Theme issue contribution

Valuing data: Attaching online data to stakes, selves, and other data

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Abstract

As datafication proceeds rapidly, a large, unwieldy amount of data is available online. In this article, we ask: How valuable is this data, how is it made valuable? To answer this question, we study how online data is endowed with worth in virtual collaboration workshops. Our workshops challenged participants to assert and question the worth of online data – a challenge that participants addressed by using a set of techniques of which we describe collage, hierarchy building, and calculation. Data, we show, gains value through attachment. Thinking with attachment, we foreground affect, materiality, and the situatedness of valuing online data. As ethnographers, we study how data, as haphazard as it comes, is attached to the circumstances and stakes at hand, to ourselves and to other data. Our study contributes a conceptual perspective that attends to the shifting boundaries of the personal and the public, tensions between locality and generality, the role of contiguity, and the limits of combinatorial connectivity.

Keywords: digitised valuation; ethnography; data; attachment; (post-)actor–network theory; virtual collaboration

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Introduction

Datafication proceeds rapidly, and untameable amounts of data are available online. But how valuable is this data anyhow? Or better, how can it be *made* valuable? In this article, we unpack the purview of these questions for valuation studies. We study two virtual workshops to examine how online data attains worth in digitised valuation. To analyse the valuation of online data, we adopt the notion of attachment. Thinking with attachment (de Laet et al. 2021), we contribute a conceptual perspective that attends to the shifting boundaries of the personal and the public, tensions between locality and generality, the role of contiguity, and the limits of combinatorial connectivity (cf. Conward 2018).

With attachment, we approach digitised valuation with a focus on affect, materiality, and situatedness. As an analytic term, attachment speaks to value because valuation is, crucially, concerned with relatability. Following Antoine Hennion, attachment is "connection, restriction, restraint and dependence" – relations that are continuously reworked (Hennion 2017a: 113, 118). Attachment keeps things together. Attachment is affective; it requires dedication. At the same time, it relies upon material qualities and sensorial capacities. Some things stick with us, and others glide through our hands. Most importantly, however, attachment needs to be understood through situatedness – it is bound to circumstance, always "specific to a locale" and its outfit (de Laet et al. 2021: 801). Attachment emerges from situated engagement, close and local, and sustains it at the same time. In this sense, attachment denotes relations of a specific kind and emphasises the inevitably situated character, the material qualities, and the affective investment of valuing data.

Situatedness, however, is commonly ignored when things virtual are discussed (Strathern 2002). Likewise, data is often portrayed as disembedded, mobile, abstract, immaterial, and unaffected. Re-emphasising the situatedness of data, scholars in science and technology studies (STS) remind us that "[a]ll data are local" (Loukissas 2019), "cooked" (Gitelman 2013), and "partial" (Pink et al. 2018). Stitched together in a plethora of practices, data carries traces that engender, hinder, obscure, or ease its situated valuation. With attachment, we shed light on the affective, material, sensorial, and reflexive capacities needed to endow data with worth.

In examining how online data gains value in digitised practice, we refer to valuation studies and post-actor–network theory (ANT), as well as literature from data studies. Empirically, we draw upon collaborative, participant observation in two workshops, both hosted with the help of home-to-home videoconferencing. The workshops build on experimental and participatory approaches developed in digital methods and use water data as a case in point. In our analysis, we detail how workshop participants dealt with the challenge of

making online data, as haphazard as it comes, relatable. Finally, the article discusses how online data finds attachment and gains worth, thereby characterising some techniques that workshop participants devised in virtual collaboration.

Data in digitised valuation

Scholars in the field of STS have characterised data as "local", "cooked", "rotten", "broken", haphazard, and patchy (Gitelman 2013; Doganova et al. 2018; Pink et al. 2018; Loukissas 2019). Data is always already processed and it relies upon the infrastructures necessary to collect, clean, and maintain it (Latour 1999; Bowker 2008; Edwards 2010; Ribes and Jackson 2013; Dumit 2018). Data, then, is inherently situated and relational.

The manifold relations that data collection and use establish make data what it is. Relations are at the heart of data. When, however, data value is narrowly defined as measurement, the reference relation between measuring (device, researcher, institution) and measured (object) gains pre-eminence. This eclipses the complexly layered relations work that make data *valuable*. In this article, we therefore foreground the relations that data entertains to things and people, to circumstances and situated practice, and, crucially, to other data. Literally, "data" comes in *pluralis* and becomes meaningful only in relation to one another (Mämecke et al. 2018). Data formats and databases are designed for circulation, compatibility (Helmond 2015), combination and "commensuration" – i.e. "the transformation of different qualities into a common metric" (Espeland and Stevens 1998: 137). Data helps to reframe and aggregate, also transcend, "personal trouble" in the public negotiation of controversial issues, generalised claims, shared concerns, and the common good (Madsen 2023; cf. Mills 1959). In this capacity, data is used both to make powerful claims about reality and to scrutinise its shortcomings. It is appreciated for being "evocative" (Mützel et al. 2018), stimulating cooperation, and fostering joint intervention (Star and Griesemer 1989; Jensen et al. 2021). Yet data is "mercurial", Rachel Douglas-Jones et al. (2021) argue. As it shifts formats quickly, travels fast, and proliferates, it glides through our hands all too easily. Its mercurial character challenges us to re-examine the situated relations work that sustains data and its value.

To value means to assemble and to cast aside. Here, we draw on scholarship in valuation studies that emphasises how "[c]reating value is a process of joining together: classifying, grouping, combining, making, re-forming. Yet", as Emma Greeson, Stefan Laser and Olli Pyyhtinen (2020: 157) argue, "it is also a process where persons, things, parts of bodies, or landscapes are disentangled, abandoned, dismissed, or corrupted." Thus understood, valuing is relations work. It

takes forging relations and cutting some, too (Strathern 1996). It can mean "sorting things out", a never-ending process that, if performed skilfully, requires delicate attunement to circumstance (Bowker and Star 2000: 47). With this perspective, we conceive of valuing as a bundle of practices, ranging from assessing and appraising, appreciating and depreciating, adopting as well as discarding, to amending, supplementing, adapting, and, crucially, fitting – equipping things and people with qualities, and "trueing" them up to what is at hand and at stake (Thévenot 2002). As Frank Heuts and Annemarie Mol (2013) point out, valuing is ill-understood as a judgement after the fact. Studying how tomatoes are valued in diverse practices, Heuts and Mol draw attention to how people *make* good tomatoes, i.e. how they engage with them and manipulate them to bring out, preserve, and increase their worth. The qualities that make tomatoes valuable, Heuts and Mol argue, "are not given; they may be tinkered with" (2013: 130). Valuing, in this sense, is not about fixed qualities but about perpetual qualification. In this vein, we focus on data to examine how valuing qualifies and disqualifies pieces of data as well as those who handle them, their capacities, and concerns.

There are different ways to make things (data, tomatoes) good and ascertain, or challenge, their worth. Things can be tried, measured, and tested (Potthast 2017); they can also be appreciated, carefully probed, and tasted (Hennion 2007). Multiple, incongruent, and incommensurable valuations may coexist, conflict, or fold into one another (Helgesson 2016). Scholars of valuation studies have observed how different "registers" of valuation interact (Heuts and Mol 2013), how distinct "styles" of valuation interweave (Lee and Helgesson 2020), and specific "constellations" of valuation play out (Waibel et al. 2021: 35). Moreover, scholars have parsed different "regimes" of engagement and valuation, distinguishing "intimate" from "public" engagement and elaborating their distinct notions of worth – from the personal, appropriate, habitual, and convenient in intimate engagement to legitimacy, justifiability, and common good in public engagement (Thévenot 2002). As we will show, the relationship between the personal and the public proved particularly salient in our study.

In this article, we focus on situated performances that unfold in specific "moments of valuation" (Antal et al. 2015). The moments we observe are "synthetic situations", i.e. characterised by the multi-sited and far-reaching interactions that sophisticated digital technologies afford (Knorr Cetina 2009). Note that the synthetic moments of digitised valuation involve people and things both analogue and digital, in immediate or mediatised presence. Note, too, that moments of valuation are not insular. They are linked by shared layers of knowledge infrastructure and build upon one another in re-articulating the socio-material "agencements" (Kjellberg et al. 2013) that they both shape and are shaped by. Data, we argue below, gains worth when it

fits into agencements of valuation and ties in with the stakes of the moment, i.e. with what the situation at hand "is about" and what it "puts to the test" (Goffman 1974; Marres and Stark 2020). As scholars have shown, digitised valuation can absorb, reprocess, and sometimes subvert the measures of worth inscribed in databases, search engines and platforms, as well as, e.g. the ranks and feeds of social media (Kropf and Laser 2019; Lee and Helgesson 2020; Paßmann and Schubert 2021; see also Balsiger and Jammet 2022 in this theme issue). When data becomes the subject of digitised valuation, both the "infrastructured-ness" of data and its valuation can inspire reflection and doubt. As we will show, workshop participants grapple with the technologically-augmented reflexivity of digital infrastructures that allow them to "see" – people, things, and data "out there" – and manipulate what they are shown at the same time (Knorr Cetina 2009: 64).

To account for the valuation of data, we rely upon the notion of attachment, a term rooted in post-ANT (Gad and Jensen 2010). As it inquires into the in/capacity to establish relations, attachment helps account for the texture of associations beyond the mere "interessement" that earlier ANT centred on (Callon 1984). As an analytic heuristic, attachment draws attention to the adhesive qualities of things and people, i.e. their ability to hold together, stick with, involve – or, slip away, repel, and ward off various forms of association. "Thinking with attachment", as Marianne de Laet et al. (2021) put it, means attending to the situated, more-than-human dynamics that brings things and people together, or separates them. Avoiding a priori fixation on human subjects and their preferences, attachments "do not belong to people nor define them" (Hennion 2017a: 118). Attachments have to be "continuously done and re-done" (118), efforts that are not only situation-dependent but reflectively work with their situatedness. Attachments are "specific to a locale and its material devices" (de Laet et al. 2021: 801). They are done by subjects "that have the agency to act as well as surrender, and rely on collaborations of sorts with objects that give (feed)back as they are tried, tested, tasted, put into use, crafted or falling in disrepair" (de Laet et al. 2021: 801). Put differently, attachments bring "subject-networks" into being (Gomart and Hennion 1999), co-formative relationships that endow subjects with competencies (of discrimination and connoisseurship) and objects with qualities (of worth). Attachments equip subjects and objects with capacities for valuation. In this vein, Antoine Hennion (2007, 2017a, 2007b) approaches attachment through "amateurship" (from Italian amatore, to love). Amateurship has amateurs re-emerge and reflect themselves through the select artefacts they are passionate about. As such, attachments are not easily transferrable or scalable. They are difficult to judge from afar. Fragile, fluid, and ephemeral, they challenge us to simultaneously observe detachment, disattachment, and reattachment.

In this article, we propose attachment as a conceptual perspective on the valuation of data. When we conceive of valuation in terms of attachment, we follow Hennion's argument that valuation is not to be understood "as a measure of inert things made from outside […] but as multiple "additive" relations, experimentations that help sustain those very things" that are being valued (Hennion 2017b: 79). Attachment cherishes objects as valuable while providing subjects with a taste for their worth. Working with the notion that data can be made valuable through the "affective and attentive relationships" built with and among them (Pinel et al. 2020: 175), we ask: How does data gain value through attachment, and how does attachment play out in digitised valuation? And, importantly: What are the limits of attachment in the digitised valuation of data?

Participant observation in videoconference workshops

To study how data is valued, we have relied upon the participant observation of two experimental workshops. Throughout the workshops, we have shifted roles between facilitators, local organisers, participants, and ethnographers as both events have been devised, planned, conducted, documented, and analysed by the authors of this article. Leaning onto collaborative fieldwork (Lassiter 2005; Estalella and Sánchez 2018), the workshops have drawn inspiration from short-term, participatory, and open-ended formats such as data sprints (Munk et al. 2019; Jensen et al. 2021). We conceive both workshops as *experiments* – encounters under unusual temporal, technological, and organisational constraints (Lezaun et al. 2013). Each workshop lasted an hour and a half; participant interaction relied heavily upon the functions of a common videoconferencing tool. Since we designed the workshops as occasions to probe, tinker, and create, participants were given instructions that remained intentionally vague and afforded much leeway. They were prompted to sieve through data repositories and online sources. Yet participants were free to interpret workshop activities as they liked and chose, e.g. which websites to visit and what data to pick, which search engines, data repositories, or online tools to use, and how to work with the data they found. The workshops, neither problem-centred nor application-oriented, were not geared towards utility or any definite "solution".

The workshops took place during the Covid-19 pandemic when partial lockdown and travel restrictions confined us to domestic retreat and pushed us firmly into the armchair (Howlett 2020: 12). The armchair has been criticised, and rightly so, for privileged complacency. It has been ridiculed for being out of touch and credited with (the illusion of) objective detachment. In our ethnography of

home-to-home videoconferencing, however, we seize upon the domestic to grapple with the locality and intimate investment of attachment and work through the situatedness of digitised valuation. To address the material, affective, sensory, and reflexive dimensions of relations forged through and with online data, we have borrowed from virtual ethnography, leaned onto digital methods, and resorted to participant observation online (Boellstorff 2008; Rogers 2013; Hine 2015). In videoconferences, ethnographic vision is sustained by layered screens, cameras, microphones, and speakers – auxiliary devices that are curiously "present-absent" (Ziewitz 2011), simultaneously separate and connect (Winthereik et al. 2011), seam spaces together and keep them apart (Vertesi 2014). As participant observation in online videoconferences affords distinctly "partial ways of seeing" (Rossmann 2021), this article draws on a compilation of ethnographic notes and materials collected during workshops. Participants of the first workshop were asked to write short, ex-post reflections. In the second workshop, ethnographers accompanied all breakout sessions, and two out of four sessions were recorded. In addition, we implemented a file-sharing system that relied upon the university cloud service and asked participants to upload the data they found and all sketches, notes, or photos they took. For our analysis, we have combined the composition of ethnographic vignettes and memos with coding techniques and category-building in an iterative, comparative approach. All participants, except for co-authors, were given pseudonyms.

Both workshops started with an individual exercise in online data scraping (Marres and Weltevrede 2013) that focused on publicly available online water data. Water is both a private need and a public issue (Barnes and Alatout 2012; Krause and Strang 2016). It is ubiquitous and scarce, widely measured and monitored yet rarely known, and hence particularly suitable, we hypothesised, to probe the worth of data across different registers of valuation. In searching for water data online, participants were encouraged to pursue their own understanding of what data, in fact, were. Participants could choose the materials they wanted to rely on, and problematise, *as data*. Since web access quickly generates an overwhelming abundance of information, they felt the need to be selective. They picked materials ranging from ready-made Excel files to statistical information from various online media or newspapers (see Table 1). Data was found on different kinds of websites hosted by various organisations. Cut from utterly different sources, the collected data formed part of diverse texts (ranging, e.g., from policy reports to activist communication) and couched in various arguments about the waste, conservation, and treatment of water. Because web searches interpret phrases such as "water data" or "data about water consumption" pre-eminently in quantitative terms, they may have introduced a bias towards numerical data.

Type of Data	Example material
Activist Communication	https://www.watercalculator.org/footprint/data-centers-water-use/
Advertisement	https://www.waterlogic.de/blog/29-beangstigende-fakten-uber-globale-wasserverschmutzung/
Calculation Tools (private databases)	Verivox Water Price Tool
Easily accessible science communication	Teaching material for physics classes: https://physikunterricht-online.de/jahrgang-11/wasserwellen/
Fiction Literature	G.G. Márquez: Relato de un Náufrago
Laboratory Testing Data	Laboratory results of commercial water quality test
Medical Advice	Letter from insurance informing participant to stay hydrated
Newspaper Articles	Newspaper Article on anticipated water scarcity in Saxony: https://www.saechsische.de/plus/reicht-das-wasser-kuenftig-in-duerrejahren-5102942.html
Photographs and Stock Photos from news media	https://www.dw.com/de/die-virtuelle-wasserverschwendung/a-37235591, 2017
Reports by Municipalities and Local Governments	https://www.dresden.de/media/pdf/umwelt/UB_Grundwasser.pdf
Product Information	Label on coffee packaging
Scientific Articles	Impact of coronavirus on water infrastructure in Brazil: https://www.sciencedirect.com/science/article/abs/pii/S0921344920304158
Statistics	Investment in water and sanitation with private participation (current US$): https://data.worldbank.org/indicator/IE.PPI.WATR.CD?view=chart
Videos	https://www.youtube.com/watch?v=408PZ_zrs5Y
Visualisations	https://ourworldindata.org/grapher/global-freshwater-use-over-the-long-run
Weather Databases	https://www.wetterkontor.de/de/wetter/deutschland/monatswerte-station.asp?id=10384
Misc.	https://de.wikipedia.org/wiki/Virtuelles_Wasser

Table 1: Overview of data collected in workshops provided by authors (duplicates eliminated)
Source: Authors' own work

With scraped data, workshop participants joined virtual breakout rooms. They were asked to work in groups to reconcile pieces of data with one another. (The second workshop also prompted participants to identify conflicts in their data.) The declared goal was to articulate relations between the different data found. Participants were invited to

jointly devise visualisations, such as models, schemes, or sketches. Here, the workshops varied because we assembled groups of varying sizes within different institutional ramifications. For example, the first workshop allowed all participants to present their data one by one in plenary before we set up two breakout sessions. The second workshop, in contrast, allotted less time for plenary presentations and confined much of the group discussion to breakout sessions (see Table 2).

The first workshop, June 2020	The second workshop, January 2021
(90 minutes) Agenda: <u>Short introduction</u> <u>Activity 1</u>. "Find one splash of water data" (data scraping, individually, 10 minutes). <u>Activity 2</u>. Presentation of results. <u>Activity 3</u>. "Use creative means to craft a model for (and provide reflection upon) relating, and e/value/ating, utterly distinct splashes of data" (in breakout sessions, 15 minutes). <u>Activity 4</u>. Presentation of results, open discussion.	(90 minutes) Agenda: <u>Short introduction</u> <u>Activity 1</u>. "Find data that documents where and how water is wasted" (data scraping, individually, 10 minutes). <u>Activity 2</u>. "Discuss: Where is there conflict in your data, what data is ir-/reconcilable?" (in breakout sessions, 15 minutes). <u>Activity 3</u>. "How are you able to relate your data in discussing the worth(s) of water?" In addition, participants were asked to develop a visualisation of their discussion. (in breakout sessions, 15 minutes) <u>Activity 4</u>. Presentation of results.

Table 2: Workshop activities
Source: Authors' own work

Finding data and putting it together

People and things, participants and data encountered one another differently in the two workshops: the first workshop, in June 2020, formed part of a bi-weekly research colloquium and was attended by a group of five social science researchers (including the first, second, and third author) – doctoral students, postdocs, and professors, all of whom share an interest in STS. Five were associated with the research group that hosted the workshop. The first author was acquainted with two workshop participants and organised the event. The second workshop took place in January 2021 and was part of a weekly Master's course in sociology at the university, where two co-authors are employed. Twelve students and one professor attended this workshop while all co-authors of this article acted as facilitators–observers.

The workshops differed distinctly regarding participants' expectations, professional experience, and academic status – differences that shaped their willingness to engage in what they

perceived to be going on. Cheery and curious, participants of the first workshop regarded the event as an opportunity to hone their academic skills. Though still somewhat unusual in June 2020, the workshop was held online. All participants had their cameras switched on and eagerly used various digital tools (e.g. Etherpads or online unit converters). In contrast, participants of the second workshop, also held online, were in attendance due to the requirements of their study programme. They all had earned a BA in the social sciences, but only a few had experience working with data gathered online. Note that, at the beginning of 2021 and well into Germany's second lockdown, students were not yet as well-versed in virtual learning as they would become. Some participants kept their video cameras switched off throughout the workshop. With many of the participants aloof and reluctant, and some outrightly irritated, workshop facilitators found it challenging to engage participants in group work. Participants seemed ill at ease and unsure what to expect from a workshop embedded in a course that usually consisted of short lectures or presentations by faculty members.

What's (good) data?

When workshop participants browsed web pages and sifted through data found online, they had to decide which data to pick and present. Which data would resonate with fellow participants and facilitators? Presenting data means deeming data, as inconclusive or incomplete as it comes, valuable – a challenge that some participants enjoyed, others shunned. During the second workshop in particular many participants were unsure about the data they found: "I'm not so good at finding real data", a participant claimed. "But this is not good data", another one reasoned. Annoyed, for example, one participant told his breakout group that he "did not find anything" online. When the second author reacted baffled, the participant explained that data should either confirm his assumptions or yield new insights. Yet none of the data he found so far, he elaborated, lent itself to either one or the other – he found it all equally inconclusive. Other participants disqualified data as "too fine-grained" or "not trustworthy". Often, participants found data quality hard to gauge. Doubtfully, they commented and compared the order of results that search engines would display for different search terms and users, questioning the reliability of online data searches. If search engines were highly personalised, websites were not disinterested, and data quality was challenging to assess; would it be appropriate to pitch the data they found to teammates and workshop organisers?

Frustrated, participants in the second workshop were testing the scope of data organisers were willing to accept: What qualified as (good) data? Trying to reanimate an increasingly sluggish discussion in

one of the breakout groups, one participant, a faculty member, made a point of getting up from his chair and consulting the floor-to-ceiling bookshelves behind his desk. He retrieved a foreign-language book title and held it to his camera for others to decipher: *Relato de un Náufrago*, Gabriel García Márquez's *Story of a Shipwrecked Sailor*. Indeed, Márquez's *Story*, the factual account of a sailor who knows the ins and outs of water, testifies to the multiple worths of water, ranging from the fearsome force of the ocean to the indispensability of drinking water. As its blurred cover appeared on participants' screens, the book raised intricate questions. Could this be data? Why did we, sociologists and anthropologists, confine ourselves to quantitative data? What could be the status of analogue text in this online meeting?

Questions about data qualification found articulation also in a personal story one participant brought up at the beginning of the second workshop. The participant detailed how her home, situated in a rural area, was acutely affected by declining groundwater levels. Her family's well had run dry, making it harder to keep animals. While she offered newspaper coverage by way of evidence, she conceded that she had no "scientific" data at hand – a shortcoming that fellow participants used to sideline her story quickly. Without "reliable" data on local groundwater, they argued, they should focus on corporate water consumption and the responsibility of large, international corporations instead. Later, when tasked to put the data they found in relation to one another, the group drew up a mind map that did not mention the family well at all, even though the third author intervened to suggest its inclusion. Participants pointed out that their mind map featured "social values" and argued that the well was implicitly included in this category. The personal account about a dried-up well, a sad family story about loss and irredeemable change, did not tie in with what fellow participants deemed data valuable to the task at hand.

Many participants felt drawn to figures and charts that offered absolute quantities. Large quantities seemed especially appealing but unfathomable at the same time: 10.6 billion cubic litres were used for the production of textiles and cotton imported by Germany in 2010. "Nice figure [schöne Zahl] but …", a participant that we will call Uwe remarked, shrugging, laughing, and discarding this piece of data. Particularly in the second workshop, most participants were quickly willing to let go of data they found. Hannah, however, was an exception. Right in the introductory round, she emphasised that she understood the workshop's question about water consumption and water waste as a question of global scope. Enthusiastically, she recommended ourworldindata.com, a website run by a British charity in cooperation with the University of Oxford. The website curates international data sets and presents them in visually appealing charts and maps, many of which are interactive. It offers various information graphics on how, e.g., water consumption levels in industrialised

countries compare to levels in threshold countries. Fittingly Hannah's virtual background sported a world map strikingly similar to those used by the website's info-graphics. Hannah presented herself as someone who does not stay at home but ventures into a global, virtual world. Curiously, in the group work phase, her teammates would be the ones to settle on a handwritten mind map that did not mention any data at all – a stark contrast to the digital, neat, and colourful info-graphics Hannah had brought up.

Venturing into the plethora of data available online is not a banal task, and participants had to decide what data they would attach to the situation, i.e. which data to include in their situated performance and fit into the self-image they wanted to endorse. Many student participants approached this question on strict methodological grounds, valuing data as "un/real", (not) "trustworthy", or (not) "fine-grained" enough. Other participants more readily attached data to personal concerns and global politics, carefully canvassing the issues that could be considered within the realm of the workshop. Some participants carefully tested the facilitators' permissiveness by invoking what challenged conventional, quantitative understandings of (online) data – a tactic probing the workshop's stakes and subtly shifting them.

Data from home, data at home

Seated at home, workshop participants found different ways to seize upon the personal and the domestic amid their private lives. Yet while some participants enthusiastically brought up data related to individual research interests, their places of living, or their personal history, others shunned doing so. And while some found it easy to interest fellow workshop participants in data that bore an intimate relation, others found it utterly challenging to convey private matters that resonated with their peers. The above-detailed example of the dried-up family well, a story quickly pushed aside, is a case in point. Some participants strongly resisted making personal experience and private life the subject of their research. The following episode from the second workshop shows how participants acknowledged the role of domestic water consumption while keeping workshop discussions and private lives separate affairs.

When a group of participants reviewed the data they had collected, one of them, Uwe, used their breakout session to think aloud:

> I don't know, but my first association was when asked to set data in relation that we could bring everything together in photos. Everything is related to water, the morning routine, for example. I get up, I shower, the products I use and wear are produced with water, I have breakfast with fruit that is also cultivated with water, and this is also somewhat data. (Uwe, workshop participant).

Having his morning routine pass before his inner eye, he realised: "All the data [we have found] ultimately relate to us; industrial production and so on – it remains with us." Uwe and his teammates quickly agreed to sample photos in a scrapbook fashion to illustrate how domestic practice involves water consumption. One of them wondered whether they should take pictures of their apartments, but by then, they had already begun searching for stock photos online – eyes flying over the screens, fingers busy on keyboards and mice.

As Uwe and his teammates were arranging photos, the first author wanted to know why they had left out all the quantitative data they had researched earlier. It would be "hard to estimate for private households", Uwe replied. "We could try to assign an estimated amount of water … but I would not know how much water I need to wash the dishes – this would be mere speculation," he said, shaking his head. He then elaborated that, from his point of view, environmental policies should aim at curbing agricultural and industrial water use. Sure, he explained, one could reduce private water consumption, but requiring people to time their showering would be difficult. Uwe felt that private water use cannot and should not be measured and evaluated. But while Uwe defied the notion that private water use counts, others in his breakout session disagreed. Avoiding outright confrontation, one participant, Taina, kept adding photos to the canvas – attaching more and more concerns to their group work. As a result, a compromise emerged in the form of a scrapbook collage that assembled impersonal stock images to illustrate the volume of private water consumption without mentioning any quantitative information (see Figure 1).

Figure 1: Scrapbook collage
Source: Participants' own work

In contrast, other participants welcomed the workshop as an occasion to engage with online data playfully. With an interest in data studies, participants of the first workshop picked large quantity data that related to personal experience and life-world circumstances. One participant researched water data relating to arid regions in her country of origin, and two participants brought up water data from cities they inhabit. Flora, e.g., explained how a particularly dry month could become a "problem for my garden". Even though the beginning of the year had been rainy and the rain barrel in her garden was well-filled, Flora had noticed that the previous month, May 2020, had been particularly dry. She recalled a note in her local newspaper that confirmed her observation. She worried that, on average, precipitation had declined, and her garden might dry out in summer. During the workshop, Flora retrieved data from an online weather service (wetterkontor.de), showing that the previous month of May had yielded only 59% of the long-term median of 1981 to 2010.

Similarly, the speciality coffee sitting on his kitchen counter struck another participant of the first workshop (third author). His coffee, "Brother Baba", a mellow roast with distinct flavours of caramel, waffle, and honey, came with a little ID card describing its origin, roast

profile, intensity, and sweetness. The packaging also featured an entry stating, "PROCESSED: WASHED". A quick search on the web listed various methods of processing coffee, washing being a common one for espressos. Wikipedia offers average amounts of water needed for coffee washing procedures in different regions. This particular coffee was from India ("Baba Budan Giri"); its processing used 14–17m³ water per tonne of unpicked fruit.

To make large quantity data relatable, the coffee atop the kitchen counter helped frame water consumption as a global issue, linking resource strains in the global South to consumer tastes in industrialised countries. Digital data, here, was appreciated through its attachment to the offline pleasures of domestic life. The group discussion kept returning to the coffee everyone would like to try: Can you smell the caramel flavour, can you feel the washed beans running through your fingers? Yet while participants were intrigued by the quality of coffee, and the quantity of water necessary to produce it, the quality of data presented no issue at all. This illustrates how in this instance, participants did not hold found data against academic standards but instead appreciated them through their relationship with the sensorial, enjoyable qualities of everyday life and its private concerns.

Putting data together

Throughout the workshops' second half, groups of participants were asked to jointly establish relations between the data they had found individually; a task that workshop organisers gave little explanation and no advice on. As detailed above, one group used an online pad to create a scrapbook-like collage of photos found online. The images illustrated water consumption in everyday life, starting with morning activities at the bottom and finishing with evening activities at the top of the page (see Figure 1). Another group settled on a handwritten mind map (see Figure 2), believing that it would be "practical" if one of them, Thomas, drew the mind map by hand and later uploaded a photograph of it. Thomas placed the term "water", surrounded by the shape of a water drop, in the middle of a sheet of squared paper and began to cluster categories around it: "scientific", "social", and "economic". Gazing down at his writing, Thomas provided a running commentary for fellow group members. From time to time, he held his notepad to the camera. Unfortunately, his internet connection was poor, so the mind map was difficult to read and his speech was frequently interrupted. Still, Thomas and his teammates were keen to cluster keywords evenly around categories, without neglecting or prioritising one of them. As categories grew increasingly connected, someone commented: "Actually, we could have drawn something like a spider's web right away." While their keywords were

supposed to refer to the data they had collected, the mind map actually did not mention any data at all.
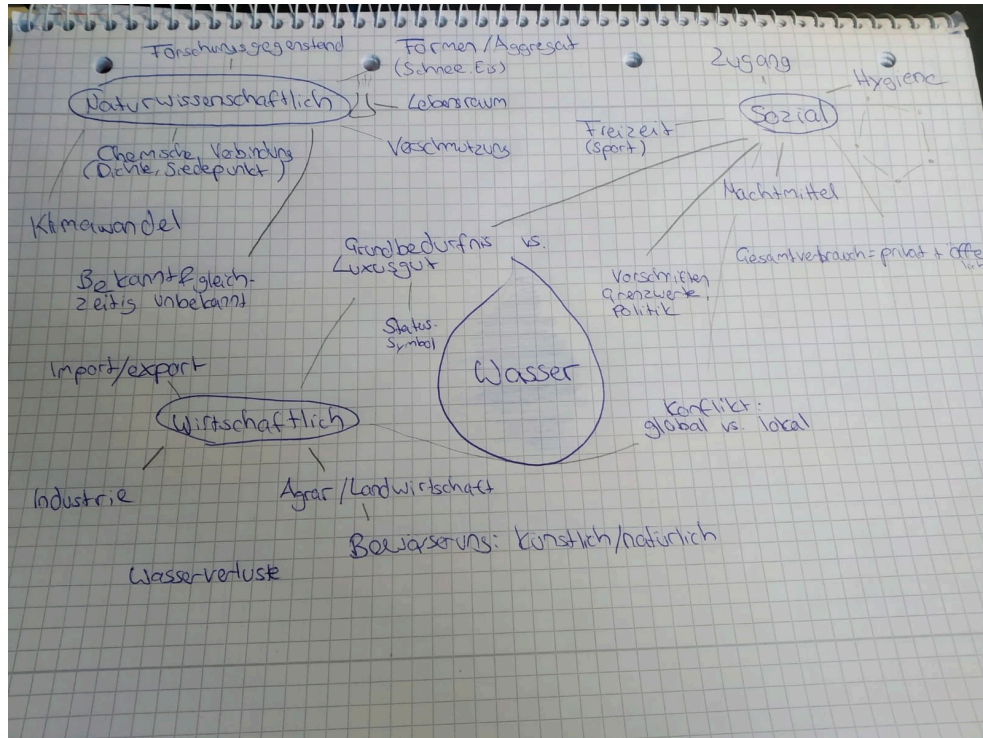

Figure 2: Mindmap
Source: Participants' own work

Both mind maps and scrapbook collages refrain from comparative modes of ordering. However, other groups of participants were intrigued by questions of priority, quantity, and (water) quality. They resorted to more abstract, hierarchical models for integrating the data they found and their discussions about the value of water. One such model is a rotating square (see Figure 3); another consists of a two-dimensional matrix (see Figure 4).
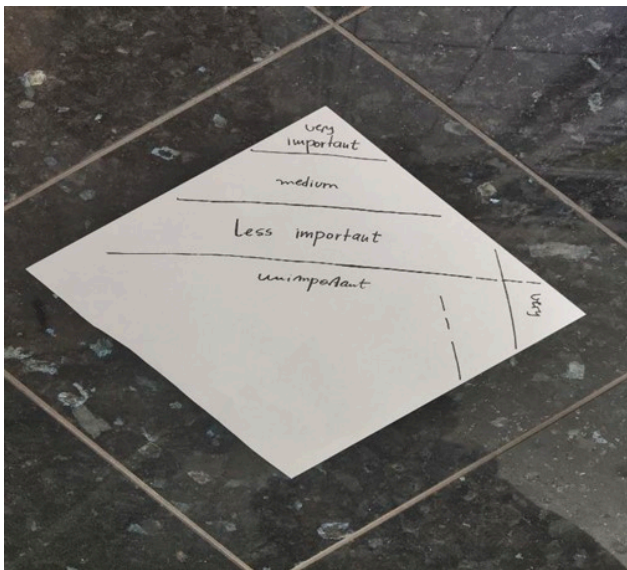
Figure 3: Rotating square
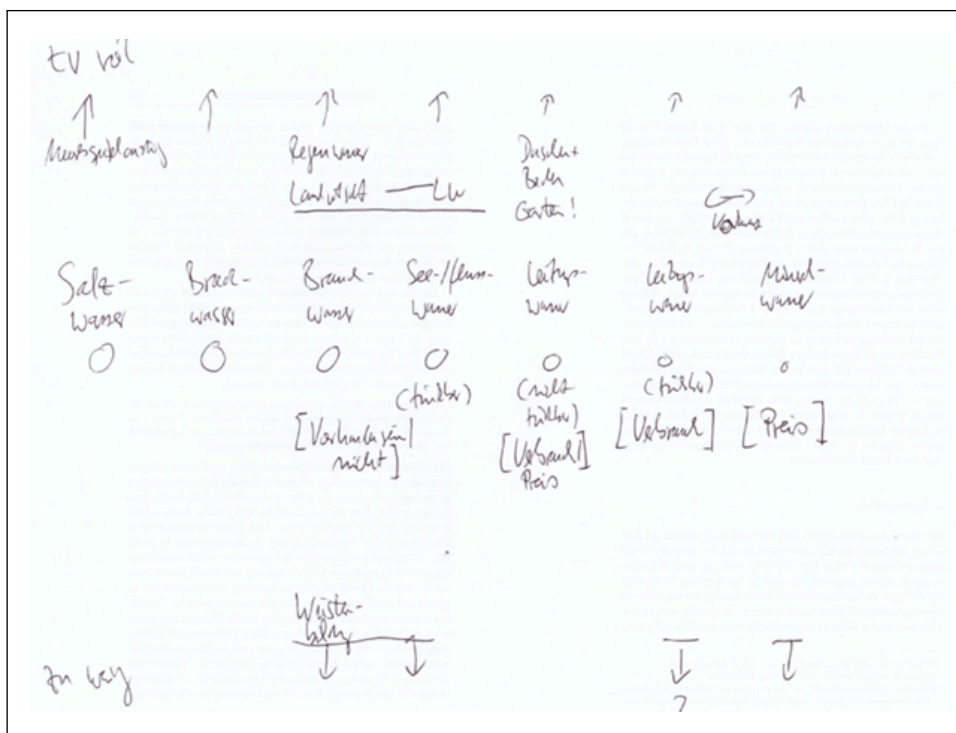Source: Participant's own work

Figure 4: Two-dimensional matrix
Source: Participants' own work

The square model was devised by a group of participants struggling with an abundance of concerns for water (and data about it): "And yet," as one of them put it, "some water is more important", and some data is more important than other. While drinking water and reliant

measures about its quality are urgently needed, it may be considered less urgent to satisfy the water requirements of coffee processing plants or the cooling facilities of data centres. Yet what if data centres keep environmental data? What if coffee beans earn livelihoods? What if bean washing uses rainwater in regions where water shortage is not a problem? Is governmental public data more relevant than the privately commissioned testing of select taps? The group cut out a squarish shape of paper to explore these questions, each of its right-angle corners signifying a pyramidal hierarchy of value. With one of its corners pointing up, rotating the square by 90° would place a different hierarchy of value "on top". As they were working on their paper model, the third author retrieved a photo from the web – a car with square tires: "It can't work, and yet it works, with a lot of friction."

Another group, too, resorted to hierarchisation and devised a two-dimensional matrix, drawn by hand on a sheet of paper. Parsing issues of water use and water waste as a problem of both quality and quantity, the group developed a scheme to compare both conditions and amounts of water. On its horizontal axis, the scheme featured various qualities of water (beginning with saltwater on the left, ending with tap water and then mineral water on the right side of the paper). On its vertical axis, the scheme plotted relative amounts (with "too much" at the top, "too little" at the bottom). Participants drew water qualities as columns, with vertical arrows indicating how distinct qualities of water might move towards "too much" or "too little" (see Figure 4).

Only one group tackled quantitative data directly. Proceeding from precipitation data and data on the environmental impact of data centres, the group converted the amount of water used for cooling data centres into the amount of precipitation that fell onto gardens in Berlin – comparing data in a way that felt absurd yet intriguing. To do so, the group had to convert gallons to litres, relating the water used by all US-based data centres during one month to the rain that reached 500m2 gardens in Berlin throughout the particularly dry month of May (see Figure 5). According to their calculations, 3,287 gardens received as much rainwater as US-based data centres needed for cooling. Unsure how to interpret this result, the group wrote: "seems a lot – even possible … ?" Similar to the quadrangular shape model and the two-dimensional matrix, this exercise in metric conversion grappled with problems of comparison and weighting. Which needs for water, and which water data, should receive our attention?

What is more important? What is equivalent? How can the rationale of equivalence meet personal attachment in considering public concerns? As this workshop exercise shows, participants managed to attach data to one another but friction between the local and the global, the personal and the impersonal become quickly apparent.
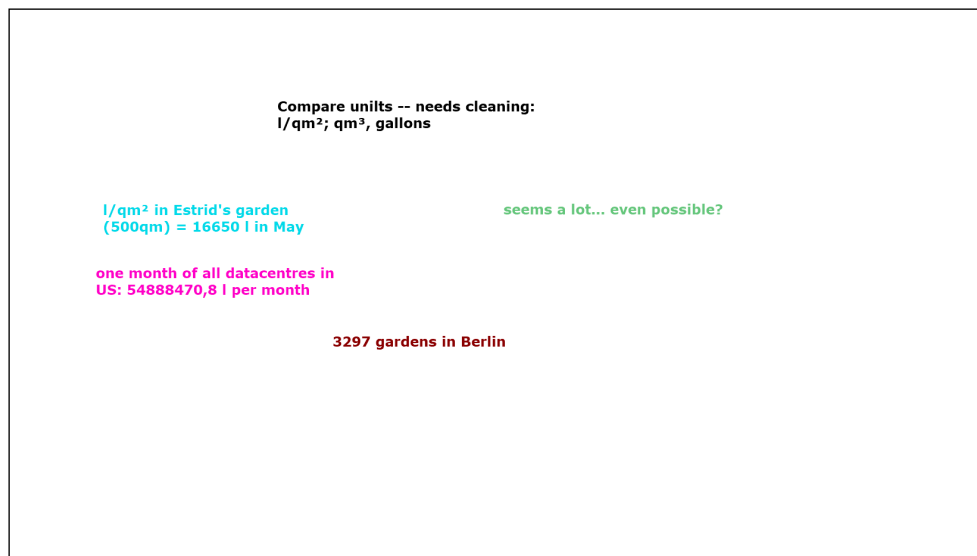
Compare unilts -- needs cleaning:
l/qm²; qm³, gallons

l/qm² in Estrid's garden   **seems a lot... even possible?**
(500qm) = 16650 l in May

one month of all datacentres in
US: 54888470,8 l per month

3297 gardens in Berlin

Figure 5: Calculations
Source: Participants' own work

Attaching online data to stakes, selves, and other data

The workshops provided an opportunity to observe and engage with the valuation of online data. Thinking with attachment, we suggest viewing valuation in terms of the material and affective, sensory, and reflexive relations through which value finds re-articulation. In particular, we draw attention to how data value emerges from attachment to the situated circumstances, the material objects, and the stakes at hand in moments of valuation. Furthermore, we elaborate on how data finds attachment to selves in situated subject networks. Last, we discuss the various techniques of dis/assembling data – attaching data to one another – that we observed in the valuation of online data.

Attaching data to the stakes at hand

To conceive of valuation in terms of attachment means, we argue, not only that it takes place *under* specific circumstances but that it works *with* them. Valuation crucially relies upon what is at hand – objects, infrastructures – and at stake in a given situation. Workshop participants, seated in front of screens at home, found themselves in domestic surroundings and with access to innumerable objects, some physically, some virtually present. Participants worked across various media, shifting back and forth between analogue and digital. Because screen sharing, for example, was unavailable during breakout sessions, participants resorted to email, shared dashboards, and handwritten

notes held to the screen. In similar vein, incomplete, scattered, and pre-formatted data challenged participants to forge attachments across data sets, metrics, and graphic renderings – a challenge that some participants avoided.

In fact, much of the data found online was hardly taken up during group discussion. Their adhesive qualities, we might say, proved poor. But while some participants complained that they found online data "hard to relate to" and "intangible", other participants presented carefully selected data as relatable and tangible. They researched, e.g., water data concerning everyday objects within immediate reach (clothing, coffee atop kitchen counter), domestic practices (showering, cooking, watering), or surrounding regions (garden, home town, home country). Making their surroundings a starting point for researching data online, participants were able to anchor the data they found within the realm of domestic life and attach it to "home".

Moments of valuation, however, do not only feature particular surroundings; they also feature a specific frame – they are about something (Goffman 1974). They put something at stake. Endowing data with value means attaching it to the stakes at hand and situating it firmly within the frames that shape its moments of valuation. As we observed, data gained value when it gained a significance that resonated with what the workshops were deemed to be about. While the two workshops may appear similar in design, participants found their attachments tried in distinctly different ways: some participants regarded the workshops as an occasion to probe and hone their academic taste, whereas others perceived the workshops as yet another test in higher education.

Depending upon their frame, moments of valuation may call upon different registers of valuation (Heuts and Mol 2013). Educational examinations promote impersonality and disinterestedness; tastings (of wine, coffee, or data) cultivate personal interest and sensual proximity. Tastings probe perceptions. How does it feel? Or better, how to feel oneself into it? Tasteful things "offer themselves only to those who offer themselves" to them (Hennion 2007: 106). Taste fosters intimate attachment and is steeped in collective discourse at the same time. The acquisition of taste depends on occasions to probe perceptions with others, and some participants made the workshop such an occasion. The coffee atop one participant's kitchen counter proved particularly conducive in this respect. Relating water data about coffee processing to domestic consumption, the taste for a particular brand of coffee lends itself to a preference for online data. Data, here, was cherished for its connection with the offline, sensory pleasures of everyday life.

In contrast, many participants were too uncomfortable to "taste" data. They felt the workshop was an educational test. When perceived as an examination, the workshop became an event that put participants' academic credit on trial and challenged them to apply the conventions of quantitative social science. Many participants found it

difficult to find and present data in ways that they believed satisfied these conventions; and many felt it inadequate to associate themselves – their lives, their homes – with the data they found. As Luc Boltanski points out, what is at stake in educational examinations is "[…] the competence [of students and involved personnel] to produce arrangements that are acceptable – 'convincing' – to others", i.e. arrangements that lay claim to objectivity and universality (Boltanski 2012: 33). Educational examinations typically minimise "extraneous worth" by barring testees from "wearing overly expensive jewellery or very shabby clothes", objects that point towards differences in financial capacity and class membership (Boltanski and Thévenot 2006: 137). Thus conceived, the workshop remained blatantly at odds with the implications of home-to-home videoconferencing, a mode of interaction that constantly risks revealing intimacies of domestic life. It became an exercise in controlled detachment, minimising exploratory familiarisation and playful attachment.

Attaching data to selves

The personal has a fraught relationship with data. While data can help translate between personal and public (as, e.g., in Marres 2009), the personal can be perceived as an infringement upon the purchase of data. In this vein, Anders Koed Madsen emphasises that "personal experience" should be assigned a "restricted role" in data workshops (Madsen 2023). In this article, however, we argue that data can gain value when it is attached to selves. Such self-attachment requires one to invest oneself in data to have oneself re-emerge in subject-data networks. Contrary to the notion that quantitative data science promotes detachment and impersonality, we observe how self-data relations can thrive upon passionate dedication – an attitude that some workshop participants adopted and others refuted.

Academic and educative exchange through videoconferencing implicates the domestic and infringes upon the private. Seizing upon the household and the private, some workshop participants readily mobilised personal attachments in selecting and presenting data (Hennion 2007, 2017b). They relished being *data amateurs*, guided by a desire for reflexivity and pleasure. Data amateurs might wonder: How do I feel myself into the data? What data is worth my dedicated attention, what data would be exciting for me to bring in, and how does a piece of data recast my subjectivity, my entanglement in the object-relations surrounding me? Data amateurs delight in reflecting themselves in bits of data. As conscientious coffee lovers, they research the amount of water consumed by washing their coffee beans. As concerned parents, they produce the digital scan of a commissioned tap water analysis. As international scholars, they retrieve water data from the regions they have researched and lived in. And as ardent

gardeners, they make calculations about rainfall per square metre. Like care (cf. Mol et al. 2010), such attachment is ambivalent. Amateurs are not immune to narcissism, and their dedication risks being overly egocentric. Nevertheless, we find that distinct self-investment challenges collaborating participants to appreciate others' discriminatory capacities and skilfully interweave personal attachment. Amateurism animates explorative reflections of data in the negotiation of public issues, relating private pleasure to the common good.

Some participants regarded self-invested data amateurism as inappropriate and opposed any attempt to create a relation between the data they found and their private lives. For example, Uwe copiously resisted any effort to relate data about domestic water consumption to specific activities in his daily life. "We could", he contended at one point, "try to assign an estimated amount of water … but I would not know how much water I need to wash the dishes – this would be mere speculation." With speculation deemed inappropriate and specific water data out of reach, Uwe steered his group away from assigning water volumes to domestic activities. He argued that it would be "difficult to require people to time their showering". Instead, he drew attention to agricultural water consumption. Aware of the restrictive environmental policies that might underlie the measurement of domestic water use, Uwe defies the notion that domestic consumption data counts and would be worth having. Implicitly, Uwe questioned the legitimacy of domestic datafication.

It is important to note, however, that detachment is productive in its own way. Throughout the workshop, several participants remained defensive, even defiant, and their detachment helped articulate questions and uncertainties. It initiated a critical, often somewhat sceptical examination of data. More than their enthusiasm, participants' defiance raised the question: What data is needed, and what data is warranted? What data does it take, and what does it take to stitch these data together? When defiance cast doubt upon data, it also brought to the fore what was lacking – e.g. parent populations, reference values, and more detailed information about data collection and data analysis. Instead, passionate data amateurs readily attached themselves to present and available data. When passionate attachment was invoked, the quality of data was hardly ever questioned.

As they attach, detach, and reattach themselves, "[a] constant testing, assessing, calibrating appreciation is at the heart of participants' engagement with their environment" (de Laet et al. 2021: 809). So, while we maintain that data can gain value through attachment, particularly to the attachment to selves, we acknowledge that detached defiance has its merits. The interplay of attachment and detachment makes for some of the complexity of valuation. The value of online data is shaped and reshaped by whether or not we hold on to

data tightly, scrutinise it at arm's length, or keep it bay, invite it home or have it slip away.

Attaching data to one another

Data rarely comes alone, and it gains value when it attaches to one another. As Wendy Espeland and Mitchell Stevens have argued, it typically associates through commensuration. Understood as a metric translation, commensuration "is fundamentally relative" and "creates relations between attributes or dimensions where value is revealed in the comparison" (Espeland and Stevens 1998: 317). Here, value "emerges from comparisons that are framed in terms of how much of one thing is needed to compensate for something else" (317). In fact, both workshops were concerned with comparison, compensation and resemblance, categorisation, and prioritisation. In particular, these concerns found articulation when participants were tasked to relate the water data they found. In both workshops, this task proved rather tricky for participants to solve in a manner that they perceived as satisfying. Online data did not associate easily with one another and challenged workshop participants to work out different relations of equivalence (Boltanski and Thévenot 2006: 33). While some groups of participants related data employing commensuration, others relied upon forms of relation-making that deliberately stopped short of comparison and compensation. In our observation of the workshops, we identify three techniques for attaching data to one another: *collages*, *hierarchies*, and *calculation*. While we characterise each technique separately in the following, they overlap in practice.

Some workshop participants devised *collages* – collections of notes or images spread out on a surface and loosely associated by resemblance or rough categorisation. Such collages rely on implicit, rule-of-thumb rationale of equivalence. What's un/like what? What belongs where? In our workshops, collages could take the form of scrapbooking or conventional mind mapping. The scrapbook (Figure 1) consists of photographs, many of which stylistically resemble one another, and uses them as stand-ins for domestic, water-consuming activities (bathing, cooking, etc.). The mind map (Figure 2), in turn, invokes analytic differentiation. Its structure relies upon three umbrella categories (i.e. the "social", "economic", and "scientific" value of water), the equivalence of which was diligently cared for when subcategories and keywords were placed evenly around them.

In creating collages, workshop participants used different materials (digital photographs, paper and pencil) to present and discuss diverse uses of water and its multiple worths, quite literally, "on a singular plane" – avoiding, notably, in cases we observed, any material mix. What is more, the collages do not attach to any of the specific data participants were able to find. They also avoid prioritisation,

weighting, and comparison. How do showering and bathing compare? What kind of tensions would be between water's "social" and its "economic" value? What are the conceptual politics of such a distinction anyhow? Steering clear of questions such as these, collages defer the challenge to quantify value and engage with concrete data. Instead, they convey the subtle notion that water remains *in*valuable.

Some participants devised diagrams of *hierarchies*. These graphics use abstract shapes to describe value orders as relational, dynamic, and heterogeneous. One of these diagrams, a two-dimensional matrix (Figure 4), features a single definite ordering of qualities of water from saltwater to mineral water. Another diagram tackles the simultaneity of incommensurable hierarchies with a rotatable quadrangular shape (Figure 3). These diagrams, too, refrain from mentioning any specific pieces of data. Instead, they strive to articulate the rationale of association that would allow for prioritizations of worth.

Finally, participants resorted to *calculation* in order to attach the data they found (Figure 5). As calculation requires reformatting data (Dumit 2018), participants carefully converted units of measure to relate the amount of water used for cooling data centres to the amount of rain that fell on private gardens – juxtaposing utterly different water qualities by equating water quantities. This equation consists of an odd if intriguing commensuration: if US-based data centres consume just as much rain as 3,297 gardens in Berlin receive, does that imply that cooling water is equally as valuable as precipitation? What impact – direct or indirect – has industrial water use upon rainfall? Clearly, one is no compensation for the other, and the relinquishment of the former would not benefit the latter in any straightforward way. While participants' calculations queried the limits of commensuration, the equation of cooling water with precipitation served participants as a means of valuation. This equation not only emphasised both the value of cooling water as well as Berlin rain; more importantly, it valorised selected data and appreciated their capacity to connect in far-reaching, thought-provoking ways.

Calculation, collage, and hierarchy building are techniques for attaching data that invoke and manipulate relations of worth. These techniques handle data in different ways – joining data through commensuration or grouping it using resemblance and categorisation. Calculation, collage, and hierarchy building help attach data to one another and query these attachments simultaneously. They can also separate data or sideline it. As techniques for handling diverse, abundant, and fragmented data, they hardly settle value. Rather, they grapple with commensuration and its limits and invoke issues of in/commensurability (Boltanski and Thévenot 2006) while they put material, adhesive qualities of data to the test.

Conclusion

Building upon a vast array of digital technologies, digitised valuation appropriates new possibilities, necessities, and constraints to forge relations; or to cut them. Digital infrastructure comes with inscribed configurations of worth (see, e.g., Balsiger and Jammet (2022) as well as Krüger and Petersohn (2022) in this theme issue of *Valuation Studies*), and users are called to adopt or discard, process, and rearrange them. Crucially, virtual collaboration takes place in technologically mediated, synthetic moments whose configuration shapes the performance of valuation. Moreover, the "mercurial" character of things digital – online data, that is – challenges digitised valuation to continuously re-situate it. Online data abounds, and massive datafication is likely to entail fundamental changes in the ways of domestic life, the manners of private reflection, and our modes of civic deliberation (Marres 2009; Gabrys et al. 2016). Before this backdrop, we studied how (online and other) data figures in the shifting boundaries between valuable and invaluable.

In this article, we have analysed how online data finds attachment, thereby gaining worth in virtual collaboration. Our analysis relies upon virtual ethnography and participant observation in two experimental workshops. Held as home-to-home videoconferences, the workshops allowed us to observe how data relates to the domestic and how data value is negotiated at the nexus of private and public. In our analysis, we elaborate how analogue and digital materials, immediate pleasure and collective debate, domestic concerns and global resources are brought together/apart in digitised valuation.

We contribute a perspective that conceives of valuation in terms of attachment. Data becomes valuable when it attaches to the circumstances and stakes at hand, to selves, and to other data. Attachment makes data stick. Conceptually, attachment recasts digitised valuation as radically relational, material, and affective. It draws attention to the ways in which digitised valuation not only "is situated" but works with the situation—its stakes, locality, and provisions. In doing so, attachment foregrounds the role of material and sensorial quality, affect, and reflexivity in endowing data with value. Attachment can be enthusiastic or wanting. Often enough, it is ambivalent, multiple, and overlapping. It may evolve or shift. Attachment alone may not do the trick. Finally, we have pointed out how questions about data quality and the legitimacy of datafication are triggered by practices of *de*tachment.

Acknowledgments

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