studying 'experiential futures' (Candy and Dunagan, 2017), but to actually involve participants more directly in the design and co-construction of speculative worlds. In Metadating and the wedding project, the narrative of the resulting fiction is driven entirely by the participants

themselves, and the way they interacted with the circumstances and materials. While the researcher maintains a great deal of control, there is scope here for a more participatory speculative design, more participatory than has so far been considered in HCI's appropriation of speculative methods. In this respect, the elucidation of this developing practice of Speculative Enactments provides more broadly a set of conceptual resources for reflecting on the direction of speculative research and practice in HCI.

Chapter 9. Conclusions

In this thesis, I set out to investigate the experience of remembering a 'data-driven life', adopting a series of conceptual, empirical and speculative lenses.

In Chapter 2, I conceptualised the emergence of a 'quantified past'. Remarking on the development of self-tracking technology, and self-tracking cultures, I reflected on how quantified data is becoming an increasingly prevalent and powerful way of viewing the world. And yet, researchers and designers are only beginning to recognise the ways in which personal informatics become enmeshed in everyday life, and implicated in human experiences and actions, including acts of remembering. Drawing in particular on the work of Frederic Bartlett (1932) and Middleton and Brown (2005) I synthesised literature from the broad field of Memory Studies, to develop a perspective on remembering as an 'imaginative reconstruction'; one which is active and dynamic; and where the 'past acts en masse', rather than as distinct memories, recalled and recited from an archive. Viewing 'memory-as-a-resource-for-action' (Harper et al., 2008), I recognised the ways in which remembering is situated, and mediated by a variety of 'organised settings' (Bartlett, 1932). I then turned to extant work in Digital Memory Studies and Human-Computer Interaction (HCI), to reconsider self-tracking tools as potential 'technologies of memory' (Van House and Churchill, 2008), and to suggest quantified data as a digital possession, rather than simply an instrument of behaviour change.

Through this positioning, I have suggested that the emergence of a quantified past is one of considerable interest to academic discourse. The prospect of 'remembering with data' is largely unstudied in HCI, or Memory Studies. Yet, the perceived objectivity and proposed power of quantified data – 'dataism' (van Dijck, 2014) – potentially challenges current practices and experiences of remembering – as an *imaginative* reconstruction. Furthermore, this intriguing tension sets a stage to consider how we might extend the notion of 'Lived Informatics' (Rooksby et al., 2014) and design for more complex human experiences of, and with, quantified data.

This conceptualisation both reflects and motivates the two central research questions of this thesis:

RQ1: What is the experience of remembering a data-driven life?

RQ2: What are design considerations for remembering with data-driven services and technologies?

With these in mind, in Chapter 3, I discussed methodological approaches to studies of remembering. I developed an overarching methodology for the thesis, considering both the way remembering is accomplished discursively, and the way it is experienced, personally. I appropriated Interpretive Phenomenological Analysis (IPA) as a flexible and idiographic method that provides a unifying, and pragmatic empirical approach to making sense of rich individual experiences of remembering in relation to personal data. I then described how this methodological framing is used to inform the methods of three studies (Chapters 4, 5 and 7).

In Chapters 4 and 5, I describe the qualitative fieldwork undertaken in Studies One and Two respectively, which jointly address three sub-questions (RQ1A, RQ1B and RQ1C, Section 1.2) about the experience of remembering a data-driven life. Through an interview study of long-term users of personal informatics tools, Study One affirms the quantified past as an emerging phenomenon, of which we could readily find examples. This study illustrates that even where a retrospective or long-term use of data is unanticipated or unintended, individuals encounter, make sense of, and make meaning from their historical data in a variety of ways. Study Two turns to contemporary forms of diary-keeping, through 'smart journaling' applications – tools which afford a contemporary form of lifelogging, through the curation of a diverse range of media, including quantified data. By interviewing traditional diary-keepers, and the users of several different smart journaling applications, I gained insight into the motivations of those who deliberately set out to create a personal record of their lives. Furthermore, this approach looked beyond 'total capture' to understand how and when particular records and media became meaningful.

My reflection on these two studies has led me to answer the initial research question, and contribute to studies of remembering in HCI, Memory Studies, Critical Data Studies and other related fields. I posit a series of Experiential Qualities (Section 5.6.1), which reflect current encounters, practices and values of a quantified past (RQ1a). These acknowledge

a quantified past as a *passive, third-party recording*, one that is generally rendered *quantitative and objective,* through a variety of processes of *abstractions, reduction and commensuration.* I also note how such records as typically *removed from the past-as-remembered, and ego-centric.* However, they are also *polymorphous*, creating the potential for multiple modes of interpretation and experience.

Across both studies, I found that data was meaningful to participants, when they could use their data to account for aspects of their lives – when it became a resource for some present action (RQ1b). Importantly, this reflects the way that data is mediated through 'data work' (Section 4.4.3). In this respect, data itself is not inherently meaningful, nor does it alone provide verisimilar accounts of one's life. Data work reflects the way data is contextualised and negotiated, such that it is interpreted as true to life (RQ1c). The vital point from this insight, is that design should not be oriented simply to bigger or better data, but towards supporting people in undertaking data work, and in the context of this thesis, towards remembering.

To develop these design considerations further, I turned to speculative design methods. Chapter 6 is a secondary methodology chapter, which tackles an underlying challenge in my thesis (RQ1d): How can we research anticipated phenomena, such as remembering one's life with data? Reflecting on existing speculative approaches in HCI, I outline a novel approach to speculative practice termed 'Speculative Enactments'. Drawing on Candy and Dunagan's 'Experiential Futures', Speculative Enactments invite participants to act amidst speculative but consequential circumstances. The practice of staging an enactment, designing the materials and the circumstances, productively constrains the imagination of the design researcher, and crucially, invites empirical analysis of participants' engagement with the speculation at hand. While foundational to the final design-led study presented in Chapter 7, the development of this approach also offers a significant contribution to the growing interest in speculative practice, especially with regards to HCI as a pragmatic and experience-centred discipline.

Chapter 7 described at length the generative design-led practice of a Speculative Enactment, in an effort to explore how to design for remembering a data-driven life. I adopted the weddings as a powerful context where remembering, and hence documenting, really matters. Therefore, beyond the encounters with a quantified past in Studies One

and Two, I could deeply pursue the meaning and design of quantified data as a form of documentary. I undertook design ethnography, and developed a speculation around a 'wedding datagraphy' service, 'Abacus' which proposed collect, process and curate quantified data to document a wedding. I undertook Speculative Enactments of this service, with two engaged couples, whom I met in the guise of a 'wedding datagrapher'. For each of them I designed three bespoke 'data artefacts' documenting their wedding, subsequently featured in a fictional Abacus brochure. Reflecting on the resulting data artefacts, and analysing the engagements with each couple, I articulate the various ways in which quantified data was imagined and crafted as a unique, and meaningful documentary of the experience of a wedding day.

These reflections are developed in most fully in Chapter 8, through a discussion of 'Documentary Informatics', responding directly to RQ2. As a design perspective, Documentary Informatics proposes a more poetic orientation to recording one's life with quantified data, emphasising the value of supporting the selectivity of data, and then subsequent constructions or 'piecings together' that framed, and stabilised the meaning of data. These are then taken on pragmatically, to suggest new approaches to curating a quantified past, and perhaps most innovatively, proposing a practice of 'snapshot datagraphy', to encourage the conception of data as documentary in the first instance.

As well as giving form and function to prior insights about the *experience* of remembering a data-driven life, these design considerations significantly advance current perspectives of Lived Informatics, and the design of data-driven tools. While this thesis has focused on the essentially human experience of remembering, at its heart, is a proposition for new orientation to a data-driven life in general.

Rather than simply designing tools as instruments that transform the human machine to make us fitter, happier and more productive, we might design for an altogether more holistic and poetic relationship with quantified data: to play with; to talk with; to think with; to remember with.

Appendices

Appendix A: Index of Self-Tracking Applications

Throughout the thesis and particularly in Study One I refer to numerous self-tracking devices and applications. For reference, and to give an impression of the range of self-tracking tools available, those applications mentioned in this thesis are listed here with a short description or promotional quote where available, and web link.

MyFitnessPal (active) *- https://www.myfitnesspal.com/*
A calorie counting app, where users can input or scan their food intake, their weight, and activity data. MyFitnessPal offers users detailed graphs, statistics and targets for their food intake.

Moves (active) - *https://moves-app.com/*
"Moves automatically records any **walking, cycling**, and **running** you do. You can view the distance, duration, steps, and calories* burned for each activity. The app is **always on**, so there's no need to start and stop it. Just keep your phone in your pocket or your bag."

RecordMySwim (defunct)
"Record my swim is a simple to use app that allows you to record your daily routine swimming workouts. As well as logs, you can set yourself swimming goals in the form of virtual challenges, e.g. Swim Mount Everest or around Central Park New York."
(Tech review available at:
http://download.cnet.com/Record-My-Swim-log-workouts/3000-2129_4-75925435.html)

Fitnotes (active) -
https://play.google.com/store/apps/details?id=com.github.jamesgay.fitnotesandhl=en_GB
Fitnotes is a simple workout tracker that supports manual input of different categories of workouts from an exercise database.

Endomodo (active) - *https://www.endomondo.com/*

"Endomondo is designed to track your workouts, provide audio feedback along the way and offer guidance on how to reach your goal. It's a free personal trainer in your pocket which syncs with Endomondo.com, where you can access a full training log and analyze your fitness activity."

Nike+ (active) - *https://www.nike.com/US/en_US/p/activity*

Nike+ is a running and activity tracking application, which captures data from a smartphone or a wearable Nike+ Fuelband. "View all of your activity in one place. Get personal coaching to help you reach your goals. Connect and compete with your friends."

SportsTracker - *http://www.sports-tracker.com/*

"Put your phone in your pocket, armband or bike-mount, and you're ready to hit the road! The app uses your phone's internal GPS to track your route, time, distance, speed and lots more."

Runkeeper - *https://runkeeper.com/*

"Go for a run, walk, hike or any activity really! You'll get a clear view of your training in real time with our fitness tracker app that not only tracks activity, but encourages you to get active more often."

Fitocracy (active) - *https://www.fitocracy.com/*

"Fit fitness into your life this year. Track your workouts, develop healthy habits, and reach your goals with the help of our expert coaches."

Fitbit (active) - *https://www.fitbit.com/uk/home*

Find your fit with Fitbit's family of fitness products that help you stay motivated and improve your health by tracking your activity, exercise, food, weight and sleep.

Misfit Shine (active) - *https://misfit.com/uk_en/smartwatch/misfit-shine-2*

"Shine seamlessly tracks activity and sleep and delivers sophisticated information effortlessly and vibrantly with multicolor LEDs and a vibration motor. See your progress

in a halo of rainbow-colored lights, or let Misfit Move encourage you to get active with a vibrational nudge and unique light animation."

Pebble Watch (acquired by Fitbit) - *https://www.pebble.com/*
The Pebble Watch was an early smartwatch, using e-ink, which synced with smartphone apps such as Runkeeper to display physical activity and alerts.

Garmin - *https://www.garmin.com/*
Garmin provide a range of GPS devices, some of which are optimised to track cycling routes and speeds. These can then be synced with other tracking apps such as Strava.

Strava *- https://www.strava.com/*
"Strava turns every iPhone and Android into a sophisticated running and cycling computer (and we work with your GPS watches and head units, too). Start Strava before an activity and you can track your favorite performance stats, and afterwards, dive deep into your data."

Clue - *https://www.helloclue.com/*
"Clue is designed to make tracking your fertility accurate, fast and friendly. Keep track of your monthly cycle by entering data about your period, pain, mood, fluid, sexual activity and personal notes."

Last.fm - *https://www.last.fm/*
"Last.fm is a music service that learns what you love. Create your own profile, track what you listen to (we call this scrobbling) and get cool stuff like your own music charts, new music recommendations and a big 'ol community of other music lovers."

MoneyLover - *https://moneylover.me/*
"Money Lover helps you get just about everything managed. A smart, easy-to-use app that allows you to track and categorize your in-and-out money, create budgets that you can actually stick to. It works seamlessly across devices and platforms, available on phone, tablet, PC and Web."

Github - *https://github.com/*

“GitHub is a development platform inspired by the way you work. From open source to business, you can host and review code, manage projects and build software alongside millions of other developers.”

Appendix B: Study One Materials

Appendix B.1. Study One Information Sheet

Information Sheet for participants

This leaflet provides information about the research study 'REMEMBERING WITH DIGITAL TECHNOLOGIES: A QUANTIFIED PAST' and how you can take part.

Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Please ask, if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What are the aims of this research?
This research is part of a PhD project "Remembering with Digital Technologies" at the University of Newcastle. The aim of this study is to understand how individuals use digital technologies to 'self-track', or record information about themselves and their lives. In particular, this study is interested in the long-term use of such tools how people might reflect on the personal history created by using these tools.

Who is doing the research?
This research has been organised and is being undertaken by Chris Elsden, a PhD student working in the Culture Lab at Newcastle University. My work is being supervised by Dr David Kirk, a senior lecturer in Computer Science.

Who is being asked to be involved?
This interview study is being conducted with up to 20 participants who have tracked some aspect of their lives using digital technology.

What kind of data are you looking for?
As this study is interested in the long-term implications of self-tracking, it is requested that the participants are able to look back on their tracking history during the interview. Therefore it is suggested that the data should be at least 6 months old, but it may be older and you do not have to still be tracking this information. It is best if this data has been collected over an extended period, but do not worry if your tracking data is in some way incomplete, spread over different devices or has be inconsistently recorded.

This study hopes to unveil a whole range of self-tracking behaviours, but some examples of possible historical personal data are listed below.

Activity and fitness monitoring *(e.g. Wearable devices such as 'Fitbit', 'Jawbone', 'Nike+ Fuelband' or smartphone apps such as 'Moves' or 'Fitocracy')*
Location tracking *(e.g. Foursquare, Moves app)*
Sleep tracking *(e.g. Sleep Cycle app or Zeo headband)*
Music listening *(e.g. LastFm Scrobbles)*
Finance tracking/spending habits *(e.g. Mint, Spendee)*
Food/calorie intake *(e.g. My Fitness Pal)*
Productivity/time management and technology use (e.g. *Rescuetime, Manic Time*)

This is not an exhaustive list, if you have recorded other personal data that you think would be relevant, you can discuss this as well.

What do I have to do?

After agreeing to take part in our research (you will have to sign a consent form before we can start) I would like to conduct an interview with you, in three main parts.

1) You will present your historic self-tracking data to the researcher who will prompt you to talk through its meaning and personal significance. It would be best if you are able to bring your own device (smartphone, tablet or laptop) to the interview.

2) The researcher will ask you some general questions about your use and reflection on self-tracking tools.

3) You will be asked to fill out a brief questionnaire with some personal details.

All parts of the interview will be audio recorded, and later transcribed and analysed by the researcher. However please be aware that the details of your personal self-tracking data *will not* be recorded in any way.

Are there any risks to me taking part in this study?

This study is of minimal risk to you. However, you should consider that discussing the past may be an emotional experience for some people. If this is the case at any point during the interview you may pause the interview, or withdraw from the study altogether if you feel you cannot or do not wish to continue.

While none of your self-tracking data is recorded as part of the research, you should also be aware that it is possible that your data can reveal more than you anticipate it to. Please be sure you feel comfortable discussing this data with the researcher during the interview. Once again, if at any point you feel uncomfortable, the interview can be halted, or abandoned completely.

Can I stop the study after giving consent?
Your participation is entirely voluntary and may be discontinued at any time with no obligation or requirement to provide a reason. You have the right not to answer any single question, as well as to withdraw completely from the interview at any point during the process.

Can I ask questions?
You have the right to ask questions about this research study and to have those questions answered before, during or after the research. If you have any further questions about the study, at any time, feel free to contact Chris Elsden, whose contact details are given below.

How will the information I give be kept and used? Will my taking part in this project be kept confidential?

By taking part in this research you will be helping me to understand the long term use of self-tracking technologies. The data acquired in the course of this research will form part of evidence reports, presentations, and academic publications.

Research findings will be disseminated to academic audiences and also professional users. All research data will be anonymised and treated as confidential. You will not be identified by name. You will be assigned a unique research reference and any quotes attributed to you will be through this reference code. Research outputs will be written up so as to prevent either individuals, families or companies being identifiable in any way.

What will happen to the results of the research project?
This study forms the first part of my PhD and explores the area I wish to investigate. The results I gather will be used initially to inform further studies, and identify further areas of interest. They may also be used to develop some initial design ideas, as part of further research. The research findings may also be communicated through academic papers and academic presentations.

Will I be compensated for my time? As thanks for your participation, you will receive a £7 Amazon gift voucher, which you should receive, shortly after the interview has been completed.

Researcher Contact Details:
Chris Elsden
PhD Candidate at Culture Lab, School of Computing Science, Newcastle University
c.r.elsden@ncl.ac.uk
Tel: 07773726728

Appendix B.2. Study One Consent Form

Consent Form

I (please print)……have read the 'Information Sheet' (a copy of which I have retained) on the research project "Remembering With Digital Technologies: A Quantified Past" which is to be conducted by CHRIS ELSDEN, a PhD Candidate from Newcastle University, and all queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and give my consent freely. I understand that the project will be conducted in accordance with the Information Sheet, which I have read, and a copy of which I have retained.

I understand that I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I understand that I can ask questions about the research at any time, including during and after the research is completed.

I understand that my personal self-tracking data I will share during the interview will not be directly recorded and will be seen only by the researcher CHRIS ELSDEN.

I consent to:
- Presenting personal self-tracking data to the researcher during the interview
- Being interviewed and having the interview audio recorded
- Fill in a brief questionnaire

I understand that all information gathered from the interview will be stored securely, my opinions will be accurately represented, all data will be kept anonymous in any publication, and no personally identifiable information will be associated with the results.

As thanks for your participation, you will receive a £7 Amazon gift voucher, which you should expect to receive after your participation in the study.

Print Name:……..

Signature……..

Date: ……

Thank you for taking part in this study. Finally, if you would be willing to be contacted again regarding further studies for this research project, please indicate with your initials below:

…….

Appendix B.3. Sample Interview Schedule

The following interview schedule is indicative of structure and questions asked of participants.

Introduction:
Thanks for coming, so before we can start, can you just tell me what it is your showing me today?

- What is it?
- When?
- How recorded?
- When did you start recording it/are you still recording it now?

And what were your initial motivations for recording this?

Part 1: Data Story
"Talk me through this data, what is it about?"
"Lead me through this data, what does it tell you?"
"Talk me through this data, what does it mean to you?"

Prompts:

- How does it feel to look back through this data?
- Is there anything surprising to you?
  What is sticking out to you?
- Is there anything you disagree with here?
  Anything missing?
  Anything misrepresented?
- Are there any gaps? What do they mean? How do you feel looking back at them?
- What comes to mind looking back?
  Period of life, or particular memories/experiences?
- How does it differ looking at overall trends and looking at specific details?
- How does it feel looking back at data from 2 months ago, to 5 years ago?

Part 2: General

- In what ways do you encounter data like this from the past?
- How often do you look back on this data?
  Intentionally/unintentionally
- And how do you use this data?
- Why did you stop?
- Did you imagine you would look back at your data like this?
- How do you think you would feel if you lost this data?
  (Is it backed up?)
- Has its importance or meaning to you changed over time?
- Should it be combined with other data?
  (back to what is missing?)
  (*Photos? Social media? Maps?)*
- How does it compare looking back on this as opposed to looking at old photos?

- Do you ever share this data with someone?
  In person/social media?
  If not, would you?
- Do you /have you looked at anyone else's data? *How did that feel?*
- Would you be uncomfortable sharing this with someone else?

Anything to add?

Appendix B.4. Debrief Sheet

Debrief

This is a debriefing form for the interview study 'REMEMBERING WITH DIGITAL TECHNOLOGIES: A QUANTIFIED PAST' to summarise what happens now you have completed the interview.

1) The researcher should explain fully the motivations of the research project, and answer any questions you have about the research.

2) The interview has been audio recorded and will now be transcribed by the researcher. He will then analyse the transcripts to develop an understanding of participants' different experiences of their long term personal data. This understanding will lead to future studies and potentially publication at academic venues.

3) If you have indicated you would be interested in participating in follow up studies, you may be contacted in the near future by the researcher inviting you to take part in a further study.

4) Any personally identifiable data will be removed from the interview transcripts and participants will be anonymised in any distribution of the results of the study. Any specific practices or quotes which are distributed will be attributed to pseudonyms. The recordings and transcripts themselves will be stored securely by the researcher for as long as necessary for the study, and not more than 5 years, unless specifically requested.

5) If you are interested in any publications resulting from this work, please contact the researcher who will be happy to share these with you.

6) You should receive a £7 Amazon voucher for your participation shortly after the interview.

Many thanks for your participation, it is greatly appreciated.

Once again if you have any further questions, please use the contact information below:

Researcher Contact Details:
Chris Elsden
PhD Candidate at Culture Lab, School of Computing Science, Newcastle University
c.r.elsden@ncl.ac.uk
Tel: 07773726728

Appendix B.5. Sample Interview Transcript

A sample interview transcript, following the IPA approach.

Initial Comments	Transcript	Coding
	Brianna 03 March 2014	
	Can you just tell me what you're showing me today and when you have recorded it and how it's been recorded?	
6 months ago, knows when she started recording (but may have checked). Sporadically had used efforts but this was - 'Too much effort'. Moves is automated, "recording my every move" passively.	It's basically data from an App Moves, going back to August last year, when I started recording it. I've used other apps before, sporadically, but they all were too much effort, which is why I changed to Moves. It's more automated, does things automatically, so I've been recording my every move. ***And that's on your phone?*** iPhone.	6 months use Passive vs active Effort
	And what was the initial motivation for...	
Previously had another tracking device, Fitbit, prime motivation step-counting and to be more active. Had desired to lose weight (but not sure when, a period/phase) but found Fitbit and MyFitnessPal too much effort – related to manual input and hardware. Phone with her everywhere, "just seemed easier to do" Moves 'records a bit of a story' – in contrast to a (colder?) step-counter with just the data.	I did have a fitbit before then, to count my steps, and to see how active I am, and to be a bit more active and walk a bit more erm... last year; at some point I did want to lose weight, so I did have a fitbit and I was using the fitness pal app to record what I was eating and exercise and all that but it seems... at some point, it got... a bit too much effort to try and do that every time, and the fitbit I had was also not wireless, so I had to plug it in and download the data everytime, which I guess with the Moves app I have my phone with me all the time anyway. So it just seemed easier to do. Yeh, so initally the idea was for counting steps for health and exercise but with the Moves app it's also nice that it records a bit of a story of what you have done that day rather than just being 'Today you walked 10,000 steps'.	Previous self-tracking Increase activity Passive tracking "Records a bit of a story"
	Ok, well if you would mind getting your phone out, if you maybe want to start at Au... Start at the beginning, August. And we're not gonna go through all of it, but if you could kind of look through it, almost sort of think aloud, and sort talk me through a few examples of the data. Maybe pick out some interesting ones, as if you were sort of looking back on this data, and what it's saying to you, what it means to you, what it tells you.	
'Apparently' – just trusting the app. Reading specific date. Changes in narrative voice – 'oh yeh!' –sudden recall of memory into a commentary (why did I start tracking?) and then the memory/explanation. Further commentary. Gaps in data – she is not sure if this is her inactivity or the device.	So apparently I started recording in August 4th, I don't really know what that should tell me, but apparently I was in Tynemouth that day... Oh yeh! I remember that day, but I don't know why I started tracking that day, it was a friends birthday, and we went to Tynemouth and it was sunny and we had a few drinks with some other guys from [my work], and then came back and played board games, [in the office], which was not really planned but it was kind of erm.. yup, spontaneous... evening. Erm... yeh that's (day I was just home?). There's a few days either I didn't do anything, or I don't know my phone was being weird. Erm... I don't know if I should go through every day. ***Sorry?*** If I should go through everyday, there must be one where I walked a bit more than usual.	Recalling specific days Gaps

Initial Comments	Transcript	Coding
Desire to show days with more activity – which are more interesting? Not remembering/finding something she is looking for. Confronted with confusing data. Negotiating/working out past with data. Makes suggestion (it could be..) Affirms this with data. Then realises it's not quite what she thought. More open/unsure explanation – "I probably walked around a lot" Then a pause for thought… Device limiting data collection. Recognises a routine/pattern. Narrates according to app. Juncture in app, where next day begins at midnight, but still awake, day doesn't end until 2am say. Data revealing other facets of her life – (working at Baltic) Remembers event of moving house and views data with that memory in mind. Data sort of confirming it? Reminding of smaller events (fish and chips with friends?) around important ones. Day after move – suggestion that she was tired, app showing little, but clearly she was doing things. App has failed to record it in this case. More routine days – "haven't done anything" – app privileging movement over stationary activity? *Could have been doing something important at home.* Confirming of parts of her character she is aware of. Not clear in the end how she feels about this.	I'm not sure there's anything... I'm not sure what this is though.. or what I was doing that day. ***So you don't really quite remember this one?*** No actually, it could be that I was looking at the flat that I moved into. That's what it looks like. But it's not.. because I think at that time I was looking at a lot of flats so I probably walked around town quite a bit... (pause)... yeh.. Sometimes my phone died, or the battery's gone, and it turns Moves off. This is it... another.. normal Friday at [work] Home – [work] - Lunch - Back to [work] – [pub], oh yeh, and another board game night. Obviously came home late *laughter* (flicked to next day on Moves, which showed the board game night continuing). (Pause).. Erm I sometimes do a bit of work at the [a museum] on the shop, so I'm like, this day I was obviously working all day at [a museum]. I mean is that kind of.. ***Yeh feel free to look at the things you think are of interest about it, or are interesting that it has recorded. Or if you were looking back at this, what sort of things you would pick out..*** Well there's erm... maybe some things that I guess I remember, like this is me moving house *laughter* so.. it's like.. driving back and forth between places and obviously walking a lot. Just up and down stairs. And then at the end of the night, having a fish and chips from the chippy next door, with my friends who helped me move. And then on Sunday I obviously didn't do anything. Erm.. well I did kind of do stuff in the house, but I didn't really record it. Erm... This is me going shopping... not very interesting. It is interesting there's always a few days in there when I haven't done anything, when I was just home. ***Is that surprising to you?*** Erm... no. I know that I sometimes do that and I know that sometimes I would like to be really lazy, and that on the weekend...'I'm not gonna do anything today!' Erm... sometimes I feel a bit guilty about it. This one is from when I got my bike, apparently. [CONTINUED]	Negotiation Period of life – moving house Explaining gaps "Normal" – routine. Negotiation Negotiations Details of experience Gaps/non-recording At home – "haven't done anything". Confirmation

Appendix C: Supplementary Study One Vignettes

The production of vignettes of the experience of each participant in Study One was an initial analytical step. For reference, further vignettes beyond those presented in the body of the thesis (Section 4.4.1) are shown below.

Ivan (Endomodo)

Ivan is an active climber who has tracked his regular exercise, largely cycling and running, using Endomodo for around three years. Although somewhat sporadic, and not currently using Endomodo due to an injury, his record includes a number of routine training runs and commutes, as well as more memorable activities such as a 3-day Coast-to-Coast bike ride. He finds tracking interesting in itself, but also a source of motivation to improve and compete against himself and others.

Looking back on past activity, Ivan remembers some familiar routes he used to run regularly, most significantly *'two houses ago'* and is surprised by some of the speeds he ran. The most significant event he has tracked is a three-day Coast-to-Coast ride he completed with his dad. Memorable for the *'new terrain'* they covered, Ivan quite consciously wanted to record this effort as a marker and something to motivate them should they wish to do the route again.

"...and I kind of thought it would be nice to say to him in 5 years' time, do you want to go out and do the Coast to Coast again, and see if we can beat the record, and I can send him a graph or something."

Knowing the exact route they took was valued as they could then try alternatives in the future. However, it is a '*shame'* that on the second day, after a mechanical incident, Ivan had to track back and stopped tracking to save the battery in his phone. The record is therefore incomplete, but remains precious to him. Especially as a record of physical activity he feels he has *'invested'* in his data, and a lot of hard work has gone into it. It's nice to "*have a little bit of a record of all that work."*

However, Ivan is not yet able to track in detail the activity he is most passionate about - rock climbing. There are few tools to track climbing and it's "*quite a personal thing"* in

that different climbs suit different people. What he does have however, is a carefully annotated guidebook of climbs in Northumberland, which is a logbook of the climbs he has done. However, limited for space, he just records the date he did each climb and little else. It's enjoyable for him to *'tick things off in a book'*; a collection he can flick through and reflect on. The book and the climbs he has marked are often a conversation starter among climbers. As such this book has become very valuable to him and on occasions where he fears he has lost it he has become very upset at losing this '*log of every climb you've done'*.

Joanna (Excel)

Joanna is an 18-year old 'fitness addict' who regularly competes in triathlons and other endurance events. She is a particularly keen swimmer, and has fastidiously recorded all of her exercise since mid-2012. Initially she relied on an Excel spreadsheet, but has more recently used dedicated fitness note-taking and recording applications on her smartphone. Though these tools make keeping a record easier, she does not yet use any automatic trackers. She has also had an on/off relationship with the MyFitnessPal app, which she uses in an effort to maintain a stable weight and continue regular exercise. She keeps these records partly out of curiosity, but also to track and reflect on her progress as an athlete.

For a long period, Joanna was over-exercising. This caused her to lose considerable weight, to the extent that friends and family considered she may have an eating disorder, although this was never the case. Reflecting on the record (alongside photos from the time) helps her understand why loved ones were concerned, but to her, the record is also proof that it was simply over-exercise that caused her to lose weight. Nevertheless, she claims the record is a sort of diary to her, and had not shared it with anyone prior to the interview – though she imagines she may do this one day.

She will look back on her record a number of times throughout the year, sometimes out of curiosity when she has a spare moment, or occasionally consciously setting aside the time. Her data is hence a source of considerable reflection and pride for her. It provides something of an access point to channel fond memories of particular successful events and achievements, as well as her sixth-form college where she lived and exercised for over a year. She completely trusts the data since she entered it herself, and sees it as an

entirely objective record of her exercise. She imagines she will continue recording for many years, hopefully with more sophisticated tools.

Tim (Last.fm)

Tim has been using Last.Fm for around 5 years since his first year of university having heard about the service from his then flatmates. He started tracking as it '*seemed pretty interesting to be able to go back'* but admits that in fact he has very rarely looked back at his data. He has 'scrobbled' across a number of different music services (Spotify/Google Play etc.) and although he initially enjoyed the recommendation service actually stopped scrobbling for 6-9 months recently as he '*just stopped bothering'*.

Looking through the list of songs and artists he listened to week-by-week invokes several episodes of reminiscence, often about periods of his life, such as living in university dorms, attending gigs and music festivals and old friends. Many of which he suggested he had *'kind of forgotten'*. However, these are often embellished with specific details and memories related to individual artists.

Occasionally Thierry questions the timeline of when he was listening to different artists, but this timeline seems important in his reminiscing for certain times and places. For this reason, the week-by-week view is much more insightful to him that just charts of quantities of listens. Like Darren, he suggests that '*music is quite transient'* and *'everything intermingles'* making it harder to identify specific listens or periods and less meaning is perhaps attached to individual songs as it might have when he was younger. However, he does take notice of when he first listened to certain artists.

Having rarely looked back he suggest that scrobbling just happens in the background but he does feel it's a good and important thing to do. On the occasions that he does remember he is scrobbling, he can be quite fastidious "*to make sure it's true"* and not *"mess up the history of it"*. However, these phases often only last a week or so.

Tim seems to see this data as a personal possession. Despite the passive nature of the service, he claims it *"feels like I've done work"* and should the data become unavailable he would be quite annoyed because *'it's my data, they're taking away something from me*

that I had access to". If it did happen, he would like at least a giant excel file, '*just to have it'*. Relatedly, when considering sharing his data, although it's public, he feels to deliberately sit down with someone to share the data would be unlikely "*because it's just me"* and to do so would be *"very selfish in that way… it's just my listening habits."*

Most interesting is when Tim compares photos and his last.fm data. He remarks that photographs are easier to immediately make sense of whereas he has to *'work more for it'* when looking back with the data. But for him this 'work' can be an interesting sort of exploratory experience, since photos clearly externalise the work of remembering. He describes scrolling through his last.fm data there is *'a kind of filtering out'* of the '*best and most meaningful memories"* and he suggests that what he remembers this way is interesting because it*'s "reflecting the importance I put on those times."* And being aware of the associations he makes give him some way to *"see how my brain is organised"*.

Furthermore, successfully remembering something forgotten can bring a fulfilling sense of achievement. When he is *'in the space of that memory'* it becomes a more reflective experience and perhaps a resource for action - getting in touch with an old friend for example. By contrast he suggests that he might pass by the overload of photos on Facebook.

Stefan (Github)

Stefan is a computer scientist who has used versioning system Github for a number of years, primarily to keep a backup of his work and coding history, but increasingly enjoys and uses the social elements of the site. Using both private and public versions of the service, he 'commits' new work on a daily basis, often adding a timestamped message. This is a 'full history' and he can '*go back to any point in time'*.

While not often reflecting on his own work, he does look at other people's. Particularly in sourcing code or a project similar to something he is working on, which he may look to use, he will look at the history of the project, to "*assess the quality or at least the commitment of the work"* and to see if it's *"gone cold"*.

Aware that others may do the same, he sees Github as increasingly offering him an important '*presence'* online, that has gone beyond a back-up and become a '*place to*

showcase my work for other people to look at'. As such he recognises he is becoming increasingly reliant on the service. And therefore, intends to improve the documentation and presentation of his profile in the future.

Looking back at his own work, he recalls most projects by their name, and the stats give him various insights into his routine. He incorporates what is suggested by these stats into a narrative which fits his daily routine as he perceives it.

"But the pushing is definitely happening after 7. I guess that means I go home and do a lot more of my actual committing work. During the day, the activity I'm doing the most, at least from lunchtime at least is watching. So that's when I'm reading up on other's people's work and reading up on that. I think that's quite a fair assessment of how I work my days, Reading during the afternoons, working in the evenings, yeh."

These sorts of reflections help him account for his time, and perhaps aim to improve his productivity, along with other apps he uses like Toggl. In these negotiations where he looks in detail at old projects, is quick to recognise possible errors in the data, but narrative is quite data led. The data also recalls periods of hard work, previous collaborations with friends, and projects which he would like to 'tie up the loose ends'. He has mixed feelings of pride and a sense of achievement about some of his best work, being '*impressed that I could have made that little thing back then'.* There are also projects which are potentially embarrassing that he would avoid looking at and if he was to work on them again, would likely start from scratch. However, it does help him keep track of all his work.

Stefan values the '*nice looking graphs'* of the public Github, but these are not available on private projects although the data to produce them is. He uses the private view for unfinished projects and those which can't be made public yet.

Peter (Strava)

Peter is a committed club cyclist who has tracked his cycling for 4 years, first using his smartphone, and more recently investing in a Garmin device which measures more specific details such as heart rate, cadence and temperature.

Initially he tracked to 'see where I had been' and find new routes to go on, but with the

Garmin his tracking is much more closely related to training. A key part of the software Strava, is as a community to define 'segments' of a route, which 'people can challenge themselves on'. This underpins a highly competitive edge to the service and Peter's tracking.

The data itself is very detailed, and allows Peter to make many comparisons between past and recent rides to analyse 'that individual effort' and to mark his progress over time.

However, he recounts few particular memories with his data, besides an exceptional event, spectating at a national time trial and has little nostalgia associated with it. Frequently he refers to past rides as 'just numbers' or stats. As most of the cycle rides are 'technically the same', many generic rides blur into one, so the data helps him be aware of what he has done.

He does suggest that when he occasionally forgets the device and doesn't record it it's frustrating, because '*in my head, if I don't record it, it doesn't really happen.'* In this respect, he reflects he has '*probably become somewhat addicted to it'* and acknowledges that a lot to the data he collects he's '*collecting it because I can'* and he'll probably use it in the future. Originally collecting data wasn't of interest, more just knowing what speed he did, but as it accumulates, suggests it becomes *'more important to retain it'.* And as the record is quite personal, '*it's probably quite precious'.*

His rides are public, and as he compares himself to others in his club, imagines they will look at his profile occasionally. On occasion the stats have been proof or a validation for him of good performances, which he does share with others. And he imagines that in the future, it will be *"certain stats"* which will stay with him, be important and be remembered, more than any of the rides themselves.

Jason (Fitocracy)

Jason began tracking his exercises as he began using weights to recover from a bad bike accident. Using the website Fitocracy, Jason enters all the exercise he does, from specific lifts and weights to regular cycling, running and climbing. His initial and ongoing motivation is to track his progress with different exercises and he enjoys the gamified aspects of the site which reward points for each exercise tracked. Although he suggests he

is mostly focused on the last 4 or 5 workouts, and uses the app to '*keep himself honest'*, he reflects seasonally (transition from gym to bike/climbing) on his progress and previous achievements and in this way his tracking has become a '*useful log'*.

Briefly stopped using the site for 3-4 months after some changes to the site, and other gaps are reminders of injuries to certain muscles or parts of his body. Recognises that recording some 'timed sessions' like Yoga and Climbing is flawed as it only records '*how long you climbed for, not the difficulty or the grade'*. However, as with other measures, like describing the profile of a cycle, as long as he is consistent in how he records it, there is some accuracy.

The repetitiveness of the data makes most workouts quite '*hard to distinguish beyond the exercise' besides* odd milestones - such as squat lifting his own body weight. Very little detail stands out to him and there is nothing nostalgic here. However, Jason feels it is important he keeps tracking as motivation to keep exercising and tracking has simply become part of his exercise routine. He doesn't share his data beyond the website.

Colette (MyFitnessPal)

Colette is a long-term dieter who has been counting calories for a number of years. Initially as part of the Weight Watchers's programme she kept hand written food diaries before transitioning to tracking on her smart phone using the Weight Watchers app for around 2 years. Admitting she sometimes becomes complacent about her tracking, since she 'knows what healthy food is' she has since been using My Fitness Pal for the past 6 months. Tracking for her is really about accountability. Being able to 'check-up' and 'monitor' her eating week to week and find out where things have gone right or wrong if she loses or gains weight.

She uses a number of apps related to tracking health (e.g. alcohol tracker, blood pressure monitor), and gains some 'peace of mind' that she has this record which could be useful in the future if *'anything really terrible happened'*. In the past, she has also kept hand-written food diaries in an effort to manage her weight. She suggests that her food diaries, being tangible are a bit more precious. Although her husband encourages her to throw them out, as she never looks at them… she *'likes having them'* as *'you can just flick through a diary'*.

Collette struggles to track when she is not eating well, and loses track of her weight. It will bother her if she hasn't tracked as she doesn't know what's she's eaten but '*knows it's probably because she started eating too much'* and likewise she stops weighing herself as she feels herself gaining weight. When she does weigh herself again, this creates 'a big spike in her graph'.

Collette suggests that despite an initial panic if she lost her data, the data in MFP at the moment isn't that valuable to her. However, that's because she hasn't lost much weight. Whereas if she had lost lots of weight, she would be bothered because – *"it would be a measure of that success, whereas at the moment this is just a reflection of my failure"*.

Collette argues that she prefers looking back at photos than a list of food and calories. Because she claims she knows well what healthy and unhealthy food is, and can recognise that from photos, whereas the nutrition information might be more valuable to someone who didn't know that already.

Suzanne (Runkeeper)

Suzanne, who describes herself as 'not a natural' runner has been using the app Runkeeper to track her progress running and cycling over 3 years. She runs mainly to keep fit and lose weight. She is enthusiastic about self-tracking, having also used smartphone apps such as Moves and recently purchased a pebble watch which interacts with her smartphone on the move. In particular, it helps her stop and start Runkeeper (strap in child/traffic lights) to improve the accuracy of her times.

Suzanne regularly runs the same routes each week, though has tracked other activities including cycling around town and to work, and random walks. Runkeeper really helps her get a sense of progress and motivates her greatly, reminding her of her achievements and that although not a 'natural' runner, gives her confidence to keep running and 'it shows me that I can'. Did the Great North Run, however this put her off running for some time and it took her a while to run regularly again, which she is a bit disappointed about now. Although some of the times are not accurate, the record of when she has run is, as she claims 'she can't run without it'.

Claims she looks back at previous runs each time she uses the app. And would be 'quite gutted' if the data disappeared for some reason as the data is such a source of motivation. It's evidence of her "trying to be active".

Suzanne suggests she views her data quite scientifically, and this is separate from any emotion about running. For example, describing taking two young kids on the back of her bike, she shows photographs she has taken of them enjoying the ride, but would never think of combining this with her data from Runkeeper for the ride.

Besides running, also explains that she will use Runkeeper on holiday in Budapest and Prague, to track where she will walk across the cities. She relates this to a road-trip across the US she did for her honeymoon, which with her husband they charted manually in Google Maps (MyMaps) and have since shared with friends going to similar places. Runkeeper will afford this sort of map but at a city level.

Tanya (Nike+)

Tanya has recorded her running for over two years using Nike+ on her iPod. This doesn't come with GPS, but as she regularly runs in the same place this doesn't concern her too much. She runs to keep fit and also manage a small health concern and she tracks to try and improve her running as she's not an 'exercising person'. Tries to run twice a week, and will usually only reflect on the most recent runs she has done.

Tanya's central narrative is one of improvement and growing self-confidence, from mostly walking, to running without stopping and doing some 5k and 10k races. Early runs recall embarrassment, and the lack of a clear goal, and then improvement as she became more motivated and aims towards running a 10k.

She has never looked back at all of her data, and frequently comments on her pace and progress, ultimately being quite proud of how much she has improved and feeling it is '*a nice thing to be able to look back at'*. As she runs in the same place, she rarely remembers specific runs, but they are situated in certain periods of her life. Earlier runs were when there was sort of less going on in her life and the year is something of a blur, whereas more recent runs she feels she remembers better in context of positive changes in her life. She also remarks the importance of her recent move from Brazil to the UK, which

significantly changed her running habits and is reflected in the data. In this respect, the place and the weather very important to her experience of running.

Gaps in the data, where she has run less regularly reflect a mixture of injury and busyness and laziness. She is reasonably well able to locate these. Although distance and speed not always accurate without GPS, because she always runs with her iPod, feels it is a very accurate record of when she has run.

Tanya hasn't combined data with other records, particularly her calendar, and sees the attraction of this but harbours privacy concerns about this. Comparing it to automatically added to photos. She describes running as *'statistics which can bring you memories'* and more rational, whereas photos are *'sort of just memories'* and are more sentimental.

Aaron (MoneyLover/Accounts)

Aaron has been tracking his income and spending using two apps 'Accounts' (for iPhone) and 'MoneyLover' (on Android) since around 2010. Both applications relied on daily reminders for manual input, however he values the awareness this creates about how he is spending his money.

Tracking his spending is hence a very practical pursuit for him, especially as he juggles money between several different bank accounts, each with different perks. He can also then use this data projectively to make future decisions about what he can afford.

Looking back. Aaron is reasonably able to quickly identify significant sources of expenditure, such as a new computer, or a skiing holiday. In particular, the spending on a particular credit card that he only uses abroad, can '*incite'* specific pleasant memories, about for example an expensive meal or a night out on holiday. In such specific contexts, '*the spending money and the way you've spent it and the descriptions and stuff, you do get a sense of what you did.'*

However for the most part, returning to previous expenditure is in an effort to account for his current balance, previous decisions he has made about managing his money, or to better understand the cost of many day to day expenses.

In terms of memory, Aaron feels it is unlikely he would seek to relive experiences through these accounts, however he does feel a curious attachment to them, "*because that's what you did, and you could see how… […] how you behaved, and what you thought money meant to you, as you kind of, like, passed through it.*"

Appendix D: List of Smart Journal Apps

Prior to Study Two, I undertook to survey the variety of Smart Journal applications then available (2015). I collated these with the note-taking tool 'Evernote', and online via a 'Pinterest' board (https://www.pinterest.com/smartjournal/smart-journal-apps/). An indicative list of these apps and their web links are listed below. Several of these have since become defunct – contemporaneous tech reviews of their services are provided.

Active

DayOne - http://dayoneapp.com/

A multi-platform journaling app, providing a writing interface; contextual content in the form of photos, location, weather, time, date and activity data; and tools to search and organise daily entries.

Momento - https://momentoapp.com/

"Momento is a smart private journal that stays up to date effortlessly". Like DayOne supports written entries, but distinguished by a focus on passive tracking, and the importing of data and content from other applications.

GridDiary - http://griddiaryapp.com/en/

GridDiary is a diary-taking app that aims to support daily journaling through the a grid of prompt cards and questions, such as "What am I grateful for?" and "Did I exercise today?".

Journi - https://www.journiapp.com/

Journi is an app designed for travel journaling, focusing on written entries, importing photographs, and sharing entries with friends and family.

TinyBeans - https://tinybeans.com/

TinyBeans is an online baby journal, proposed as a way to record and share a baby's growth with one's family, away from social media. Supporting written entries and photos, the app also focuses on recoding developmental milestones, and can be printed out into 'baby books'.

23 Snaps - https://www.23snaps.com/
23 Snaps is a photo-driven smart journal, which also focuses on recording and sharing children's growth.

Penzu - https://penzu.com/
Penzu is a privacy-focused, online journal, which emphasises the writing of different kinds of journals or diaries.

Moleskin Journal - http://www.moleskine.com/microsites/apps/moleskinejournal
Accompanying the popular notebooks, Moleskin have built a digital app to "*enjoy all the things you usually do with your Moleskine notebooks, and send your creations out into the world, page after page."*

Defunct
Narrato - https://www.engadget.com/2013/08/13/narrato-for-iphone-is-a-full-featured-journal-app/
"Not only can you use Narrato to record your thoughts, feelings and photos, but it also connects to many social media tools so you can populate the resulting "lifestream" with your comings-and-goings easily. In more of a passive mood? Find your best tweets or status updates and bring them into Narrato with a tap."

STEP - https://techcrunch.com/2013/05/02/step-weplanet/
"There are already plenty of journaling apps out there, but Step Journal stands out as a personal data aggregator that records and helps you make sense of your life's minutiae."

HeyDay - https://www.engadget.com/2014/01/27/daily-app-heyday-is-a-journaling-app-that-writes-daily-entries/
"The app creates entries on your behalf based upon the places you go and the photos you take. Heyday works surprisingly well at creating a timeline of your daily comings and goings."

Appendix E: Study Two Materials

E.1. Website Screening Survey

Participants for Study Two were primarily recruited through a website (https://openlab.ncl.ac.uk/smartjournaling/index.html) where they were invited to express their interest as follows:

> *In this study we would like to speak to people who are using digital tools to keep a journal or diary. In particular, we're interested in 'smart' or 'automatic' journals, which bring together lots of information about your life, such as photos, social media posts, locations and physical activity.*
>
> *Examples of the type of apps we're interested in include: DayOne, Momento, HeyDay and STEP. If you use or have used any apps like these, and would be happy to take part in a short (~30 mins) interview, please fill in this short form (link to Google Form). Participants will be given a £10 Amazon voucher as a token of thanks. Look around the rest of the site, to find out more about the research, what to expect from taking part, or about the research team.*

The Google Form shown overleaf asked some basic screening questions, after which participants were approached via email:

Sign up for 'Experiences of Smart Journaling'

Please fill in this form to express your interest in participating in our study about the experience of smart journaling. If you require more information about our study, you can find it here - https://di.ncl.ac.uk/smartjournaling/.

It is important that participants in our study give informed consent - that they understand and agree to freely take part in the research.

By submitting this form, you confirm that:

You have read and understood the information about the study on the website.

You understand you can ask questions of, and withdraw from the study at any time.

You consent to being interviewed about your experiences of smart journaling, and having this interview recorded and transcribe for the purposes of research.

You understand that information gathered in this form and in any interview will be stored securely, kept anonymous, and will not be associated with any personally identifiable information.

As a thanks for taking part, you will receive a £10 Amazon voucher.

*Required

What app(s) have you used to keep a journal? *

For each, over what time period have you kept this journal? *

(e.g. DayOne - Feb 2013 to present)

Besides writing or annotation, what other data goes into your journal? *

(Tick all that apply)

- [ ] Photos
- [ ] Video
- [ ] Social Media (e.g. Facebook, Twitter)
- [ ] Locations/Check-ins
- [ ] Weather
- [ ] Activity (e.g. steps or exercise)
- [ ] Transport
- [ ] Mood
- [ ] Music
- [ ] Other:

Please list any other apps or devices you use to record or track aspects of your life. *

(e.g. Fitbit, Sleep apps, Moves, MyFitnessPal)

Name: *

Age: *

Gender: *

Location *

(e.g. Newcastle, UK)

Email Address *

Confirm email address *

How did you hear about this project?

Informed Consent *

☐ I have read and understood the terms of consent at the top of this form, and freely consent to my involvement in this study.

Submit

Never submit passwords through Google Forms.

E.2. Study Two Information Sheets

Diarists, and Smart Journalers each received the appropriate information sheet.

Participant Information Sheet
'Experiences of Smart Journaling'

About the research

What is this research about?
This is a study about people's experiences of using journaling and diary apps. There are many of these apps, some popular examples include:- DayOne, Momento, HeyDay and Step.

These automated or 'smart' diaries are interesting to us because they combine lots of different media – photos, social media posts, activity data - so called 'digital traces' in one place. They also give us an opportunity to find out how people experience their digital pasts, and tell us more about the kind of details and stories about their lives people desire to preserve and remember.

This study is part of a wider PhD project about diary keeping, and the role of digital technology in remembering the past. We're especially interested in how different technologies, from social media to wearable devices, leave digital traces and record the past in different ways.

What will we do with the results of this research?
Our research is about informing the design of technologies in our everyday lives. This research will contribute to the aforementioned PhD project, which aims to design technology that supports valued human experiences of remembering. The research will also be written up and presented in academic venues.

Who is conducting this research?
This research is being conducted by Chris Elsden, David Kirk and Abi Durrant of the Digital Interactions group at Culture Lab, Newcastle University.

Chris Elsden, the principal researcher on this study, is a PhD student whose research focuses on *remembering with digital technologies,* and enquires about human relationships with digital possessions like social media, photos and self-tracking data. He is being supervised in this research by Dave Kirk, a senior lecturer in Experience-Centred Design, and Abi Durrant a Leverhulme Fellow.

If you have any questions about the research, please contact Chris by email on c.r.elsden(at)ncl.ac.uk.

You can find out more about our research group generally at - https://di.ncl.ac.uk/.

About taking part

Who are we looking for?
This interview study is being conducted with people who have used a digital journaling tool to record parts of their life. There are numerous examples of these, but some of the most popular include: DayOne, Momento, Diaro, HeyDay, Journal by Android, STEP and Saga.

If you, or anyone you know, uses any of these apps, or apps like them, then we would love to hear from you.

What would happen if you want to take part?
First, get in touch with us using the form on the project website – https://di.ncl.ac.uk/smartjournaling.

Next, we will email you to arrange a 30-minute Skype interview with you about your journal. We'll ask about how you keep your journal, some examples of what you've recorded, and

your reflections on journal-keeping in general. For most people, these interviews are enjoyable and reflective.

With your consent, we would like to record these interviews using call recording software (http://www.ecamm.com/mac/callrecorder/), which will then be transcribed and analysed for our research.

We will then transfer to you a £10 Amazon voucher by email, as a token of thanks for taking part. Finally, we just need you to reply to confirm your receipt of this voucher.

Are there any risks to me taking part in this research?
This study is of minimal risk to you. However, we will likely discuss the past, which can be an emotional experience for some people. It is entirely at your discretion what topics we discuss or not. If at any point during the interview you feel uncomfortable, you may pause the interview, or withdraw from the study altogether if you feel you cannot or do not wish to continue.

What data will we be collecting?
With your consent, interviews will be video and audio recorded.

We will also collect some basic demographic information about you in the initial inquiry form on the website.

Finally, we would be very grateful if you could choose and provide us some screenshots of your journal app as it appears on your device.

How will the information you give be kept and used? Will your taking part in this project be kept confidential?
By taking part in this research you will be helping us to understand how people use digital journals. You can read more about the broader aims of this research above.

The interview data acquired in the course of this research will form part of evidence reports, presentations, and academic publications. Research findings will be disseminated to academic audiences and also professional users. All research data will be anonymised and treated as confidential. You will not be identified by name. You will be assigned a unique research reference and any quotes attributed to you will be through this reference. Research outputs will be written up so as to prevent individuals, families or companies being identifiable in any way.

What if you change your mind or have any questions?
It's important that you know that at any time, even during or after the interview, you can ask questions, stop the research, or withdraw from the study completely.

Chris is the first point of contact for this study (c.r.elsden@ncl.ac.uk) but should you have any further concerns you may also contact Dave Kirk (david.kirk@ncl.ac.uk).

You may also call us (+44 191 208 4617) during office hours.

Participant Information Sheet
'Experiences of Diary Keeping'

About the research

What is this research about?
In this study, we're seeking to understand the practices and experience of keeping a diary over many years, and use this knowledge to support the design of digital diary and journaling smartphone apps.

We hope that by speaking to people who are able to look back at their diaries, we can understand the role diary keeping plays in their lives, and give some insight about the sort of memories, stories and details that are meaningful for them to remember. We seek to compare this in particular to new technologies that seek to automatically record parts of people's lives.

This study is part of a wider PhD project about the role of digital technology in remembering the past. We're especially interested in how different technologies, from social media to email, or even wearable devices, leave digital traces and record the past differently from traditional means – such as writing a diary.

What will you do with the results of this research?
Our research is about informing the design of technologies in our everyday lives. This research will contribute to the aforementioned PhD project, which aims to design technology that supports valued human experiences of remembering. The research will also be written up and presented in academic venues.

Who is conducting this research?
This research is being conducted by Chris Elsden, David Kirk and Abi Durrant of the Digital Interactions group at Culture Lab, Newcastle University.

Chris Elsden, the principal research on this study, is a PhD student whose research focuses on *remembering with digital technologies,* and enquires about human relationships with digital possessions like social media, photos and self-tracking data. He is being supervised in this research by Dave Kirk, a senior lecturer in Experience-Centred Design, and Abi Durrant a Leverhulme Fellow.

If you have any questions about the research, please contact Chris by email on c.r.elsden(at)ncl.ac.uk.

You can find out more about our research group generally at - https://di.ncl.ac.uk/.

About taking part

Who are you looking for?
This interview study is being conducted with people who have written and kept a diary for a number of years. It does not matter however if you have only kept a diary on and off, if you no longer keep or diary, or from when the diary dates, though we are especially interested in diaries that are more than 5 years old. It's really valuable for us to hear what aspects of the past remain meaningful to people over time.

What would I have to do to take part?
After getting in touch, and reading the information about the study, we would like to arrange an interview with you at a time and place of your convenience or your home if this is best. The interview is semi-structured, and will last around one hour.

We'll ask about how you keep your diary, some examples of what you've written, and your reflections on diary-keeping in general. For most people, these interviews are enjoyable and

an opportunity to be reflective.

With your consent, we would like to audio record these interviews using call recording software which will then be transcribed and analysed for our research.

As a token of thanks for taking part, we will then give you a £10 Amazon voucher.

Are there any risks to me taking part in this research?
This study is of minimal risk to you. However, we will likely discuss the past, which can be an emotional experience for some people. It is entirely at your discretion what topics we discuss or not. If at any point during the interview you feel uncomfortable, you may pause the interview, or withdraw from the study altogether if you feel you cannot or do not wish to continue.

What data will you be collecting in this study?
With your consent, interviews will be audio recorded.
We will also collect some basic demographic information about you and your diaries.
Finally, we would be very grateful if you could allow us to take some photos of your diary/diaries.

How will the information I give be kept and used? Will my taking part in this project be kept confidential?
By taking part in this research you will be helping us to understand the experience of diary keeping, and apply this to emerging digital diaries.

The interview data acquired in the course of this research will form part of evidence reports, presentations, and academic publications. Research findings will be disseminated to academic audiences and also professional users.

All research data will be anonymised and treated as confidential. You will not be identified by name. You will be assigned a unique research reference and any quotes attributed to you will be through this reference code. Research outputs will be written up so as to prevent individuals, families or companies being identifiable in any way.

What if I change my mind or have any questions?
It's important that you know that at any time, even during or after the interview, you can ask questions, stop the research, or withdraw from the study completely.

Chris is the first point of contact for this study (c.r.elsden@ncl.ac.uk) but should you have any further concerns you may also contact Dave Kirk (david.kirk@ncl.ac.uk).

You may also call us (+44 191 208 4617) during office hours.

E.3. Study Two Consent Forms

Diarists, and Smart Journalers each received the appropriate consent forms prior to taking part.

Newcastle University

Consent Form

I have read the 'Information Sheet' (a copy of which I have retained) on the research project "Experiences with Diary Keeping" which is to be conducted by CHRIS ELSDEN, a PhD Candidate from Newcastle University, and all queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and give my consent freely. I understand that the project will be conducted in accordance with the Information Sheet, which I have read, and a copy of which I have retained.

I understand that I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I understand that I can ask questions about the research at any time, including during and after the research is completed.

I understand that the entries in my diary that I may share during the interview will not be directly recorded and will be seen only by the researcher CHRIS ELSDEN.

I consent to:
- Being interviewed about my experience of using journaling apps and having the interview audio recorded
- Sending selected screenshots of the use of my journaling app
- Filling in a brief questionnaire with basic demographic information.

I understand that all information gathered from the interview will be stored securely, my opinions will be accurately represented, all data will be kept anonymous in any publication, and no personally identifiable information will be associated with the results.

As thanks for your participation, you will receive a £10 Amazon gift voucher, which you should expect to receive after your participation in the study.

Please type your full name, and the date in the boxes below.

Print Name: _____

Date: _____

Thanks again for your participation, which will be of great value to our project.

Consent Form

I have read the 'Information Sheet' (a copy of which I have retained) on the research project "Experiences with Diary Keeping" which is to be conducted by CHRIS ELSDEN, a PhD Candidate from Newcastle University, and all queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and give my consent freely. I understand that the project will be conducted in accordance with the Information Sheet, which I have read, and a copy of which I have retained.

I understand that **I can withdraw** from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I understand that **I can ask questions** about the research at any time, including during and after the research is completed.

I understand that the entries in my diary that I may share during the interview will not be directly recorded and will be seen only by the researcher CHRIS ELSDEN.

I consent to:
- Being interviewed about my diary keeping and having the interview audio recorded.
- Having photos taken of my diary, at my discretion.

I understand that all information gathered from the interview will be stored securely, my opinions will be accurately represented, all data will be kept anonymous in any publication, and no personally identifiable information will be associated with the results.

As thanks for your participation, you will receive a £10 Amazon gift voucher, which you should expect to receive after your participation in the study.

Print Name:……..

Signature……..

Date: ……

Thank you for taking part in this study. Your participation is greatly appreciated.

E.4. Study Two Interview Schedules

The following interview schedule is indicative of structure and questions asked of Smart Journalers and Diary Keepers

SMART JOURNALING INTERVIEW

In Practice

Can you tell me what apps you use, and how you use them?
- on a day to day basis?
- how often and when do you write?
- what sort of things do you try to record?
- is it organised in any particular way?
- do you tag places or people?
- how much do you write?
- what other data do you import into the app - and how?

Besides what you write, why do you collect the other data in the app (e.g. photos, location, activity)
- what does it do for you?
- why are those details important?

And how do you look back with the app?
- when/how often do you look back?
- triggers to look back?
- browsing/search?
- how far back?

- do you share it or talk about it with anyone?

- do you ever delete or edit any entries? How/why?

Do you have any problems with the app? Anything you dislike about it?

Motivations

How did you start keeping a journal?
- have you kept diaries before?
- know others who kept them?

What do you feel you get out of digital journaling?
- what keeps you motivated?

What's the best moments or experiences of keeping a journal for you?

How do you decide what to write about?
- How do you choose what data to include?
- Does the data help structure what you write?

Open Narratives

Could you look back through your journal, and pick out some interesting examples / experiences you're happy to talk about?

- Something that stands out to you?
- Anything you look back on frequently?
- Something you have shared before?

Reflections

What feelings do you have when you look through your journal?

Which entries would you say are most interesting or meaningful to you?

Do you remember what you're writing about?

Or does it just let you know what you were doing or thinking?

How does it compare to other diaries you have kept?

- compare to other recording/tracking
- compare to looking through photo albums/Instagram/Facebook photos?
- compare to looking back on social media

Compare to other records you have kept?

How valuable is the data which is included?

- *photos*
- *locations*
- *music/weather*

Is there anything you feel is missing from your journal?

- What other data would you like to be included?

Anything else in your life you record that's important to you

- *would you look back on this?*
- *how is your journal different?*

How do you imagine you might use this in the future?

- what data/stories do you think will be most important to you?
- would you share it with anyone?
- how would you feel if you lost it?

Would you be happy to share a couple of representative screenshots for us?

DIARIST INTERVIEW

Introduction

So, tell me about your diary?
- how did you start?
- how long have you kept a diary for?

Motivations

Why do you keep a diary?
- what do you get out of it?
- how do you keep motivated?
- are there times you haven't kept a diary, or you have written less?

How do you decide what to write about?

When do you read your diaries?
- what triggers you to read your diary?

Best thing about keeping a diary?

Are they something you're proud of?

Practical Use

Can you tell me a bit about how you keep your diaries?
- how often and when do you write?
- where do you write?
- what sort of things do you write about most?
- how detailed is your writing?
- do you only write, or do you draw/keep pictures/newspaper clippings etc.?
- where do you keep your diaries?

How and when do you look back at your diaries?
- triggers to look back?
- searching for specific things?
- just browsing?
- torn any pages out?
- thrown any diaries away?

How have they changed?

Is there anything social about keeping a diary?
- do you share or talk about what you write?
- does anyone else ever read them?

Open Narratives

Could you look back through your journal, and pick out some interesting examples / experiences you're happy to talk about?

- Something that stands out to you?
- something you have looked back at before?

Do you remember any particular occasions when you've looked back at your diary?

- has it ever been especially important for you to be able to look back?

Reflections

How does it feel to look back at your diaries?

What are the things that most interest you in your diaries now?

- has that changed as you've got older?
- does that surprise you?

Is there anything that's missing?

- (how do you reflect on the times you didn't have a diary?)
- anything you would add to them?

Do you wish you had more details of everyday life?

- is a 'sense of the past' enough?

How does it compare with photographs or other mementos?

- Would you like all of these things in one place?

Have you ever thought about keeping a digital diary?

Would any of this information be important to you now?

What do you think you will do with your diaries in the future?

- do you hope people will read them?
- would you like them to be looked after?

E.5. Study Two Debrief Sheet

Each participant in Study Two was presented with a debrief sheet at the end of the interview.

Debrief

Thanks very much for your participation. This is a short debrief form for the interview study 'Experiences with Smart Journaling' to summarise what happens now you have completed the interview.

1) The researcher should explain fully the motivations of the research project, and answer any questions you have about the research.

2) The interview has been audio recorded and will now be transcribed by the researcher. He will then analyse the transcripts to develop an understanding of participants' different experiences of smart journaling. This understanding will lead to future studies and potentially publication at academic venues.

3) If you have indicated you would be interested in participating in follow up studies, you may be contacted in the future by the researcher inviting you to take part in a further study.

4) Any personally identifiable data will be removed from the interview transcripts and participants will be anonymised in any distribution of the results of the study. Any specific practices or quotes which are distributed will be attributed to pseudonyms. The recordings and transcripts themselves will be stored securely by the researcher for as long as necessary for the study, and not more than 5 years, unless specifically requested.

5) If you are interested in any future publications resulting from this work, please contact the researcher who will be happy to share these with you.

6) You will receive a £10 Amazon voucher for your participation by email shortly after the interview. For our own records, we would greatly appreciate if you could promptly acknowledge receipt of this voucher.

Many thanks for your participation, it is greatly appreciated.

Once again if you have any further questions, please use the contact information below:

Researcher Contact Details:
Chris Elsden
PhD Candidate at Culture Lab, School of Computing Science, Newcastle University
c.r.elsden@ncl.ac.uk
Tel: 07773726728

Debrief

Thanks very much for your participation. This is a short debrief form for the interview study 'Experiences of Diary Keeping' to summarise what happens now that you have completed the interview.

1) The researcher should explain fully the motivations of the research project, and answer any questions you have about the research.

2) The interview has been audio recorded and will now be transcribed by the researcher. He will then analyse the transcripts to develop an understanding of participants' different experiences of diary keeping. This understanding will lead to future studies and potentially publication at academic venues.

3) If you have indicated you would be interested in participating in follow up studies, you may be contacted in the future by the researcher inviting you to take part in a further study.

4) Any personally identifiable data will be removed from the interview transcripts and participants will be anonymised in any distribution of the results of the study. Any specific practices or quotes which are distributed will be attributed to pseudonyms. The recordings and transcripts themselves will be stored securely by the researcher for as long as necessary for the study, and not more than 5 years, unless specifically requested.

5) If you are interested in any future publications resulting from this work, please contact the researcher who will be happy to share these with you.

6) You will receive a £10 Amazon voucher, or high street voucher of your choice as thanks for your participation.

Thankyou, once again.

Once again if you have any further questions, please use the contact information below:

Researcher Contact Details:
Chris Elsden
PhD Candidate at Culture Lab, School of Computing Science, Newcastle University
c.r.elsden@ncl.ac.uk
Tel: 07773726728

Appendix F: Supplementary Study Two Vignettes

As in Study One, the production of vignettes of the experience of each participant in Study Two was an initial analytical step. For reference, further brief vignettes beyond those presented in the body of the thesis (Section 5.5.1) are shown below.

Andrew, 68, (Diary)

Andrew is a recently retired high school modern languages teacher, who has kept written diaries on and off for 30 years. He began with a 5-year diary, inspired by a friend, but lapsed after finishing this. As his career progressed, he began taking more notes, and over time *"personal things crept in"*. Now retired, he finds he writes at greater length. Andrew reflects frequently on his age, and in part his diary serves as a testament to a life well lived and that "*it's not all my imagination"*.

The contents of Andrew's diaries are diverse even including on occasion some self-tracking and quantified records such as calorie intake, prices of bottles of wine and Munro's climbed. More private or emotive thoughts were sometimes scribbled in German, though in general his diary was more factual, containing little emotion, even around significant life events such as his mother's passing, or his wife's illness. These might be thought out instead on a long walk to avoid the diary becoming too morbid. He sees this stoicism as being *"stupidly Scottish in that one"*.

Despite seldom looking back at his diaries, Andrew draws a certain comfort from them, finding he is turning to them more and more in retirement, and as he notices his memory fading.

> *"I'm pleased they're there, I'd feel even more 'really old man' without them. I'm glad they're there. Because it's terrifying.. it's very erm... it's not even unsettling...it's just annoying how much you forget, and how much you jumble up in confusion. No I'm glad they're there."*

Audrey, 66 (Diary)

Audrey has kept a journal of all her travel and family holidays since her honeymoon in 1968. She typically records notes while on holiday, on various scraps of paper, which are then transposed into a note book once she comes home. These are quite rich chronicles of what they did on holiday, with quite a focus on the travel itself, typically by car.

> *I guess I started doing it because I thought it would be fun in my dotage to look back on all the holidays.*

Looking back now, she believes she has written much too much 'trivia' – or 'very detailed rubbish'. Though into her sixties – Audrey still sees it as something she will look back on more in her dotage. Nonetheless:

> *I'm really glad I did it. I mean, just reading that little bit of that early France one. You know I had forgot – you forget, I would never remember all those – I mean I remember that we went camping in France with the kids, but I don't remember any detail whatsoever. I don't even remember all the places that we went to. So it's really nice to know that it's there and that I can read it when I want to.*

However, Audrey contrasts this detail with the objects she sometimes brings back to remind her of a place – e.g. a bracelet. These might provide a pleasing, everyday reminder of foreign times and climes – not details, but the sense of time and place. Beyond reminiscence, the motivation to look back at her journals is often social, stimulated by discussing old holidays, or people going to new places. In this respect, the journals are something to check, and to reference, rather than to browse through. She also tots up the costs of each holiday – and this is one of the most interesting aspects to her now.

Emily, 26, (Diary)

Since the age of 6, Emily has kept an infrequent journal about her progress in life. She writes at least twice a year – on her birthday and at Christmas – but she also writes at times of significant changes or events in her life, such as moving to study abroad.

> *I don't know where it came from, I was inspired… I guess I loved the idea of a diary but I don't know if it was a TV character.*

This is very reflective and personal writing; an 'update' on where she is at in her life, important things that have happened, and how she feels about them.

> *But I go through like, it starts off with kind of like, the headlines change in terms of order with no particular structure. But I'll go through things like family, I'm gonna say education/career stuff, because I suppose now it's like National Grid whereas before it was more academic stuff, friendship circles. I always do a 'hopes for the future' about what I want to get out of the next 6 months. I have a reflection on if I've progressed in any of those places or if anything's changed.*

In this way, her writing is purely therapeutic, but can also be playful. She occasionally writes in the 3rd person, or includes quotes she likes from other authors.

> *I kind of try and mix things up a bit. I don't always write in like kind of first person. I'll try do it in like 3rd person, I've dabbled at languages in it. I'll not read you out those chapters! (laughter) I'll try mix up the writing styles or stuff.*

Most remarkably, Emily has almost NEVER looked back at her journals, and we never looked back during her interview. However, she feels she may do one day when she is much older, and further removed from the events and feelings she is writing about.

> *I like the idea that in my old age I'll look at it but I'm not looking at it now.*
>
> ***Like are you curious about it? Do you have to stop yourself reading it? Or are you just never interested?***
>
> *I'm curious... but I think it would be too cringy! (laughter) I kind of roughly know what's in it as well.*

As it is, her diary serves a present-focused, and therapeutic purpose, to help her reflect, and also look forward as positively as she can.

> *Sometimes it's kind of like a bit difficult when you're writing about a difficult subject. Because you write in your diary stuff that the times you didn't come across as the most marvellous person in the world. But I think it's always quite good to face up to those times because it can only make you better in the long term.*

Laura, 46 (Diary)

Laura is a long-term diarist. She began keeping a '5 year diary', a gift from grandfather, aged 13. This was the only daily diary she ever kept, and now writes in personal notebooks a few times a month, covering the main events and going's on, particularly relating to her family. Inside the books, she includes other important written correspondence, such as postcards, letters, printed out personal emails. All of these are stored in a trunk in her bedroom. She writes either based on going through a day-to-day agenda, ensuring she notes important events, or through categories such as family, work, personal etc. Besides from looking back at her previous entry from a few days previous, she very rarely looks back. Like others, she sees her diaries as a project for older age, and perhaps a legacy for her daughter, although only after her death. She sees these as very private, and very personal diaries.

> *"It's just my history, isn't it? I'm not bothered that it's not terribly interesting, and that I'm not going to be famous from it.I would hate it to be published. It's not for that, but it's just [about 0:14:24] my life, and I think it's good knowing it's there, because I would like to go back and read them sometime."*

> *"A photograph is a picture; it's an impression that someone else standing in exactly the same spot as me at that time would have had the same image in their brain. But my diary is my impression; my perspective on what happened*."

Reflecting on legacy, she claims some heritage in record keeping and documenting – pointing to organised family archives she has, and she focuses her writing on people and family. While personal, her records are *'pretty factual'*, and to the point. As a medic, she described the death of father in very medical terms.

> *"I have been up since 2:30am. It's now 11:30pm. Dad has taken a turn for the worse and is now on a sub-cut syringe driver." and sub-cut fluids. He phoned us at 2:30am saying he was having some sort of attack. When we arrived, he was writhing on his bed, drenched in sweat, pale and shut down with abdominal colic and a feeling he needed to move his bowels."*

Laura suggests she tends to remember feelings around an event like this. However – reading back her writing around this time was comforting to her, and ageing brings a realisation of how much she forgets.

"I guess important events in recent life, sometimes I have re-read if I've felt the need to, like my father was very ill and then died, so obviously I did a lot of writing about his diagnosis with cancer, and how we looked after him, and his death and his funeral and all that kind of stuff. I think in the aftermath after he died, I went back and read quite a lot of it, and in a way, I found it quite comforting, actually."

Aaron, 36, (DayOne, Momento)

Aaron is a software developer, technically savvy, and the most actively engaged with notions of Quantified Self and lifelogging – a self-described experimenter. Beginning with a written high-school journal, Aaron has created many diverse records of his life, which includes: a year of video journals or 'captain's logs'; 'Lifeslice' - a daily selfie taking app through webcam; and an automated wearable camera, the Narrative Clip. An enthusiast, he has also become the family archivist, including a remarkable history of letters and recordings on a dictaphone, to which he sees himself contributing his part. Although he embraces the idea of 'total capture', accumulating masses of media and data about his life, Aaron remarks a strong contrast between more passive and active records.

"I feel like it would be nice to have, like a 10000ft view that you can then also zoom in on a microscopic level. Where you can kind of back away from your journal, and see activity data, location data, photos, videos, contextual information. Peppered into what it is you've actively chosen to record."

Comparing many kinds of media, he ultimately values his regular DayOne journal for its reflective and therapeutic qualities.

"You would think the video would be just as personal. But there's something about the on-the-spot nature of the video camera being on that eliminates the ability for your brain to actually emote. So I feel like when you're sitting down in a blank piece of screen, or whatever! And there's no time constraint, there's no pressure, there's no camera rolling, you're more able to capture something authentically."

Jorge, 38, (Grid Diary App)

Jorge relies on the app GridDiary to help him reflect on his daily life; where he is, and where he wants to be. His writing is part of a mindfulness and gratefulness practice, well supported by structured, pre-set questions he has made with the app. For this reason, he rarely looks back, as the record is simply not nostalgic in that way.

> *"So it's forcing me to think about the things that matter, what I did wrong or right and it helps me maybe the next day…"*

> *"But the value is helping me to get to the right focus, remember the right things, it's more about what it helps me remember."*

While he values remembering and keeping track, he feels his use of other note-taking tools and social media fulfill this role for him if he needs.

> *"I have previous in which I intended to take pride in writing a proper journal, but I quit after 2 or 3 days. So it doesn't have much value for me. Of course, there are things I would like to remember and keep track of, but then I use Evernote for that. I don't need to write a regular diary."*

Lisa, 48 (DayOne App)

Lisa is a life-long journaler – in various forms. Shey typically writes about events and 'personal grumbles'. DayOne for her is a personal and quite private journal, which is often photo-driven – as this is a good way to tell a story.

> *"I think I have kept journals way from when I was a kid. I have recently discovered school girl diaries that I wrote in from time to time. During my 20s I wrote extensively in big books that I wrote into. It has been a lifelong, not persistent every day or every month, but it has been a behaviour that I have done all the way through my life."*

Some entries in part rehearsals of stories you might tell someone, and thinking things through. However, she also recognizes a journal as a way to recognize and deal with feelings and emotions, in particular, accepting and understanding how life changes and feelings pass.

> *"When you look back over your journal you realise there were some of these key points that things happened. You go, "Ah that time has passed." I just feel very*

differently about some of those things. I think that is one of the things that is useful about journals that you can go back and you can look at those frustrations or those points where things really annoyed you and use it to recognise that feeling will pass."

In this way, her journal gives her a way to connect to and accept the past. Rather than reminiscing, her journal helps her move on.

"I think it helps to give a sense of connection to the past, connection to somebody who was past. If there is any sense of reflection it is that I as a person have moved on."

Given this connection, and her emotive and reflective use of the app, her step count from Fitbit seems out of place when imported into the app.

"I use Fitbit, I have been using Fitbit for about three years or so. I know if I go into DayOne it will now grab my steps I think on my phone. But because I have already got an app, because I have already got Fitbit doing that for me it doesn't seem terribly relevant to grab that there."

Karen, 38 (DayOne App)

Karen began using DayOne collaboratively with her partner to record their holidays. They did this very much in mind of creating a curated record of their unique traveling experiences, beyond the 1000's of photographs such trips typically generate. Both will write in on different days, and are very socially aware that this is a record to be shared with people on return. In the past, Karen has made a short iMovie of photos, and the DayOne app offers a similarly quick overview of holidays.

"I've looked back at it a little bit, shown some friends, particularly showed the likes of my mum, coz, I thought it would be quite a nice thing for her to look through rather than me boring her with all my stories. Just like, here you go, here's a snapshot of what we did on holiday."

"Thing is you take so many photographs when you're on holiday now, I guess you know what it's like yourself, you take so many photos. And it's nice, I really enjoy kind of flicking through photos, but this is kind of a quick way of looking through the highlights I suppose."

Karen has a strong feeling that people '*forget so quickly'*, and despite working around the world at golf tournaments, finds she doesn't record her work in this way. However, she does also keep a curious record of all of the golf courses she has played, and some scorecards she held on to when she was younger, which would 'trigger' their own memories.

> *"But I mean the scorecards that I kept were probably more from when I was younger, the scores that I keep in the spreadsheet now would just be like the total score. But... again, even just looking back, I played Nairn, and I shot such and such and it was on such and such a date, I'd be like 'oh yeh, that was a really good trip, I went up there with some friends and we did such and such', so it would kind of trigger memories which was nice actually."*

Michelle, 45, (Narrato)

Michelle was the only participant who no longer kept a journal, she had previously used Narrato, which supported writing and capture of context from a smart phone. Over time, she found she had less time to write, and gravitated towards QS and automatic capture, to keep track of her life, as well as focusing more on public blogging. In this way, some practice of writing has taken on different roles in her life at different times.

Narrato was very much a private place for her to write for herself, in particular contrast to her public uses of social media. In this way, Narrato also became a space or a backstage for her personal expression prior to sharing something.

> *"Because it was about more than just text, it was kind of a nice toy to play with, and I could write things privately for myself, so I was kind of using it as a diary for a while. But then also I could share stuff, it was also in that way that it was bringing together text with images. So it was kind of a space for expression as well as recording stuff*."

This was usually very long form writing – *'writing for myself is a real luxury',* but carefully accompanied by imagery. As her habits changed, she began using the app less and less. She could not locate her past entries during the interview, though assumes she still has some access to them from the cloud.

She now feels that QS 'does more' for her in a way than journaling – which was a pleasure, but told her less about herself than she feels self-tracking can.

"Because if I think about the acts that I do that are quantified now, they give me an understanding they've got some data visualisation aspect to the, all of them do really apart from Evernote, they kind of teach me something about myself that's quite accurate, whereas the journaling is really quite free-flowing and it's not about numbers specifically, because it's not my blog, I'm not thinking about the number of people who would have read it. It's kind of just there, and it doesn't really in any sense give anything back. Other than the fact that it's just really satisfying to do."

As we discussed the many other quantified records she now keeps – Clue (a fertility app), Sleep data, Evernote Food, Mood, she suggest the ideal solution for her would be a better means to tag and annotate QS data.

Most interestingly, she can relate her data to some important events in her life.

"... I had one day, I think it was in November where I had 99%. I woke up and I felt amazing, and I had one day this week where it was just the other night actually, where it was 34%, I had such a bad night's sleep."

"The 99% it was… I'd spent a few weeks homeless at some point last year, so I was moving around a lot, house sitting, and staying with various friends, and I had literally been in ten different homes over like a 5 week period, so when I moved in where I am now, that 99% was kind of like me finally being able to rest completely, because I was in my own bed for the first time in a long time, so that 99% isn't just about it was a great nights sleep, it was also the end of a bit of an ordeal, and the beginning of just feeling more settled."

Anil, 30 (DayOne and Momento)

Anil is an avid journaler, who takes real pleasure on reflecting on his past, on his own or with his friends. He uses both DayOne and Momento to create records of what he and his friends are doing.

"I don't think my entries are going to have anything profound in there. But for me it's just the joy of reading of what I was doing and who I was with, that's the motivation."

Anil puts great emphasis on reliving, or connecting emotionally with his journal and frequently sends entries to friends, and puts great effort into recording in the moment.

> *"I use DayOne for – if it's been something specific that's happened that I want to remember it, where the automatic journaling is either not appropriate or doesn't provide enough detail then I'll use DayOne for that, and select a photo."*

Momento, which creates daily journal entries automatically, therefore provides a baseline for Anil. He expresses contrasting feelings about the kind of contextual detail Momento offers. For one part, he feels there is '*always enough there'* and it can '*help with the memory to try and bring it back'.* Nonetheless, his own written entries in DayOne tend to be more emotive.

> *"I don't think you can really get a really good feel as to what you did that day or how you felt. Because the entries not particularly personable, I know you have the Twitter entries, but if you're just looking at a check-in and it says checked in to cinema or whatever - it doesn't really mean a lot by itself. I think the DayOne entries in that respect, they're more valuable to me emotionally than Momento. Despite the fact that Momento has so much more, it's got a lot more richer data, but for that emotional connection I think I have to have both."*

Lastly, he uses the app extensively socially, and frequently looks back and recalls past entries. He therefore values when the app itself reminds him of previous entries.

> *"It will tell you what you were doing a year ago and that's, that's really valuable to me, I like to know what I was doing... just you know when you talk to friends "yeh we were here, a year ago' so yeh that's the kind of memory, that's the reason I keep the diary."*

Alexis, 21, DayOne/Evernote/Memoir

Alexis is writing to try and capture the important things in his life – in as clear and decluttered way as possible. He experiences a tension in trying to record whatever might be important, and to capture thoughts and emotions as they happen, but also to achieve a clarity of thought, goals, ambitions and reflections.

> *"It's a place for all my thoughts that you know... it's actually a declutter zone if I could call it like that. So everything just goes there, everything that I'm thinking*

about, everything that I'd like to do, unfinished documentaries, documentaries I'd like to watch. I'm just recording anything that I might need in the future, or any reference point."

He describes feeling an urge to record, and a nostalgia for moments even as they are happening.

"I just had this urge to start recording my life, but recording seemingly insignificant moments, just recording moments, just to capture them, because I've often, often you can feel nostalgic about a moment as it's happening. ..not so much to revisit it, but to get a sense of closure a sense of satisfaction from you know, I've collected that moment, I've locked it in, and somehow it's not lost. Which is you know a false reality, because it is lost."

DayOne and Evernote serve different purposes for Alexis in this respect. Evernote includes rough thoughts and ideas, while DayOne becomes more about *'creating a story'*.

"Whenever I feel like the impulse, whenever there's that spark when I need to write something, I use my phone and write the idea in its raw form, or the thought or whatever it is. And later on in the day, or a couple of days later, I'll pick up all those notes, and start to arrange them and make the thoughts a little bit more consistent and you know... and then filter them and file them."

Alexis was initially excited to try Memoir, because of the promise of a more visual record of his memories, however he struggled to use the app, as he found it too intrusive and automated.

"I think you lose the balance when the app starts determining what a memory is or when that app starts determining what photos matters. You know I have thousands of photos on my phone, but there are only about 20% of those that actually matter that actually have a sentimental value, that trigger nostalgia. So the automation that matters for me mostly could be about location, or things like DayOne does, which are very subtle, where tracks location and the weather and the time. Which are data points which aren't intrusive, but they can paint an interesting picture, to trigger... right, because isn't that what journaling is about? It's about triggering emotions from the past, at least that's how I view it."

Appendix G: Design Workbooks

The following Design Workbooks, presented chronologically reflect the progression of the Quantified Wedding project from the initial design ethnography, to planning participant engagements.

A Quantified Wedding

Weddings are frequently conceived of as the best day of one's life, the biggest party you will ever have. As such, they have become carefully staged and recorded; one of the most memorable life events.

An official photographer and videographer is hired, and a unique physical album curated. Special books are signed by attendees. Dresses are kept, honorifically as a legacy of the event, in the attic. An official registry is signed. Disposable cameras are often distributed amongst guests, in addition to the photos and videos taken and shared with smartphones.

Weddings, and the rituals that surround them, can be increasingly recorded through personal informatics tools. In one case, a man recorded and later presented his heart-rate monitor data while proposing to his girlfriend (she said yes).

As an intrepid wedding planner and photographer, **design and present a premium 'Happy Quantified Couple' wedding package, to 'know thyselves' and mark the big day.**

DESIGN WORKBOOK #1

Anticipatory Ethnography
Lindley et al. (2014)

Abstract
Here we consider design ethnography, and design fiction. We cast these two approaches, and the design endeavour itself, as forward-looking processes.

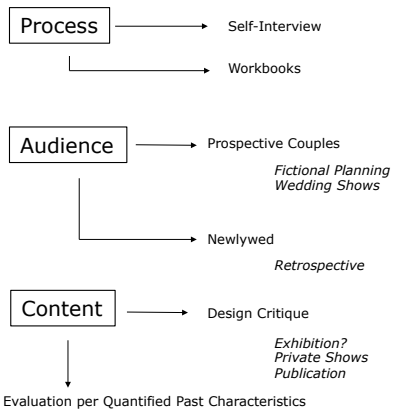
Exploring the means by which design ethnography and design fiction derive their value reveals the potential for a mutually beneficial symbiosis. Our thesis argues that design ethnography can provide design fiction with the methods required to operationalize the practice in industry contexts. Meanwhile design fiction can provide design ethnographers a novel way of extending the temporal scope of the practice, thus deriving actionable insights that are applicable further into the future.

The intention is to study the design of the fictional 'Quantified Wedding', using anticipatory ethnography.

This choice, should be reflected in the means to materialise and communicate the fiction.

In the first instance, this is the publication of a '***Quantified Wedding Magazine***'.

But how will this be studied, performed and engaged with; and by whom?



... We suggest looking at design fiction prototypes as a painting (in harmony with our 'joining the dots' metaphor). There are three parts to this metaphorical painting, corresponding to three approaches to anticipatory ethnography:

1) Studying the *process* of creating a design fiction (ethnography of the paint, brushes, and making of a painting).

2) Studying how an *audience* interacts with or perceives a design fiction (ethnography of people viewing the painting).

3) Studying the *content* of a design fiction (ethnography of the painting itself).

pp246
Lindley et al. (2014)

*"So as with **design ethnography** the underlying value of **design fiction** is the insightful dialogue about the future, and that dialogue is an emergent property of the **discursive space**."*

The Wedding Magazine

Wedding magazines are popular monthly, or bi-monthly publications, intended as a resource (primarily) for brides-to-be, planning their wedding.

They are thick, glossy and often glamourous. They contain many adverts and sponsored content, as well as regular features and 'real-life' wedding stories.

Image centric, these magazines offer a source of inspiration and support in all the significant aspects of planning a wedding.

They often contain 'pull-outs', which may focus on one particular feature of a wedding (e.g. dresses, photography, venues).

The primary material output for this design fiction is proposed to mimic such a pull-out, focusing on the future of recording data about a wedding.

Issue no. 23
March 2019

Your quantified wedding checklist

Hundreds of new ways to keep track of the moments that matter!

Under the Veil
How a quantified wedding works

Meet the wedding planner who wants to quantify YOUR wedding!

***30** beautiful ways to visualise your data as personal mementos!*

***112** kinds of data you could collect about your wedding*

How your guests can have fun and get involved in tracking your big day!

Real stories about couples most precious data!

Data Maintenance 101
Make sure your memories last forever!

'Real, but Glossy' – Technology and the Practical Pursuit of Magic in Modern Weddings

Massimi et al. (2014)

Massimi et al. published a 2014 CSCW paper on technology and weddings, with a number of useful and provocative insights.

*These individuals are **sanctioned** to perform the necessary work of documentation and entertainment so that the rest of the congregation may instead focus on the **pure aspects of participation.***

*The shot list illustrates again how weddings are about particular times where particular people are engaged in a particular activity that is especially meaningful or important – the (sought for) **magical moments**.*

*The first few months after the wedding was regarded as a time for talking about and working with the mementos. This was a kind of timeframe or window that followed the event where **revisiting it is expected and indulged**, and the production of photo albums, memory books, thank you cards, and so on is done.*

*Weddings have special moments of spectacle that act **as indices into the event** and orient documentation efforts.*

*Without diminishing the importance of the official records of the day, a great deal of joy and unexpected value comes out of the **unplanned and more serendipitous collections** and showings of wedding traces.*

*…traces that are captured outside this envelope of editorial control might appeal precisely because they **are contrastive, mocking the sought-for perfection** through documenting the less-than-perfect, the foolish dress, the infelicitous speech.*

Quantified Past

A reminder from previous work.

PASSIVE

EGOCENTRIC

REMOVED FROM PAST-AS-REMEMBERED

ABSTRACT / REDUCED / COMMENSURATE

QUANTITATIVE / OBJECTIVE

AMORPHOUS

Accounting for one's life

Experience of recording

Unique perspective

Legacy

Three Approaches

What data can be captured from what activities?

How will this recording be interacted with during the wedding?

How will the data be presented and interacted with after the wedding?

DATA

What is it?

How is it captured?

What does it represent?

INTERACTION

What interaction is there on the day?

How is this materialised and presented?

Is this commensurate?

Sur/sous-veillance

REPRESENTATION

How is the data visualised?

Where and when is it represented?

What future interactions are anticipated?

All That Data

What are basic forms of data that can be drawn upon?

This laundry list includes data which is recorded passively, of the environment or is through interaction.

PASSIVE

ENVIRONMENT

Temperature
Global/Local

Volume
By area
During particular event
Sound waves

Light
In ceremony
Sunset

Location
Tracking different objects
Tracking people
Placing things together
Locations over time

Biometrics
Heart rate
GSR
Breathalyser
Genetic Data

Timestamps
Timeline of day
Specific events
Co-produced media

Motion
Accelerometers on objects
Physical activity
Video analysis
Computer Vision
Touch

Counts
Occurrences
Encounters
Summaries
Steps
Consumption

Audio
Speech Analysis
Keywords
Music

INTERACTIVE

Categorisation
Objects
Guests
Moments

Self-Report
Observations of guests
Occurrences
Mood
Place
Encounters
Experience Sampling

A Wedding Timeline

Key events and associated objects in the planning, performance and reflection upon a wedding.

PROPOSAL	PLANNING	CEREMONY	PHOTO SHOOT	RECEPTION	POST WEDDING
rings	venue	preparation	shot list	champagne	honeymoon
sharing news	save the date	wait	bridal party	meal	open gifts
	invites	walk in/given away	families	speeches	thankyous
	dress	vows		favours	facebook updates
	website	kiss		1st dance	creating mementos
	rehearsal	sign register		cake	album/journal
		exit ceremony		candid photos	videos
		bouquet throw		wedding book	website
				gifts	
					anniversaries

The Data Booth

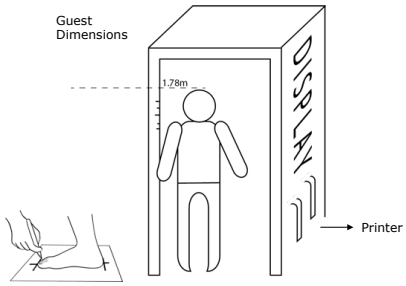
Some wedding companies offer photo booths for hire, where guests can take and print out photographs, or leave messages for guests.

This is a site of interaction and playfulness during the wedding.

Consider the design of a 'data booth'.

Here guests may create, view, or be gifted data during their interactions.

Physical Measures



Tangible Questionnaires (UCLIC)

Keypads
Switches
Sliders
Control Panel

Data Gathering Questions

Where did you come from today?

Who's the best looking bridesmaid/ groomsman…

How drunk are you?

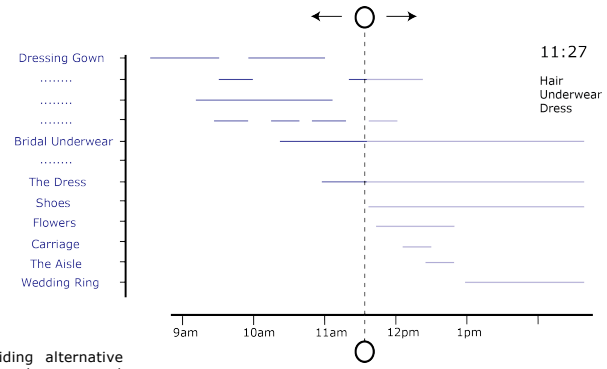
How drunk will you be?

How long have you known the bride/ groom?

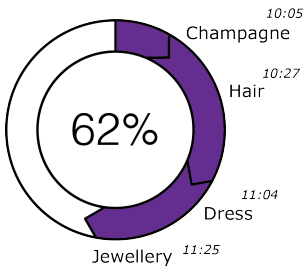
Which of these words best describes...

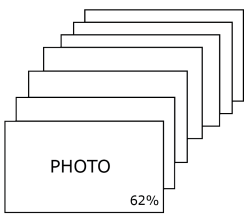
Becoming a Bride

Tracking the objects that the bride encounters, wears and carries as an account of her day and transformation.



Providing alternative means to represent and navigate other media e.g. photos.

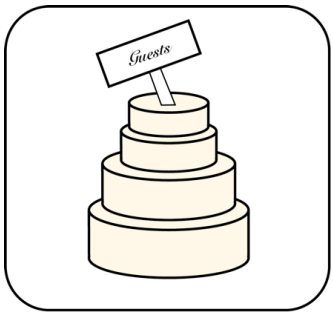




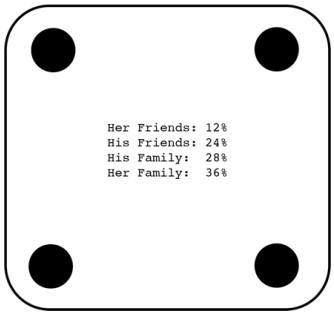
Making use of image recognition technology.

Visualising Coasters

An example of embedding data in fun and easily encountered everyday objects.



The illusion of volume of the wedding cake creates an interesting ambiguity.



Only revealed when the coaster is turned over.

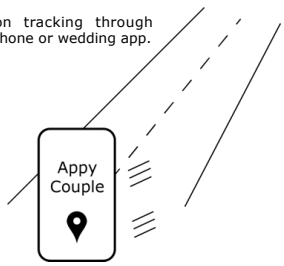
Invitation Mapping

Guests arrive from all over to attend a wedding. In their own way, they map crossed paths, old and new haunts.

Consider means to map their unique convergence to witness the big day.

A GPS enabled wedding invitation.

Location tracking through smartphone or wedding app.

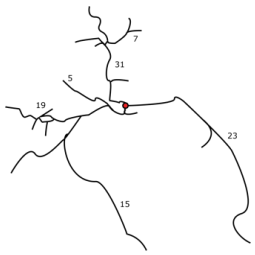


Appy Couple is an existing wedding planning app.

www.appycouple.com

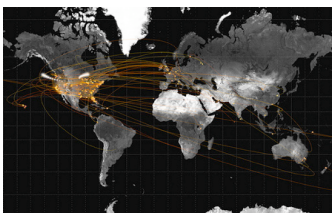
Mapping may be achieved via:

- Invitations
- A wedding app
- Self-Report



Patterns created through paths taken.

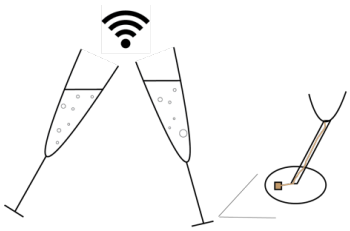
Available at multiple scales.



Jer Thorp's 'Just Landed' map of air travel.

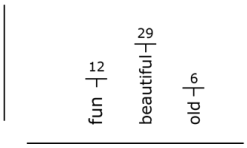
A Toast of Data

Different common wedding objects, such as champagne glasses could be augmented to generate data about the event.



Creation of sound wave art

Numerous applications for keyword analysis



Augmented Glasses

Delivering Data

When hiring a photographer or videographer, arrangements are made to provide the resulting media in particular formats.

Normally this includes a large number (e.g. 500) of edited digital photos, access to the photos via a website, and a selection of high quality prints.

The data from numerous sources at the wedding would need to be collated, cleaned and then provided in both an accessible and compelling format.

Perhaps this is a new role: a datagrapher? Data curator?

HOW IT WORKS

- Meet before wedding to discuss the data you would like to be collected
- Our trained *datagrapher* will be present throughout the day, to set up and look after all the recording.
- We take all the raw data and edit it and clean it to provide the highest quality data.
- Our in-house design team apply your data to your selected products (e.g. wedding albums, gifts etc.) and work closely with your photographers and videographers.
- We deliver all your chosen products, along with the original data directly to your home.

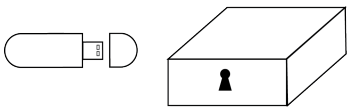
WHAT WE PROVIDE

Standard

- Agreed physical mementos
- Two master USB sticks containing all raw data in accessible formats (csv)
- Secure cloud storage of all raw data (lifetime access)
- Flexible privacy settings to share data with friends and family

Premium

- One-to-one session with data curator to make the most of your data
- Annual anniversary products



Wedding Album 1

The wedding album is the most prominent physical artefact created to remember one's wedding.

These are often albums of considerable size and weight. Often they are provided as part of the photography service, and contain many photographs, sometimes with hand-written captions.

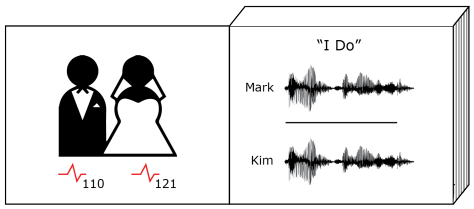
They may be carefully personalised and are often passed down through a family.

Data collected at a wedding should seek to integrate with the wedding album, and the media it contains.

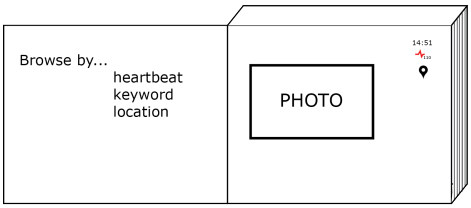
The album may embed, or display data.

It may be possible to navigate the album by data.

The album itself may be an enduring site of data capture, reflecting it's own usage and evolution over time.

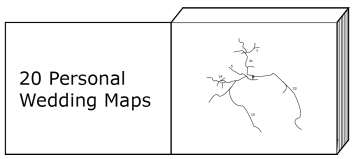


Data embroidery, as a means to physically embed data in the album.



Care required to include data tastefully, in a way that endures.

May be twinned with a tablet application to afford smart navigation.



Could be supplemented with physical copies of smart journal content.

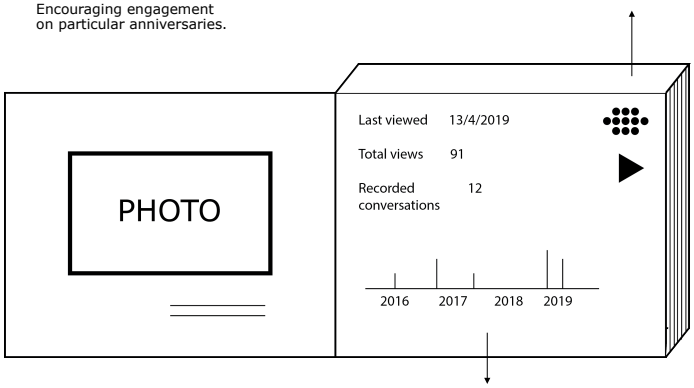
Wedding Album 2

Thoughts on how the album itself may be instrumented, to support remembering and reflection.

Potential for slow or evolving interactions around the wedding album.

Encouraging engagement on particular anniversaries.

Playback of snippets of conversations around the photo



Timeline of viewing history

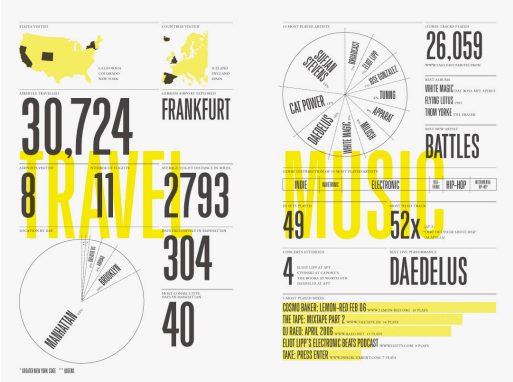
Feltron Wedding

Designer Nicolas Felton has famously produced and published annual quantitative reports of his life.

Besides the immense volume of data, a notable feature of his work is the way the data summarises and abstracts huge parts of his life.

Such a quantitative report or summary of a wedding may be of interest retrospectively.

It may be well placed alongside or as part of a wedding album.



A page from the 2006 Feltron report.

---

181 glasses of champagne

24 steps down the aisle

6 diamonds

17 hats

Married at 13:07

81 guests *(pie chart)*

Playlist *(by artist/genre)*

Blue *(most popular colour)*

Let's Talk About The Dress

The dress is a fundamental point of interest both in anticipation of, during and after the wedding.

Many brides keep their wedding dresses, despite never wearing them again.

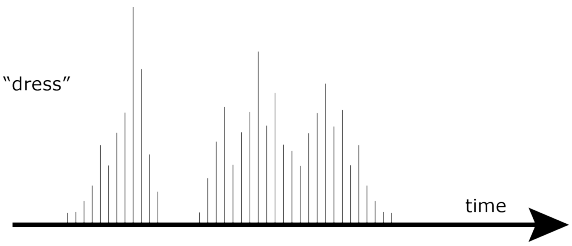
Some may even pass them on to their children.

Using advanced speech analysis technologies, talk about the dress could be recognized and quantified.

Wedding dress
[wed-ing dres]

noun
the dress you wore at your wedding

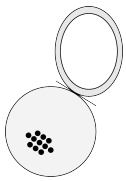
related words
beautiful (15); modern (11); bespoke (9);
expensive (6); chic (5); train (3);



Mirror mirror....
What was my wedding dress like?

"..she just looks so well."

"Isn't she beautiful?"

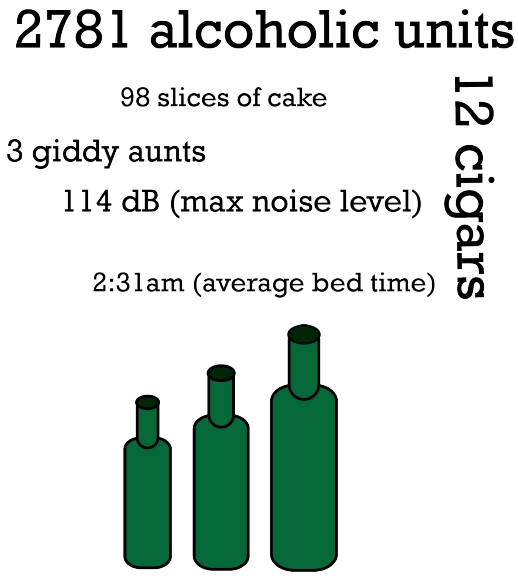


Powered by
Amazon Echo.

White Wedding Vices

Weddings can be a time of extravagance or and over-indulgence. During the Metadating event, such vices were seen as more evocative or illustrative of people's identities.

Data might playfully represent these vices at a wedding.



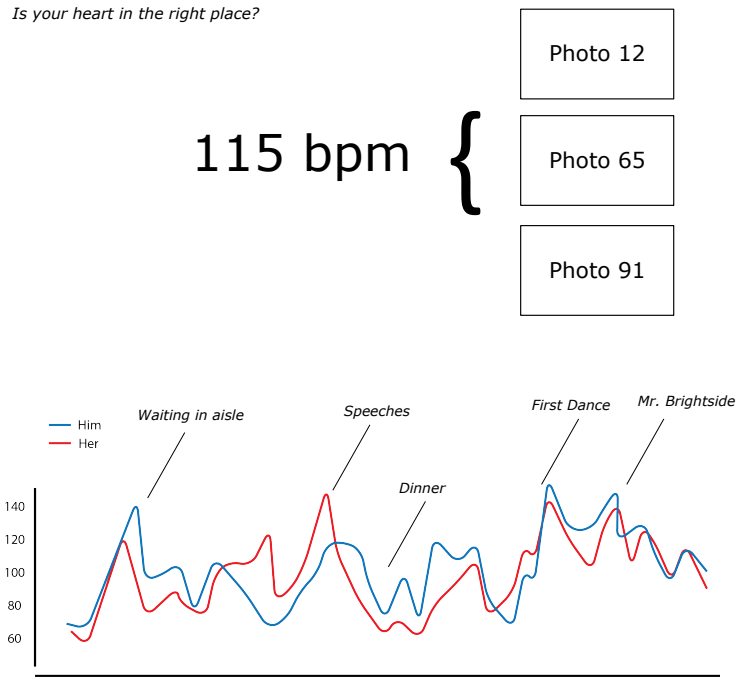
The Heart of the Matter

Consider the use of heart rate data to ambiguously represent the course of the day. Leaving moments to speculated or puzzled about. This may be the heart rate of bride, or groom or both.

Ambiguity

Emotional Intensity of a moment

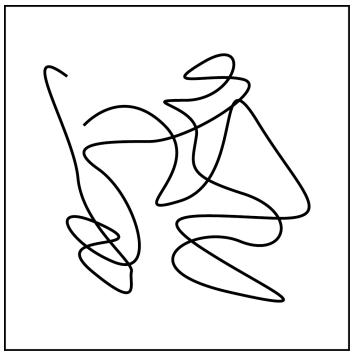
As metadata



Dancing with Data

Dancing is a central physical and social activity at a wedding.

Significant rituals exist around the 'first dance' as a married couple.



"She's The One – Robbie Williams"

Our first dance.

Abstract shape may be appropriated and reused as a personal motif.

Album cover for your wedding playlist.

"And we danced all night!"

"Do you remember we had that song at our wedding?"

Instrumented Wedding Shoes

Aerial dancefloor camera.

A team of video analysts.

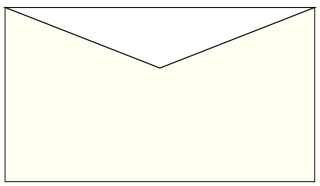
Touch-sensitive dance floor.

Thanking with Data

After the wedding, newlyweds face the prospect of sending numerous thankyou letters to their guests, for their gifts and attendance.

Sometimes these can include a personal photo or further memento from the day.

But could guests not be given the gift of data?



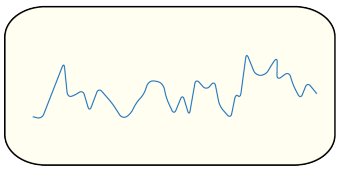
Thankyou for:

Dancing for 32 minutes.

Drinking at least 16 units of alcohol.

Speaking to 42 other guests.

Traveling 115 miles to be with us.



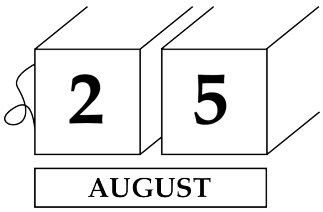
This data
as a token
of our thanks.

Anniversary Data

Interaction with wedding media extends beyond the honeymoon period, and can be a frequent point of reflection about one's life.

This raises the possibility of slow interactions with this data, as it's meaning and relevance changes over time.

Particular events, rituals or interactions could be focused around annual anniversaries.



Connected Desk Calendar

Slow countdown to future anniversaries.

SINCE WE"VE BEEN MARRIED:

5,234,798 steps

5 holidays

81 bottles of wine

4.3 hours of intercourse

A Quantified Wedding: Proposed Enactment

This speculative enactment is to be focused around an easily understood and engaged data-driven artefact.

Participant couples will collaborate in a datagraphy service to explore and commission the design of a bespoke and semi-fictional artefact for their wedding.

A potential output of a quantified wedding or 'datagraphy' service are posters or portraits, which summarise key data collected at the wedding.

Personalised 'Mr & Mrs' posters are already a common wedding product, used on the day itself, and occasionally kept as a memento. Similarly, in place of a guest book, some couples create poster art from guest's fingerprints. This also represents a move away from a wedding album, to create a distinct artefact. However, the poster may be easily adapted to other form factors if desired.

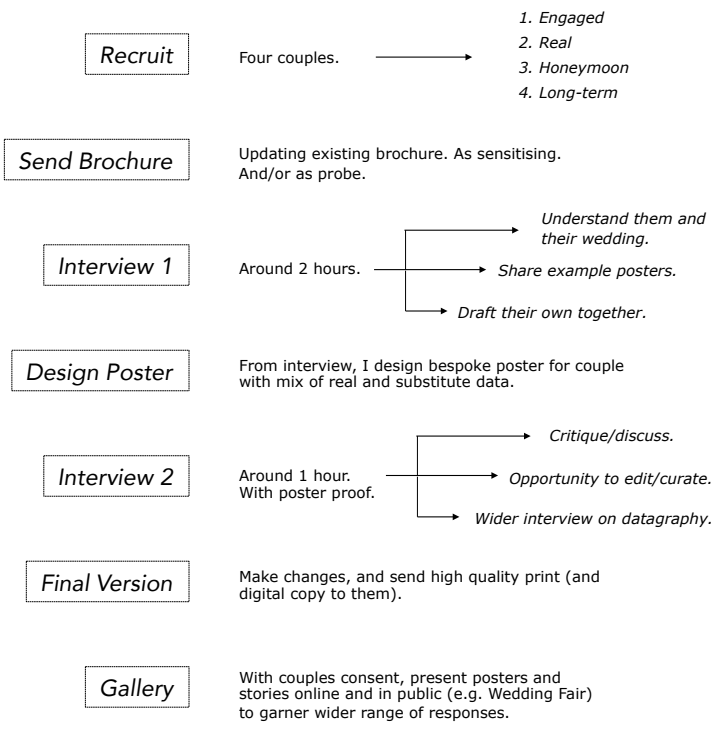
This workbook outlines the process and design work entailed in this enactment.

DESIGN WORKBOOK #2

Summary.

A summary of the overall process for participants engaging with the enactment.

Each is explored in more detail overleaf.



Recruitment

This project will require intense, idiographic engagements, with a small number of engaged and diverse participants.

Different perspectives, seeking couples at different stages of engagement and marriage, to attempt to grasp the potential role of datagraphy over the lifespan.

Recruited through word of mouth, snowball sampling and aiming for both diversity, but people able to engage wholly with the enactment.

Will require full ethics approval.

The 'Sell' or approach to participants will be similar to Metadating:

We are researching a new wedding service – 'datagraphy' - which entails capturing and representing a range of data from your wedding to produce a meaningful record of the data. Before the technical implementation of this service, we want to understand more about what data might be meaningful to couples, and what they would like to do with this data. And to do this – focusing on one particular artefact – the data poster/portrait.

Engaged.

In the midst of planning their wedding, the excitement, anticipation and imagination of the big day. Another service alongside many they are engaging with at this time.

Real.

Attempt to work with one couple, using real data as far as possible. Requires close relationship with their wedding. Somewhat limits possible data. Lens on other fictional data.

Honeymoon.

Honeymoon period when couple can indulge in remembering, sharing and making mementos from wedding. Data can be related to real rather than imagined event.

Long-term.

Able to look back and discuss what they remember and what matters to them now. Data should match remembered impression of wedding day.

Send Brochure.

In addition to the initial approach (and website?) to be involved in the study, couples will be sent a brochure for datagraphy service prior to their interview.

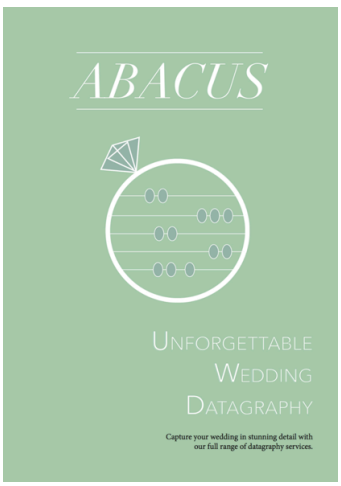
This makes use of the brochure I already have (easily adapted), helps develop and deepen the fiction, communicating many of the issues at play. In this respect, it is a sensitising artefact.

Along with an information sheet and consent form, it could be extended to include some probe like elements to encourage participants reflection prior to the first interview.

Print x5 on glossy paper.

Setting broad context for datagraphy service.

Include consent form, cover letter and information sheet to make clear fictional elements.



Opportunity for them to send any prior questions.

Fix bleeds.

Replace 'packages' page with example of posters.

First Interview.

The first interview will last around 2 hours, and be in three parts.

First, getting to know the couple, and their wedding. The aesthetic, and quality of the day.

Second sharing example posters with them and discussing the datagraphy service. At this point, with fictional data, something of a caricature, or artists impression, seeking elements of truth rather than precise accuracy.

Finally, scaffolding a process of agreeing what they would seek from the datagraphy service and the design of their poster.

Sample Questions

Can you give me an overview of your wedding day? When, where, who etc.?

What are you most excited about?

What have you/(do you expect to) look back and remember the most?

What's important for you to record about the day?

What are/were your plans with your photographer?

What do you feel are the personal touches with your wedding?

How do you feel about this sort of data(graphic?) record of your day?

Is there anything you've read or seen on these posters you think you might like to record if you could?

Could you imagine sharing this sort of data with friends and family?

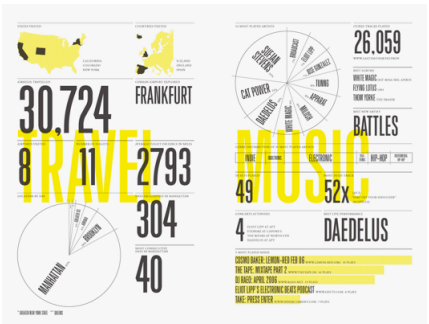
Do you think there would be other uses for this data?

Example Posters.

Posters are proposed as a focus for the enactment as they are easily understood, tie in somewhat to existing practices, and practical to produce.

They are also hoped to be flexible enough that alternative or preferred incarnations can be discussed.

Posters are a more public or shareable representation – less private than some existing records.



Drawing inspiration from Nicholas Felton's work. Tutorials are provided online.

Graphic design to be undertaken in Adobe Illustrator and InDesign. Many easy-to-learn tools available for basic manipulation of data sets, e.g. producing means, samples, pie-charts etc. which can then be edited.

Mr & Mrs posters commonplace. Posters can be summarising, or focus on one key metric or detail. A set of posters together might constitute an album.

Posters have an ego-centric quality which may need to be tempered or made more intimate.

‘Create-your-own’.

Core of the enactment is mimicking a service of agreeing and directing with couples the design of a future (or past) datagraphy service for their wedding.

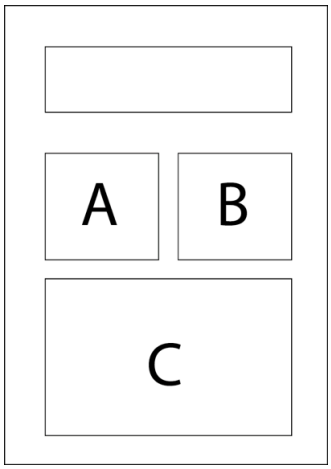
This should scaffold them into the fiction, and provoke interesting discussion about the sort of data that matters to them and they would like to see represented.

As well as examples of posters, process will include additional props, and tasks, which help guide conversation.

Aim to end with clear idea of what has been commissioned and some key guidelines for the design of their poster.

Colours & Motifs

Mix & Match Components



‘Data Catalogue’

(Akin to sample ‘shot list’ of photographer)

181 glasses of champagne

24 steps down the aisle

17 hats

Married at 13:07

81 guests (pie chart)

Playlist (by artist/genre)

Blue (most popular colour)

Second Interview.

The second interview is an opportunity to present and discuss one or more proofs of the proposed product.

May be sent digital copy in advance, and one or more physical copies shared and annotated during the interview. Beyond critique, opportunity to edit and curate prior to publication of final version.

Invited to reflect on reality/surreality of the data and how it relates to what they imagined or real life events.

Finally, this is an opportunity to reflect more broadly on datagraphy, and what associated services and products could be valued.

Sample Questions

What were your first impressions?

What do you like/dislike most?

What changes would you like to make? And why?

Does this data feel like it could be representative of you and your wedding?

How is this different to other records of your day?

What do you think other people would make of this?

How much does it matter that this data is surreal?

Were this a reality, would you consider a service like this?

Are there other products you would be interested in through this service?

Analysis.

A brief word on analysis.

Like Metadating, this will generate a diverse set of data and materials.

IPA will be a primary mode of analysis for the interview studies.

However, this will be supplemented by photographs and ethnographic material from the participant's engagement.

Clearly I will seek to reflect on my design process and thinking as a whole.

I see a wider opening up and making public of the work as being a lens on the project as a whole, and any data gathered analysed thematically.

Research Data

Interviews (12 hours)

Photos/video of couple's design work

Annotated proofs of each poster (x 4)

Final poster designs (x 4)

Broad range of on and offline comment

Reflections on my design process

Final Version.

Following the second interview, a final copy of the poster is published to a high quality and delivered to the couple.

They also receive a digital copy, and where appropriate some of the raw (fake or real) data used to produce the poster.

This is part of their compensation for taking part in the study.

Invited to pose any more questions about the service. Could be followed up some weeks later to gain a final reflection.

Crucially, permission sought to share the final copy of the poster (under pseudonym if preferred) with wider audience as part of dissemination and further reflection on the study.

Public Presentation.

With luck, the design process with these four couples should produce a range of compelling materials and stories. These offer a rich tapestry for engaging with a datagraphy service, and the quantified past more widely.

Given the highly idiographic nature of the design process, it would be valuable to gain a set of wider views through the public display and discussion of this work.

Beyond a gallery setting, there may be opportunities to present this in the context of a wedding fair, or as a wedding blog. Here, a stronger fictional element is performed, and another point of reflection gained on the whole concept and process.

Wedding fairs an opportunity to perform service and fiction for both prospective couples and also those within the wedding industry.

Could involve a stall inside or near a wedding fair.

Not trying to sell anything, but presented as a fun future service.

May need to have some sort of basic service available – e.g. taking couple's heart rate and materialising with them there.

Can use online tools like Tumblr and Pinterest to report ongoing process of project, or present final range of designed artefacts.

Opportunity for wide sharing of project, and data collection through online engagement.

A Quantified Wedding: Data Cards

This Design Workbook explores a set of Data Cards.

Initially, these are simple props and probes to be used in lightweight interviews with married couples about recording and remembering their wedding. In particular, they get down to very simple forms and outputs of data representation.

However, their use may be extended further in the study.

They may be part of the 'form' to be returned by participants – filling in their own imagined wedding data on the cards.

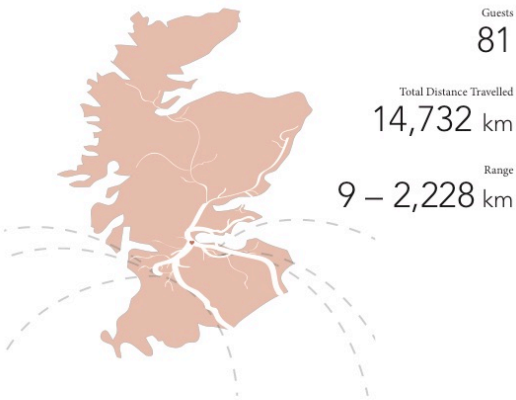
They could be elements which make up larger posters or albums of data.

They could be distributed more widely, as emissaries of the project and its aims.

DESIGN WORKBOOK #3

A Quantified Wedding: Data Cards

WEDDING TRAVEL



A Quantified Wedding: Data Cards

Wedding Playlist

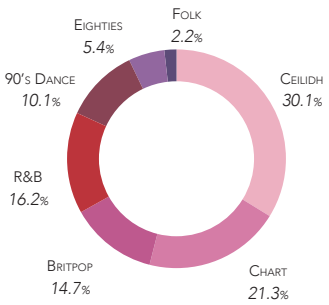
52 guests danced to 'Strip the Willow'.

Beyoncé was your most played artist.

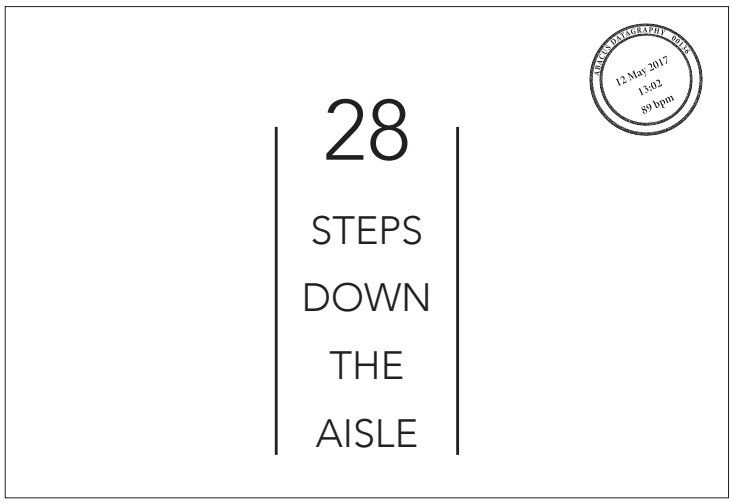
'Mr Brightside' was your top singalong.

The oldest song played was from 1953.

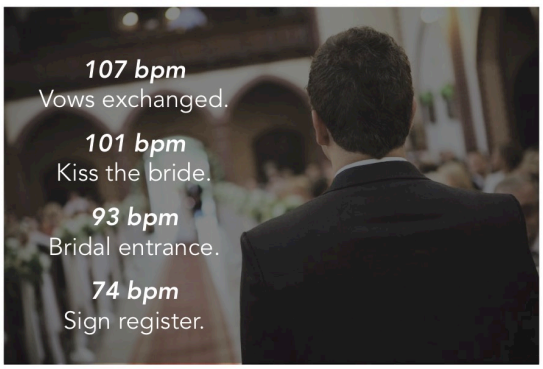
90's dance music began at 10:32pm.



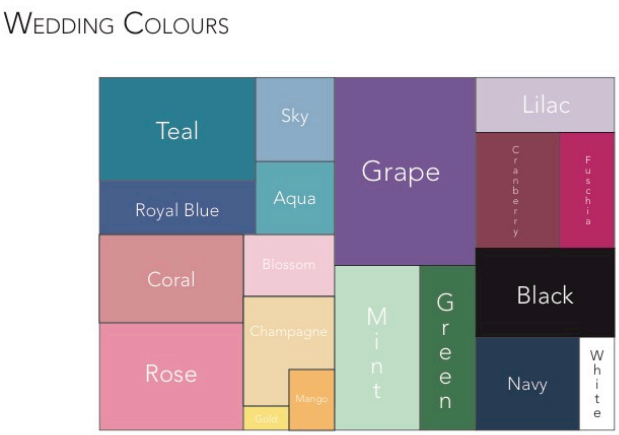
A Quantified Wedding: Data Cards



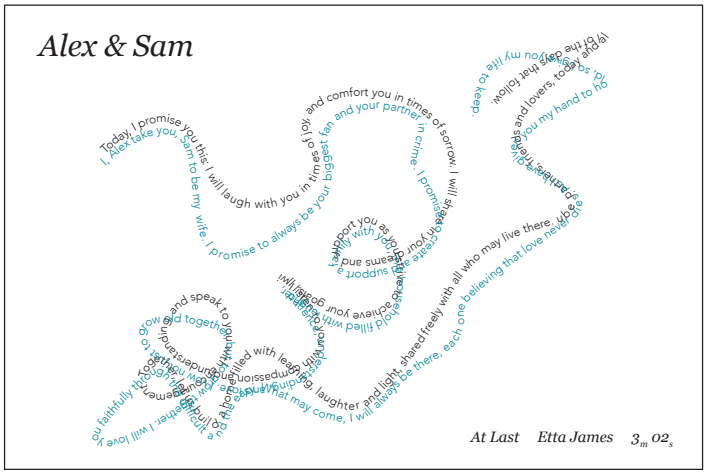
A Quantified Wedding: Data Cards



A Quantified Wedding: Data Cards



A Quantified Wedding: Data Cards



A Quantified Wedding: Data Cards

A Quantified Wedding: Data Cards

Appendix H: List of Abacus Cards

After several iterations, the final selection of Abacus Data Cards (Section 7.2.2.) are listed below.

1	247 minutes for the bride to get ready
2	5 tracks by Beyonce
3	Number of hats: 25
4	More than **a third** of your guests were family.
5	Cigars smoked: 21
6	Guest travel: 9-1,727 km
7	Joe Parker ate THREE slices of wedding cake.
8	Max HR: 124 bpm at 14:21
9	No one drank whisky.
10	Your photographer took 1278 photographs.
11	19 minutes waiting at the aisle.
12	Your first kiss: 13:33
13	Your heart beat its fastest when you read your vows.
14	*Snowdonia***.** The loudest table.
15	Your guests travelled: 14,135 km.
16	28 steps down the aisle.
17	A map of your first dance.
18	19.29 The 12 minute cigar**.**
19	Her heart rate was on average 11.6 bpm faster than his.
20	133 seconds, and your vows were over.
21	Paul and Joanne married at 13:32
22	His: 102 bpm Hers: 113 bpm
23	*Loch Lomond* 62 guests dancing.
24	52% of guests travelled more than 100km to witness your marriage.
25	9 minutes alone together
26	Highs of 28C

28.2 years. Average age of guests.

Most of your guests **(24)** wore blue.

There were beautiful speeches for **37** minutes.

Hands shaken: 185

Laughter peaked at 109 dB.

Your breath quickened dramatically as she walked down the aisle.

Bridesmaids carried your dress 17 times.

The first high heels came off 17:52

198 glasses of Veuve Cliquot champagne.

Top Dancers: Joanne / Bill / Natalie

You were married under a full moon.

12 kilts

#NiamhandSteve / 73 Facebook posts / 22 Tweets / 52 Instagram

Posts / 14 Snapchat Stories

Your heart was beating faster than theirs.

72% of guests think **she wears the trousers.**

307 wedding pins on Pinterest.

Mark, the last to leave. 01:23

22 flights.

Best Man's Speech: Beautiful (12), Drinks (5), Fuck (2)

Niall, the Photobomber. 17 photos.

11 cousins.

The colour palette of your guests.

Your wedding playlist: Mostly Indie (61%)

She tried on too many dresses.

The groom loses his bow tie. 11.23

2 giddy aunts.

Appendix I: Speculative Enactment Materials

I.1. Information Sheet and Cover Letters

ABACUS

Chris Elsden
Open Lab, Floor 4
89 Sandyford Road
Newcastle University

Newcastle upon Tyne
NE1 8HW

19th August 2016

Dear _____

Thank you once again for agreeing to take part in the Abacus Weddings project. We hope this will be a fun, alternative and reflective experience for you as your big day approaches.

In this introductory pack should be:

2 x Abacus Datagraphy Cards
2 x 'For Me' & 'For You' Envelopes
1 x Prompt Cards & Envelope

1 x Taking Part Information Sheet
2 x Consent Form
2 x Release Form

When we meet, we will use the Abacus Datagraphy Cards as a starting point to discuss datagraphy at your wedding. You should take a little time to look at these together, following the instructions inside.

The 'Taking Part' information sheet provides a lot more detail about the Abacus Weddings project, the related research, and what is expected of you by taking part.

We've also included a Consent Form and Release Form for you each to sign, to fulfill the ethical protocol for taking part. This is to be clear what we're asking of you, what information we're recording and to reassure you about your participation.

We will go through these forms together when we meet, but it would be great if you can consider them in advance. If you have any questions at all in the meantime, do not hesitate to email or call (details below).

Yours faithfully,

Chris Elsden
Datagrapher & Researcher
Abacus Weddings
c.r.elsden@ncl.ac.uk
07773 726728

ABACUS

Taking Part in Abacus Datagraphy

We're really grateful for your participation in this Abacus Datagraphy project, and excited to meet you.

We hope to offer you a fun and interesting experience, to playfully imagine the sort of data your wedding might produce. *To be clear, we are not going to carry out datagraphy in practice, at your wedding*. Instead, through meeting a 'datagrapher' (like a photographer, for data) - we will plan and imagine how data could be collected, and write a 'real wedding' style story about this together, focusing on the kind of data mementos you might produce (e.g. a map of your guests). We hope this short magazine-style article about you and your wedding, will be an interesting personal memento – capturing how you both imagined your wedding, in the weeks before the event.

Please take some time to read the information overleaf, which will explain more fully the project and the nature of your participation.

The Process

1) *Receiving an introductory pack*
The pack you have just received will introduce you to the idea of datagraphy, and get you thinking about data at your wedding before we meet.

2) *Meeting 1 - Getting to know your datagrapher*
Our first meeting all together will last around 2 hours. In this time we will discuss your wedding planning in general terms, and the datagrapher will seek to get to know you as a couple, and understand the style of your wedding. Feel free to look out any materials you have (such as invites, favours or pinterest boards) which will help you talk about your wedding. We will then work with the Abacus Datagraphy Cards, and use these to discuss different data that matters to you, and what you could record at your wedding. We will also discuss different ways this data could be represented as mementos, after your wedding. Lastly, we will take some photos of you both together for the first page of the article. The photo will capture you both holding a picture frame containing some fictional data about your wedding. We hope for this to be a memento, so you may want to dress up a little to make the most of this.

We would like to audio record and transcribe this meeting. This recording will not be shared beyond the Abacus researchers, and will be used primarily to help the datagrapher write and design the magazine article, provide some quotes for the brochure, and as part of our ongoing research.

3) *Receiving your article proof*
Based on this first meeting, your datagrapher will prepare a 4-page magazine 'real wedding' feature on your imagined wedding with data. We will share an example of the style of this article at our first meeting. The article will include a 500 word story; two or three examples of 'data mementos' that were discussed; some quotes; imagined data from the wedding; and one of the photos we took with you both. Around 7-10 days after our first meeting we will send you a proof copy of this article.

4) *Meeting Two - Editing the magazine article together*
A few days later, we will meet a second time to edit the magazine article together. This will be an opportunity to discuss any changes you would like to see, the data artefacts we have designed, and edit the data we have imagined throughout. We want you to be absolutely happy with what we publish in the magazine – so this is your opportunity to make any changes! We would also like to audio record and transcribe this meeting as before, for our research.

5) *Publishing the brochure*
After meeting with our second couple, Abacus will then prepare the whole 12-page brochure which we will share publicly. We will post to you a final personal copy for you to keep.

About The Abacus Brochure

The brochure we are going to make will be 12-pages, and seeks to imitate a promotional pullout you might find in a wedding magazine. It will feature two couples, and an introduction to the concept of datagraphy.

This is part of an approach we call 'Design Fiction' which is interested in designing near-future artefacts and services, and setting them alongside fictional narratives. This is a useful way to do research about imagined or emerging technologies, and generate discourse about these new areas of research and design.

We hope to publish a small number of the magazines (around 50-100) and use these to discuss and promote our work - primarily with academic and professional audiences, however, like some regular wedding brochures and magazines, we would also like to make the brochure publicly available as a downloadable pdf via our website.

About us, and our research

Abacus Weddings is based at Open Lab, Newcastle University, where we do applied, interdisciplinary research into interactive technology and ubiquitous computing.

This work is the final part of Chris Elsden's PhD thesis, (supervised by Dr David Kirk & Dr Abigail Durrant) investigating memory and technology. David Green, a film maker and PhD student also at Open Lab will be supporting with the photography in this project.

We've been studying in particular at the experience of a so-called 'Data-Driven Life' and the long-term implications of recording and remembering the past with quantified data, such as that collected by smartphones, Fitbits, or home monitoring systems. The final brochure, and other data recorded during our meetings (e.g. audio, photographs, written materials) will be used first and foremost in completion of my thesis, but later written up and presented to academic and professional audiences. We also hope to continue developing the Abacus Weddings, following the response to the brochure.

Confidentiality & Anonymity

We hope for this concept brochure to be both an interesting memento for you, and a realistic brochure for an emerging wedding company, featuring real couples. For this reason, **we require couples not to be anonymous** in the brochure. We would like to refer to you by your first names, and include a photograph (approved by you) of you both with a picture frame of data.

However, while the brochure and the process of making it will be made public, all of the other research data (e.g. audio transcripts, personal details) will be treated as confidential. The data will not be shared beyond the research team, and only disseminated as research findings, referring to you only by your first names.

Are there any risks to me taking part?
This study is of minimal risk to you. We hope you enjoy discussing and imagining your wedding with us. While the brochure will be made available publicly, we want to ensure you are absolutely happy with the feature we produce and share. Indeed, it is a key part of our research that you take care to edit the magazine to be representative for you. If at any point during the project you feel uncomfortable, you may pause the study, or withdraw altogether if you feel you cannot, or do not wish to continue.

What are the consent and release forms for?
The consent form is part of Newcastle University's ethical research procedures, to ensure that you understand the research, and what is required in taking part. The release form is to allow us to edit, make copies of and reproduce photographs of you in the brochure, and to publish the final feature.

Can I withdraw, even after signing Consent and Disclosure Forms?
Your participation is entirely voluntary and may be discontinued at any time with no obligation or requirement to provide a reason. You have the right not to answer any single question, as well as to withdraw completely from the enactment at any point during the process. You may also request for your data to be removed from the study and destroyed at a later date after having participated in the study.

What if I change my mind or have any questions?
It's important that you know that at any time, even during or after we meet, you can ask questions, stop the research, or withdraw from the study completely.

Chris is the primary investigator for this study (c.r.elsden@ncl.ac.uk) but should you have any further concerns you can also contact his supervisor Abigail Durrant (abigail.durrant@ncl.ac.uk).

I.2. Consent Forms

ABACUS

Photography Consent & Release Form

Project Details

Name of production: Abacus – "Wedding Datagraphy" Brochure
Date: September 2016.

Researchers: Chris Elsden & David Green
Open Lab, Newcastle University
Marjorie Robinson Library Rooms,
Newcastle upon Tyne,
NE1 8HW
Contacts: c.r.elsden@ncl.ac.uk // 07773726728
d.p.green@ncl.ac.uk // 07939967370

Your Details

Name [BLOCK CAPITALS]:

Please tick to confirm that you have read and understood each point.	✓
I, the undersigned, consent to being photographed for the purpose of these photographs being used within the research project named above.	
The specific nature of this research project, including its timescales, has been explained to me.	
I understand that these photographs may be edited by the researchers.	
I consent to the photographs (including edited versions) being used to publicise the research.	
I understand that these photographs (or any part of them) may be distributed in any medium in any part of the world.	
I am over 18 years of age.	

Signed : _____ Date: _____

Contact details (phone & email):

_____

ABACUS

Abacus Datagraphy Consent Form

I have read (and have a copy of) the 'Taking Part in Abacus Datagraphy' sheet about the Abacus research project "Quantified Wedding" which is to be conducted by Chris Elsden, a PhD Candidate from Open Lab, Newcastle University. All queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and freely give my consent. I understand that the project will be conducted in accordance with the details given in the information sheet.

I understand that I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I understand that I can ask questions about the research at any time, including during and after the research is completed.

I consent to:

- ☐ Meeting a 'datagrapher' on two occasions to discuss my upcoming wedding.
- ☐ Having this conversation audio recorded.
- ☐ Being featured in the Abacus Datagraphy Concept Brochure, a proof copy of which will be discussed and edited with me, before being distributed publicly.
- ☐ Appearing in identifiable photographs for publication in the brochure (with my approval) and for dissemination of the research, in print and online.
- ☐ Being contacted about future developments and follow-up opportunities with Abacus Datagraphy

Please print your full name, date and sign in the boxes below.

Print Name: _____

Date: _____

Sign:

Newcastle University

I.3: Second Cover Letter

ABACUS

Chris Elsden
Open Lab, Floor 4
89 Sandyford Road
Newcastle University

Newcastle upon Tyne
NE1 8HW

19th August 2016

Dear _____,

Please find enclosed three copies of your draft feature article. We hope you find it an enjoyable read.

At our next meeting, we will go through and discuss the article together. In the meantime, take this opportunity to highlight or annotate any parts of the article you think you might like to change or discuss. **This is your wedding, and you can imagine it how you wish!** In particular, look closely at all the data (highlighted on one copy), and think about what it should be.

A couple of final points to note:

Wedding magazines tend to write most of their articles as quotes from the couple, so please edit these as you wish. I've written them based loosely on our last conversation.

Weather permitting would like to have another go at taking a profile photo for you outside in the ivy lane. We would also like to rephotograph the playing card, and wedding receipt images we've used here as well.

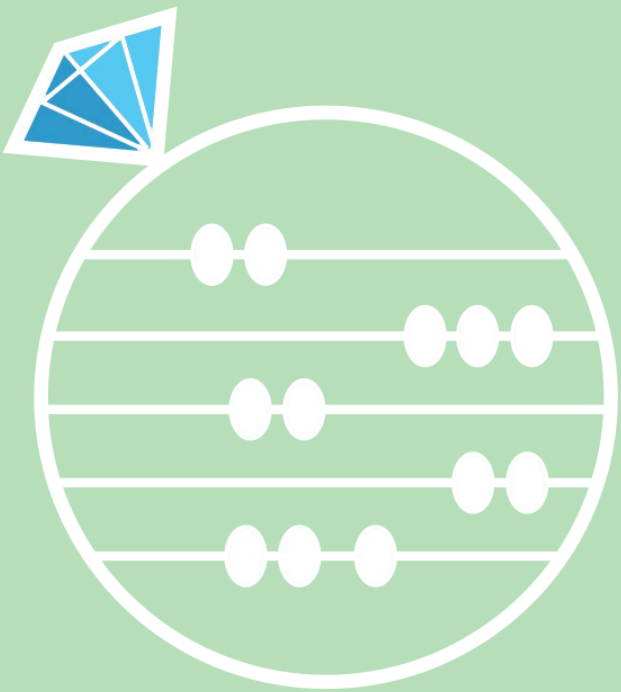
Really looking forward to meeting you both again,

Best regards,

Chris Elsden
Datagrapher & Researcher
Abacus Weddings
c.r.elsden@ncl.ac.uk
07773 726728

Appendix J: Abacus Brochure in Full

ABACUS



UNFORGETTABLE
WEDDING
DATAGRAPHY

CAPTURE YOUR WEDDING IN STUNNING DETAIL
WITH OUR FULL RANGE OF DATAGRAPHY SERVICES

Introducing Datagraphy

Datagraphy is a new way of seeing and recording your life. Quantified data offers a unique perspective, supplementing your photographs and videos.

By combining the latest sensor technologies with a keen attention to detail, we create a beautiful modern record of your day that you can cherish forever.

Imagine beautiful maps of your guests who have traveled miles to be there. The story of your partner's heart rate as you walk down the aisle. The path of your first dance. A whole new layer to your wedding album.

At Abacus, we offer a full suite of datagraphy services, personally tailored to you. Our services can help you plan, collect, manage and curate your personal data into beautiful products and memories to share with friends and family.

We know how stressful wedding planning can be. Our professional datagraphers use cutting edge techniques to seamlessly collect all the data you want from your big day, while you are left to enjoy it with peace of mind.

We pride ourselves on offering a professional and bespoke service. No two weddings are the same. Our datagraphy can help you capture, represent and visualise the personal moments and details that matter most.

Once collected, the data is yours. Forever. We hope to help you make it one of your most beloved possessions.

Read on to learn about our services, and meet two newlyweds who share their experiences of Abacus Datagraphy.

In This Issue

Real couples and their Abacus weddings

Our Services

We offer a full range of data services, always tailored to your vision. Our datagraphers will help you decide the data you want, make sure everything runs smoothly on the day, store and deliver your data securely, and work with you to curate beautiful mementos to share with friends and cherish for generations.

Collection

1. ***Your datagrapher*** will meet with you in advance of your wedding to understand the data that matters to you and how we can blend in seamlessly with your day.
2. ***We liaise*** with you, your venue, and vendors to put in place everything needed to collect your data.
3. ***On the day,*** we give you peace of mind and let you focus on the things that matter. We're on hand to make sure all your data is collected as planned.

Processing

4. Our expert team ***carefully hand-clean*** and prepare your data so it is ready to be transformed into beautiful products.
5. Your data is ***securely stored*** and backed up in the cloud, so your memories are always safe.
6. You will always ***receive a raw copy*** of your data (in .csv format), and samples of agreed products within two weeks of your wedding.

Curation

7. You can share any data you want with friends and family through an ***online gallery*** and store.
8. We love working on bespoke projects with our couples. We meet with you to curate and craft ***beautiful mementos*** unique to you, your story and your style.
9. Your data is something for you to cherish and explore for years to come. Kept secure, we can work with your data again for special occasions or anniversaries.

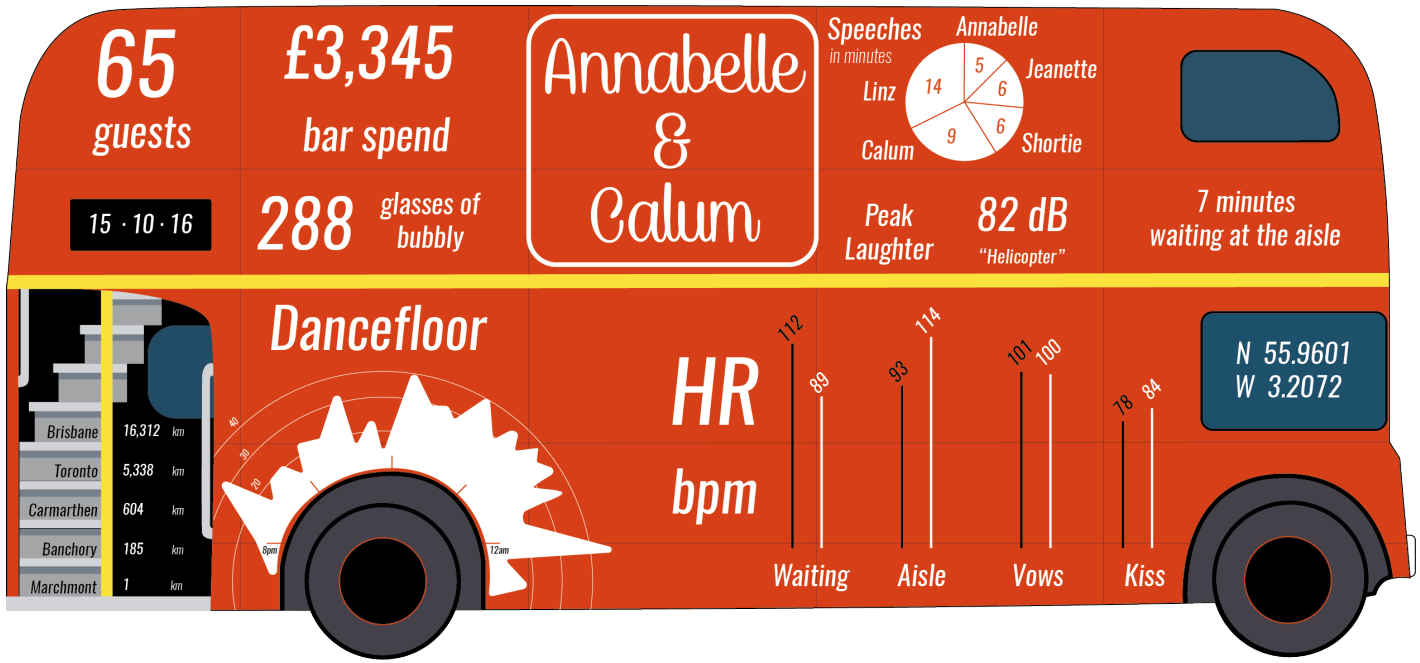
THE MAGICAL MYSTERY TOUR

WRITTEN BY CHRIS ELSDEN

Annabelle & Calum embraced the beautiful City of Edinburgh in their wedding, arriving in a big red bus, and taking guests on a magical journey.

Calum's heart rate peaked as he strode the short 0.8 miles across Edinburgh's Meadows, towards Lothian Chambers, on the Royal Mile. "Somehow, walking in my kilt through this public park with my groomsmen was the moment it all became real."

The big surprise for the guests was yet to come. The bride Annabelle arrived in a 27'6" long, red London bus! "So many of our guests came from beyond Edinburgh. It's such a beautiful city, we decided to take them on a tour between the ceremony and reception." It was only a short 45 steps from the bus to the end of aisle with her dad. "He wasn't 'giving me away' as such, but it was really a lovely moment to share. I really just remember how proud he looked."



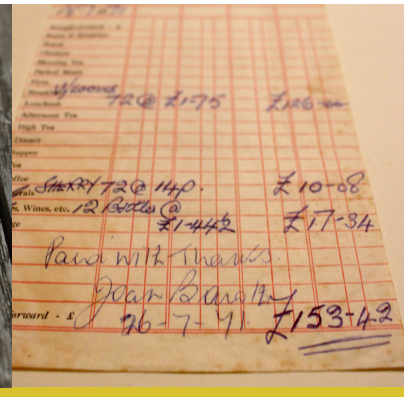
The pair opted for an 'unplugged' ceremony but it was their first kiss (at 14:52), which has become part of the way they would commemorate their day. "Maybe to some people the time doesn't matter, but once the ceremony started, we weren't aware of it at all, so it's nice to have this marker. The kiss is the romantic part of it. 14:52 is probably now the most important time of our anniversary."

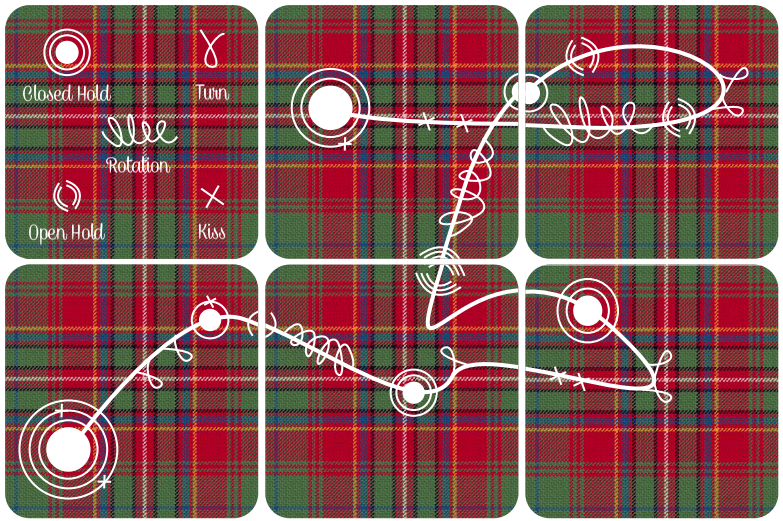
"We chose a fine art style photographer and trusted her to capture a unique interpretation of the day. The data Abacus can provide feels like another interpretation again. When we first sat down with our datagrapher, we realised just how much we could record. We really tried to pare it down to things that would represent us and our wedding in an interesting way. Some are just quite funny, like the bar spend. Others are talking points. Heartrate is like – who was the most excited or nervous?"

Neither Annabelle or Calum had recorded any data about themselves before, but were instantly taken with the idea for their wedding. “Even smoking cigars, it’s just a small detail, but it tells its own story of the ebbs and flows of the whole night.” It’s a different way to remember than just photographs. “We asked our guests to suggest songs, and made a Spotify playlist. We’ve listened back to the playlist a few times, and with the data captured from the dance floor, it helps us remember those highlights when everyone was dancing.”

“14:52 is probably now the most important time of our anniversary.”

Calum





“We wanted it to be something we could share.”

Annabelle

“The difficult part was deciding what to do with our data. We couldn’t imagine firing up the laptop to look through it. We wanted it to be something we could share, and that people might actually talk about when they came round!” The coasters of their dance, and the bus infographic are now both proudly on display in their home.

Still, they aren’t the first in their family to hold onto data about their big day. Tucked inside their wedding photos, Annabelle still has the receipt from her parents wedding venue. “They were £17.34 for 72 glasses of sherry and 12 bottles of wine in 1971. Our guests managed to spend £3,345 at the bar at our wedding - I wonder what the bill will be in another 45 years!”

• • •

THE BAKERS' BIG DAY

WRITTEN BY CHRIS ELSDEN

Rowan & Julia shared fabulous food under canvas in a rustic and relaxed setting.

Rowan & Julia were married at Newburgh Priory, North Yorkshire in May. "The venue was a beautiful stately home but our reception was in two giant (10.3m) tipis which really set the relaxed tone for the day. Beers in bathtubs, lawn games, a silent disco and gourmet cheesy chips."

Being bakers, food was a huge deal for the couple. "We actually chose our wedding date based on the availability of our favourite caterers, The Hog & Apple Food Co. It was all sharing food. We had Italian canapés, because we were engaged in Sicily, 15.8kg of different kinds of roast pork, and (of course) 52 individual Yorkshire puddings."

The happy couple used Abacus to record both the silly and the sentimental. "The time we spent together just after the ceremony was some of the most special, just taking it all in" said Rowan. "We found out later from our datagrapher that we only actually spent 9 minutes alone together throughout the day."

Julia's sister is a florist. "Doing all the flowers together was such a lovely part of the preparation. We really wanted something to reflect that. The data about the flowers signifies their place on the day and we remember them quite vividly."

"We liked data that gave a sense of how fun and relaxed the day was."

Rowan

"Data gave a kind of authenticity to these stories."

Julia

ROWAN & JULIA

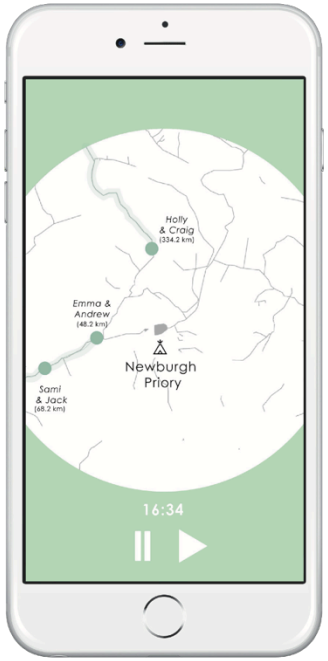
Newburgh Priory — 13.5.17

08:29	Finished breakfast together.
10:41	Beard trimmed.
13:03	Dress on.
14:19	Pronounced husband & wife.
14:47	A moment alone together.
15:26	Sun comes out (24C).
15:42	Pimms and lawn games begin.
17:41	Speeches begin, Granny interrupts.
20:34	36 guests dance to Escape (The Piña Colada Song).
21:49	Mother of the bride tries the silent disco.
01:45	Lawrence is the last to leave.

Before having heard of Abacus, Julia already knew that recording the weather was important. "I'm really into weather! I loved the way that we were able to integrate that into some of the mementos we have from the day."

15.8 kg of Roast Pork
81 glasses of Pimms
39 cheesy chips

"Our wedding was quite small and intimate, so most of the guests knew each other. We liked the data that picked out individual stories that we might have missed and made the day what it was. Our friend Holly had EIGHT slices of the cheese wedding cake. Lawrence was the last to go to bed at 1:45am. That kind of thing has been fun to share."



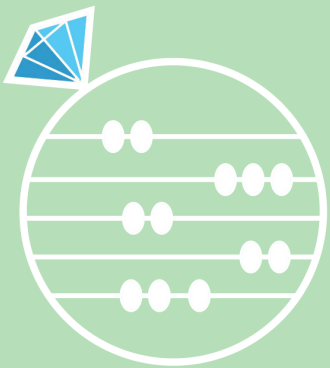
Guests who accepted their invite via the Abacus app could share their journey to North Yorkshire with Rowan & Julia. "The map was fun at the time, it added to the anticipation. But it's quite special to be able to play that back now, and see all these people converge on our wedding."

A detailed timeline of the day is a similarly tongue-in-cheek memento. "We don't have lots of pictures around the house, but the timeline is something nice and personal that people still talk about. There are important things like the time we got married, and our first dance, but also some more funny events, which give a sense of the day."

"Everyone has stories from their wedding that are embellished over time, but sometimes it's important to know what really happened – especially for people who weren't there. The data gave a kind of authenticity to these stories that get passed down – 'Yes your mum really did take that long to get ready!'"

◆ ◆ ◆

abacusweddings.co.uk



Abacus is a fictional wedding datagraphy company developed for a research project at Open Lab, Newcastle University, UK, investigating the future of personal data. For enquiries about this research, contact Chris Elsden (c.r.elsden@ncl.ac.uk).

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