WORKING PAPER / 2025.01

Data and the sensorium, or what data can teach us about ourselves through ourselves: an inquiry on wellbeing, data justice and the human experience of knowing, sensing and being

Berta **Fernández Nuez**

University of Antwerp
IOB | Institute of Development Policy

The IOB Working Paper Series seeks to stimulate the timely exchange of ideas about development issues, by offering a forum to get findings out quickly, even in a less than fully polished form. The IOB Working Papers are vetted by the chair of the IOB Research Commission. The findings and views expressed in the IOB Working Papers are those of the authors. They do not necessarily represent the views of IOB.

Institute of Development Policy

Postal address:
Prinsstraat 13
B-2000 Antwerpen
Belgium

Visiting address:
Lange Sint-Annastraat 7
B-2000 Antwerpen
Belgium

Tel: +32 (0)3 265 57 70
Fax: +32 (0)3 265 57 71
e-mail: iob@uantwerp.be
http://www.uantwerp.be/iob

WORKING PAPER / 2025.01

ISSN 2294-8643

Data and the sensorium, or what data can teach us about ourselves through ourselves: an inquiry on wellbeing, data justice and the human experience of knowing, sensing and being

Berta **Fernández Nuez**
Berta.FernandezNuez@uantwerpen.be

February 2025

University of Antwerp
IOB | Institute of Development Policy

Data and the sensorium, or what data can teach us about ourselves through ourselves: an inquiry on wellbeing, data justice and the human experience of knowing, sensing and being

Berta Fernández Nuez

Abstract:

In tackling knowledge structures and power injustices that would allow for each one of us to live better lives, data – its uses, constructions and consequences – has become a factor of change. In this paper, the consideration of data justice takes a new road in the inquiry of the nature of wellbeing and justice. Using the capability approach, first, the paper discusses the constraints of agentic elements within individual justice. Secondly, inserted among traditional debates of wellbeing, life-satisfaction approaches are pinpointed to secure a definition of what means to live well within each one of ours perceptions. By reviewing these incongruencies in the applicability of the capability approach within data justice frameworks, the paper seeks to establish the consequences of taking an 'emotional distance' in the inquiry of people's wellbeing and justice. By accounting for the need of more humanistic ways of analysis, the paper stands on the strengths of the sensorium as a scope that considers an unlimited array of points of entry for thinking, sensing and being. This paper anticipates new possibilities for data representation by focusing on 'data futures' that welcome creative, sensorium knowledge-making. These possibilities go beyond mainstream Western epistemologies and ontologies and instead, focus on more inclusive and contextual world-making practices.

1. Introduction

The purpose of this paper is to discuss data for development from the capability approach perspective while inputting the sensorium as a mediator factor. As data continues to be framed as a transformative force in development, the conversation around its 'power' has intensified (Milan & Treré, 2019), specially since its newly gained economic perspective in current affairs has undermined individual justice in favour of corporations and global forces of power (Thatcher et al., 2016). In other words, as the individual is redeemed to the background, data has become a situated factor for difference, equality and identity, its control, of high importance. Recognizing these stakes, scholars have engaged with the idea of 'data justice' to address the ethical, social and political implications of data within our lives and wellbeing. Nevertheless, there still needs work to be done in the definition and theorizing of data along human relations and societal formations.

For that, in the pages that follow, this paper aims at establishing a relationship between data and the capability approach –a highly-discussed theory of wellbeing and justice in human development– that opens up ways of looking at the practices of datafication as part of people's wellbeing (Cinnamon, 2020). The questions of this paper are as follows: to which extent is data an essential trait of people's wellbeing? And what role could the sensorium have in achieving this? To answer these, the use of the capability approach allows this paper to take two standpoints: first, it grants that data is a factor for wellbeing; and second, it helps pinpoint justice and wellbeing through the individual. Needless to say, I am using the capability approach as pointer for the usefulness of some of its arguments while maintaining a critical stance towards its applicability to the matter of this paper, as some of its weaknesses offer space for improvement. And so, this is an exploratory paper looking into what the capability approach can offer and what it cannot in regards to data justice.

While the capability approach has been previously applied to data justice frameworks, such as in the work of Chiappero-Martinetti et al., (2020), this paper takes a distinct direction by focusing on enhancing the valuation of data and its influence on people's lives. It advocates for the deeper integration of data into concepts of wellbeing and justice by arguing, that, in order for people to gain value and better understand their relationship with data, the most natural and human way of connecting to knowledge – that is, through the sensorium – must be accounted for. The paper critiques and expands on existing data justice frameworks, contending that the applicability of the capability approach cannot be fully realised within these frameworks without addressing the absence of the sensorium in wellbeing and justice conceptions. In other words, I concede that such applicability is deflected by some of the weaknesses of the approach in itself, for which I will go through in this paper. In addition, the fact that data is also missing the sensorium in its nature, affects how confidently we can talk about the capability approach within a data justice framework.

Perhaps, the question that arises now is: what is the sensorium, and why is it relevant for the discussion of this paper? The sensorium is based on a multitude of disciplines, from sensory anthropology to psychology (neuroscience and emotion), philosophy (cognition, virtue and *logos*) and art (aesthetics and multisensory). The sensorium is distinct from other ideas such as "mnemonic assemblages" (Freeman et al., 2016, p. 5; Hamilakis, 2017), which have a tendency to portray people as disembodied and atomistic actors, focusing in individual cognition through temporal lines without considering the environmental and relational context in which learning and remembering occur. Considering this, definitions on the sensorium as "a multilayered phenomenon that spans all aspects of sentient existence, including the way in which touch and other sensory inputs elicit affects, emotions and perceptions" (Tonder, 2015, p. 2) do not do enough justice to the term. By contrast, I consider the sensorium to be an umbrella-term that encompasses not only a physiological elicitation through the five senses and internal perception such as balance, thermal perception or kinaesthesia (Vannini et al., 2012; Fulkerson, 2014); I also account as part of the sensorium the emotional, psychological, cognitive and even metaphysical dimensions of human experience and its surroundings (material or not). In this way, it allows for issues concerning justice, ideology and power to be perceived through the embodied nature of lived experience (Tonder, 2015, p. 3), much in connection with perspectives of *buen vivir*.

The sensorium has had some exploration in the capability approach through Nussbaum's (2001) work, where senses and emotions take form as central capabilities. However, a triangulation of the capability approach, data and the sensorium has not yet been identified. As it will be shown, the three aspects can converge and have a conversation on different points such as practices, the senses, types of wellbeing and modes of knowing and sensing through multimodality and creativity. This convergence align with the call by data feminists for advancing 'data futures'. Within this realm of improvement, the paper looks for a redefinition of justice and wellbeing, to reimagine the ontology of knowing and sensing, and discuss the advancement of data justice through other forms of data representation. With the final discussion of some examples of these data representations, the paper offers some ground towards what could mean to have some form of instrument that would converge other forms of knowing and thinking that materialize capabilities for our own wellbeing.

As such, the analysis is meant to be unidirectional, from the general topic of the capability approach to its integration in data and development, specifically data justice, and a touch-base on the sensorium as a tool for approaching the whole debate. Within this exploration of theory, the second part of the paper will focus on the exemplary cases of the convergence between the capability approach, data justice and the sensorium, i.e. data representations. The questions and challenges of the capability approach are the same ones as those of data justice. Thus, examining how these come up first in the general approach, and how are exemplified in the exercise of data justice frameworks as they are right

now, I can input on the sensorium through a unitary pointer of the whole dilemma. Nevertheless, the reader should bear in mind that, along the way, many topics will be left open, as this theoretical discussion lacks a practical exploration, and is only meant for a probing of several ideas.

2. What is data? A social phenomenon like any other

For the discussion, it is imperative that I define data first. In first instance, data compiles increasing variances in meaning that differ from the quantification and numerical realm; in other words, data is not only about numbers. In fact, there has a been a growing academic inquire about the structure, practices and nature of data through sociological, anthropological and psychological research due to a "crisis of faith in quantification" per se (Mennicken & Espeland, 2019). With nascent routes such as 'critical data studies' (Hepp & Kramp, 2022), the study on data has transversed beyond "the depoliticized boosterism and hype that propelled discussions of 'big data' and 'data science' during the 2010s" (Selwyn, 2021, p. 594). The inquiry has shifted from how governments and companies have control over personal and economic data (Johns, 2021) to new 'data futures' (Selwyn, 2021) that analyse how socialites have emerged, been defined, challenged and diminished thanks to data. The shift can be traced through the historical evolution of data studies, transitioning from the quantification schools of thought—focused on state management and statistical approaches—towards a more activist and personalized perspective that integrates human experiences, including aspects of technology, emotion, and aesthetics (Mennicken & Espeland, 2019). And it is in this nascent perspective of data that this paper is situated.

Deriving from this, for the definition of data, it is quintessential that we define the practices of its making and use. Data practices are conceived by Ruppert and Scheel (2021) as: sociotechnical, situated, performed, contingent and enrolled. Data practices touches on the "method assemblages" by grouping technologies, people, materials, rules, things and concepts in ways that allows for data to have a performative power over people and their lives (Ruppert & Scheel, 2021), including here brain-body-world dynamics. These characteristics grant data practices of a de-centring power towards human agency as a highly reflexive and formally rational enterprise (Ibid, p. 34). By conceiving a practice, we are able to attend to actors' beliefs and values as well as material and external factors involved in the making and use of data.

Defining data through its practices makes us consider data as a factor of life. By acquiring characteristics of assemblages, values and other human factors, data becomes more than just numbers; rather, it is a human way of defining, structuring, filtering and conceiving the world through representations (numerical or not) that are inextricably linked to the attributes of those who have created them. Data practices not only constitute people's knowledges, but does move and is created according to people, i.e. who they are, what they believe, how they move or be and why they are who they are (Valsiner, 2006). In this regard, data practices enrolled characteristic is the most influential of all. Data practices are enrolled in the sense that they enact the same realities they mean to define. This enactment relates to the activities and "techniques that make things visible, audible, tangible, knowable" (Mol, 2002, p. 33) in data practices. Acknowledging data practices as enact*ed* and enact*ing* also positions data as something being "cooked" (Kitchin, 2021). Since the 'cooking of data' integrates data as a socio-technical structure that is part of people's lives, then we should turn to consider how people live with and through this data. During COVID-19 and the post-pandemic, this 'cooking of data' showed clear cases of the necessity to pay attention to how data, numbers and representations affected people's everyday lives, such as those mentioned in the works of Lee et al., (2021).

When approaching wellbeing and justice in this paper, the technical practices of data that enable inequality and the perpetual systems of difference and separation are what is most interesting. Data

can mirror the same human factors that make up difference and "othering", and consequently, embeds these systematically in practices and technologies of datafication. Using the capability approach, such constraints can be challenged in systemic and individual forms of life-assessment, i.e. wellbeing. What follows is a discussion on the integration of the capability approach within data justice, a critical response to the challenges that data poses in our everyday lives.

3. Reconfigurations of the capability approach for data justice

The capability approach offers a fresh viewpoint on what justice looks like, enabling data to be seen as a crucial component of people's well-being and thus, materialising the point of this paper. If we consider that the central take of the capability approach is its focus on the individual as main controller of justice and wellbeing, then, by considering data as a factor of life, data turns itself as a driver for choice, value and agency in our daily actions towards self-realization. In this section, I will explore the development of the individual's role in the capability approach, while also addressing the redefinition of certain matters of justice and wellbeing that would better pinpoint data as a factor within the aforementioned idea.

3.1. Valuation and agency for an 'imperfect' justice

As previously mentioned, the capability approach is a considerably well-established and highly discussed topic of development and welfare. For some, it cannot be assumed to be a theory of justice, as it does not provide prescriptive criterions but only evaluative judgements for the idea of justice at a certain moment (Ballet et al., 2013). Nevertheless, its usability and transcendence stems from the alternative pinpointing of Amartya Sen (1982; 2009) on what means to live well (or *flourishing*) and what is the role of individuals in determining and controlling their own lives, injustices and wellbeing. Among its strengths, the capability approach effectively brings together the aspect of 'agency' within structural constraints, while de-centring resource constraints as definers of wellbeing. In its essence, the capability approach looks into what a person can *do* and *be*, embedded in a set of freedoms (capabilities), where lives are composed of *beings* and *doings* which are states of a person that Sen terms 'functionings'. Setting the focus on what a person has the ability to *be* and *do* as well as how they choose to carry out a life they value, outsources much of the issue regarding wellbeing from the role of governments or institutions, into people's hands. In other words, understanding wellbeing through situated individual freedoms transposes the inquiry from what a government is offering and what people have rights to, into what they are really *doing* and *being* and the actual works of wellbeing. Sen's focus on the individual has created two main routes of critique among academics; the first one, in regards to the valuation and agency aspect of determining *doings* and *beings* in people's own wellbeing.

In Sen's (1992) definition of capabilities and functionings, he considers that certain *valued* functionings determine wellbeing. The value-laden issue of capabilities has acquired various disputes. Especially, questions arise as to which point could a relatively 'negatively-valued' capability also enable wellbeing before someone else's and which role do morality and ethics play in it. In addition, agency also foregrounds the weighting between negative and positive capabilities. Agency is embedded when Sen conceived freedoms as real opportunities (1985a, pp. 3-4; 1985b, p. 201; 2002) where one has all the required means necessary to achieve that *doing* and *being*, *if one wishes to* (my own emphasis). In this sense, agency has proven to be valuable in itself (Garcés Velásategui, 2020). The choices made among the different capabilities available to a person are considered valued judgements, which in themselves are based and held accountable according to individual or collective agencies. In other words, the value that one might give to two colliding individual or collective agencies can determine the value my capabilities' choices acquire.

Seeing this enmeshed theorization of valued judgements and agencies that can alter in very various ways how certain capabilities might be weighted as 'positive' or 'negative', some authors have theorized in favour of a 'free agency' in an attempt to stabilize the approach. The idea of 'free agency' grants space for neutral-valuation parameters of people's choices in a way that accounts for an exploration of the individual within a spatial and relational self. By getting rid of the convey of 'value' in a normative way, critics advance a capability within a neutral definition of "the freedom that people have to do and be certain things" (Robeyns, 2017; Byskov, 2020). Consequently, accepting also negative agencies (e.g., dubious or illegal ways of living) as part of a 'free agency' definition introduces questions about responsibility, cultural context, and human diversity. For example, how do external factors like geography, physical traits, or societal norms shape individual choices and their ethical implications?

The second critique arises from Sen's lack of basic pointers and specific measurements for defining an 'achieved wellbeing'. By not providing a list of basic capabilities that would allow to asses a level of wellbeing, and to that extent, justice, Sen left the door open to grant the individual's valuation and agency system to withheld their own weight in delivering different kinds of wellbeing and justice for different people, thus accounting for human diversity. Furthermore, for some, Sen's incompleteness in an assessment criteria that would determine value (Claassen, 2020), undermine the specificity of the approach that would also ease operationalization. This is the main standpoint where Sen and his counterpart, Martha C. Nussbaum, differ. Nussbaum (2005) has become well-known for her undertaking in the approach by drawing on a list of ten capabilities to consider for ensuring wellbeing in any society. Though her work has gained both fans as well as enemies (who favour a Senial perspective), Nussbaum's objective philosophical account grounds a mid-point in the capability approach between political economic perceptions and purely empirical approaches of wellbeing. Especially, Nussbaum's demarcation of 'practical reason' and 'senses, imagination and thought' as central capabilities for wellbeing, reconfigures the approach along the lines of knowledge and the cognitive enterprise, while opening space for the sensorium, as intended for the discussion of this paper.

Further from taking practical reason and the sensorium as central capabilities, these could also characterize other capabilities to be used or not for wellbeing, re-approaching the issue of value and assessment along cognition and sensorial knowledge. Nussbaum has already made great input in this aspect by considering compassion and emotional judgements for valuation as decisive ethical factors in determining people's negative or positive take on capabilities (Nussbaum, 2001; 2004). She has, however, been criticized by some for emphasizing compassion over all other human emotions and sensory inputs, which remain important for an individual's assessment of their own self-realization (Hunt, 2006). For the sake of this paper, I take on Nussbaum useful referral to the different capabilities. However, also deem that the definition of freedoms relies much on the human diversity of each one of us. The same feeling or emotion might be valued differently to each one of us, and thus conceptualising a list of terms such as happiness or comfort, could not have much meaning across regions, people, histories or temporalities. As explored before, the valuation factor is still weak in solving this issue, despite the explorations by Nussbaum (2001; 2004) through the idea of compassion as the ultimate decision factor for not doing harm.

The continued and unfinished dissonance in the discussion of value, agency and the ethics of individual wellbeing may weaken Sen's capability approach, preventing it from being considered a social justice theory by many (Anderson, 2010). For some critics (Richardson, 2020), the un-specificity of Sen's work and its impetus towards human diversity, leave the idea of "utopian accounts of justice" (Sen, 2009) out of the question, proving the capability approach uncapable – ironically – of becoming a justice theory. However, as Sen explains (2009), the capability approach's rationale is to explore ways that

show how real-life unjust situations can be made more just, even if this entails the absence of perfect justice. His perspective has some relation to political justice theory, which defends that people's involvement in changing their lives is a way of searching for how to live less unjustly everyday, rather than fight for perfectly just world (Ballet et al., 2013, p. 30). Such respite in Sen's approach to justice allows us to situate the issue of wellbeing in the individual's hands and through their individual experience of the world, leaving aside other more restrictive frameworks. Perhaps, it is this 'individual human experience' viewpoint of justice that is the most interesting in Sen's work, one that converges with other works that attempt to situate alternative ways of justice-making in different settings, such as feminist care and disability scholarship (Terzi 2005; Khader 2008).

Thus, while favouring both strengths and weaknesses in Sen and Nussbaum's take on the capability approach, this paper is founded at an crossroads. The individual takes the main part in achieving their own wellbeing, sometimes to the detriment of ethics and communal wellbeing. The centre-stage of value and agency proves this individual strength, that grants fluidity and variety in the definitions of justice, only setting for achieving less unjust scenarios. However, Sen's reticence to give a list of capabilities, undermines his position towards objective valuation of the capability approach, and thus Nussbaum might have achieved better disposition of the approach for receptibility. The interplay of human diversity with choice, value and agency – internal and external factors, or the individual versus the world – pose great space for data for wellbeing to acknowledge various forms and determine new ways of developing justice meanings. As we will see in the next section, the individual's role not only redefines justice, but also wellbeing.

3.2. Wellbeing beyond hedonism: life-satisfaction perceptions

The capability approach expands perspectives of wellbeing and justice beyond utilitarian aspects such as pleasure, happiness, or possession of "primary social goods" (Rawls, 1971). While explicitly problematizing previous measurements of wellbeing as *utility* and *goods* (Oosterlaken, 2020), the capability approaches leaves other issues open for ethical questioning: "should satisfactions, preferences or choices that involve oppression of others be included as part of [the approach]?" (Gasper, 1997, p. 286). As with 'free agency', this point in the capability approach makes us question not only whether the approach entails justice, as discussed previously, but whether it also accounts for wellbeing. So what does 'wellbeing' mean? As Tiberius (2006) points out: "wellbeing in the broadest sense is what we have when our lives are going well for us, when we are living lives that are not necessarily morally good, but good *for us*" (p. 493). Here, the matter of value comes up again: how do we make judgements of our world that define our choices and drive us in search of the life we want? How are we able to interpret what we need for *being* and *doing*?

Both philosophical and psychological accounts establish three approaches for achieving wellbeing: based on pleasure (hedonism and affect-based theories), life-satisfaction and objective values (eudemonistic theories and the capabilities approach) (Tiberius, 2006, p. 495). Objective values, as they focus on need-based conceptions of wellbeing, seem to always be forced to correlate to affect and life-satisfaction. Such correlation forces philosophers and psychologists to deem satisfaction based on needs as a secondary cause from the other approaches of wellbeing (Ibid). In addition, not much favour is given to hedonist theories as they have been proved to drive to error in the ways people define what is good for them purely through the idea of pleasure (Ibid). Thus, for Tiberius (2006), a life-satisfaction approach to wellbeing meets two criteria: supporting "truth-adjusted pleasures" (Feldman, 2004), by giving authority to individual subjects, and secondly, accounting for the normative aspect of wellbeing in idealizing standards or assessments of life-satisfaction, making the overall end-result robust and productive (Tiberius, 2006, p. 497-8). However, this perspective has not been easily adopted or supported by academia.

One disregard on the life-satisfaction approach of wellbeing is the fact that in order for it to be perceived, it needs to be measured as the 'satisfaction' moment happens. This temporality weakness in the approach worries both psychologists as well as philosophers (Schimmack et al., 2002) who are left to conceptualise wellbeing based on the stability degree of life-satisfaction perceptions. It has been proven that the basis for assessing this stability is people's reliability on relevant and chronically accessible information for forming judgements (Tiberius, 2006, p. 499). This information is made up of previous experiences that allow for life-satisfaction judgements to be reworked each time it is measured (Schimmack et al., 2002). Therefore, life-satisfaction wellbeing gets characterized within a temporality line that would undermine establishing any kind of normative basis on it.

Apart from the effect of temporalities, another reason that has pushed for not favouring a life-satisfaction approach to wellbeing has been the disregard for neutral valuation in favour of positive subjective states (e.g., hedonia, eudaimonia) within psychology and philosophy. Authors that want to transverse this have analysed how negative factors such as marginalization might work as a uniting factor in wellbeing and life-satisfaction measurements (Syed & McLean, 2022). Considering this, if we are to favour wellbeing in individuals' steering wheel, where does it leave us in terms of social arrangements as sympathy and commitment that affect individual values? (Ibrahim, 2020). Again, this brings us back to the normative authority question of wellbeing and situates value as a difficult aspect of life-satisfaction in its measurement, application and conditioning. Values might be individually or communally affected and determined, they can be internally or externally defined, with certain degree of dispossession or paternalism (Tiberius, 2006, p. 501), and they as well might contradict personal wellbeing, benefit and happiness in favour of compassion (Nussbaum, 2001; 2004).

In consequence, such diverse conditions and reflexive scenarios deems leaning towards a middle path on the approach of wellbeing and pinpoint practical reason and individual attitudes towards their own lives as the best practical solutions for acquiring wellbeing, without delving into portraying definitive lines. Focusing on individuals' experiences conscript theoretical works from taking paternalistic and setting political grounds on wellbeing. As such, balancing theory and normative concerns of wellbeing with practical ethical ideas invites for a psychological and applied analysis of what means to have a 'good life'. Within a psychological centring, the individual definition of life-satisfaction aligns with global surges fighting injustices through reworking what wellbeing means (Tiberius, 2006).

By drawing into Mignolo's (2015) epistemological and ontological shift, oppressed social groups would achieve means by which to own a representation of their world in their own way. This epistemological shift, one that recognizes the different ways of knowing by which people across the globe provide meaning to their existence, is of imperative importance for an decolonial epistemology (Ndlovu-Gatsheni, 2021) on the cognitive analysis and ontology (Smith & Reid, 2018) of wellbeing. Collating different 'practices of living', those that enable the pursuit of the fullness, creativity, harmony and flourishing of human and biospheric life (also known as 'living well', *sumac kawsay*, *suma qamañ*a or *buen vivir*), would redeem the advancement of capabilities that prioritize individual, community and biospheric wellbeing (Smith & Reid, 2018; Leslie et al., 2022, p. 34). In this way, life-satisfaction approaches for wellbeing could learn from relationality aspects of different ontologies around the world that put the same emphasis on the 'I' as well as the context where this 'I' exists, even allowing to reconsider the ethical issue of who am 'I' within the 'rest', as *I* might deem the 'rest' as 'I' (Baggini, 2019).

The review of the incongruencies of Sen's capability approach, the implications of an 'imperfect justice', a reconfiguration on wellbeing and the account for human diversity have been the main

discussion points in this last section. By leaving the door open for a plurality of functionings and capabilities, the individual valuation of life-satisfaction redeems itself as an important evaluative space that allows a wide range of conceptualizations of wellbeing to come to the fore. Achieving life-satisfaction thus relies on a life without injustices and full *doings* and *beings* by own choice. Inquiring about how people value their wellbeing, without only considering hedonism or eudemonia, I advance that perhaps, a sensorium tool base of valuing life-satisfaction is a route worth exploring. As Tonder (2015) concedes, to acknowledge the human experience and all its diversity, the task of justice and wellbeing theorizing (as well as the political) has to turn into the creative and the sensorium for it to accommodate all the views and ways of knowing (p. 6).

I correlate that the capability approach has more relevancy today due to the continuous role of information and data choices that people have to carry out in their judgements for their wellbeing. Data and information are power (Thatcher et al., 2016; Milan & Treré, 2019), and thus their inclusion in this wellbeing discussion shall be analysed with a lens for unjust scenarios. Life-satisfaction judgements come in form of data (such as about wellbeing, health, rights or economy), and therefore, it is an issue of data justice that people have a good relationship to the data that matters in their life, for freedoms and agency to be exerted. It doesn't require much imagination on how could an approach to the sensorium be situated in a data justice dilemma. If I value having knowledge on the status of climate change to make choices on changing my diet, and I do have the capability to change so, the data that I acquire has to matter for me and I have to be able to access it. In order for me to make it matter to me, my senses and feelings have to be accounted for, as in that way I will have a more personal and direct connection to my knowledge-formation basis. However, while the capability approach offers useful standpoints for a justice theory, the question of individual wellbeing, which needs further theorization, undermines the task of including data for wellbeing as it is. And this is clearly exemplified in the way different data justice frameworks are set up.

4. Data justice frameworks: faint examples of the individual's role in their justice-making realities

The term 'data justice' suggests an examination of the relationship between datafication and social justice and highlights the politics and impact of data practices. The initial literature on data justice focused on power asymmetries in data governance and administration, calling for "information justice" (Johnson, 2014). Global developmental approaches have also been proposed, focusing on equitable data distribution and accounting for the impacts of datafication in communities and individuals within development settings (Heeks & Renken, 2016). Additional contributions about data justice in practice shifted the focus from security and privacy concerns to the inclusion of activist and civil society perspectives (Dencik et al., 2016). From this background, Taylor (2017) converged the different visions into a data justice framework based on three core pillars for organizing freedoms in people's relationship to data: visibility (meaning access to representation and informational privacy), engagement with technology (considers people's sharing in data's benefits as well as the autonomy in technology choices) and non-discrimination (accounting for the ability to challenge bias and prevent discrimination). Taylor's data justice framework re-focuses the perspective towards data and its relation to human needs. As such, it positions the individual relatedness to data and its outcomes as important factors to consider when understanding the state of justice in a specific context.

Just as Heeks and Renken (2016) did, Taylor (2017) adopts the capability approach to conceptualize the use of freedoms in people's relationship with data, especially when approaching the concerns of privacy and security. However, Taylor (2017) moves forward from Heeks and Renken (2016) by conceiving the positive as well as the negative outcomes of people's interactions with data and drawing on the autonomy of people to navigate these and their needs and wants, configuring in this way the value-neutral perspective in critique to Sen's capability approach. For Taylor (2017) and Heeks and

Renken (2016), the capability approach serves as the most useful method for considering the issue of justice in a way that accounts for its varied perspectives in theory: procedural, instrumental, rights-based, structural and distributed. In addition, by using the capability approach, data justice is able to be inclusive of various important questions. First of all, it approaches the idea of freedoms that enable to situate the individual towards data as well as their agency, value and choice considerations. Secondly, by allowing for contextualization and applicability to various diverse scenarios, it allows for data justice to achieve certain degree of sustainability as a global framework. Thirdly, it attends to 'small data' and the convergence of structure and human-specific experiences with data, being able in this way to open up even more the frameworks for alternative views that add on critical data studies, such as data feminism.

Since the work of Taylor (2017) and Heeks and Renken (2016), there has been great inquire into what data justice means and how to operationalize a data justice framework in development settings (Dencik et al., 2022). Heeks and Shekhar (2019) take on analysing different community mapping initiatives in urban settings, situating them through their data justice framework that allows for understanding the extent of freedoms, capabilities and injustices. Their data justice model is centred on identifying tensions and disjunctors in data ecosystems and pointing out that the design and implementation of data initiatives must take into consideration all avenues of justice in order to prevent unfair outcomes. Pritchard et al., (2022) work on their own data justice framework with environmental conservation applications focuses on data composition, data access, data control, data processing and use and data consequences. Such framework gets formulated in favour of advancing data justice questions on the visibility and participation of people and communities within environmental data practices.

From these various conceptions of data justice frameworks for development, I come up with two shortcomings; first, there is a technological deterministic and political economic input on the relation of data in people's lives. Data justice gets configured along an information value chain and it is analysed, through local data initiatives in Heeks and Shekhar (2019) or conservation measures in Pritchard et al., (2022), with an utilitarian perspective for distributive, procedural, rights-based, instrumental and/or structural justice frameworks. In fact, in these works, the capability approach seems to only be used for its agency and valuation approach, but still in a normative way, where individuals are only accounted as victims and 'justifying agents' for the justice that is sought. As Hoffmann (2019) expresses, the point of establishing theoretical frameworks on data justice is not to 'open' the definition of justice in data as an easy fix. If we only regard data as a 'good' (Thatcher et al., 2016; Milan & Treré, 2019) for which rights and opportunities shall be offered, then the social attitudes and the background norm-setting that entangles data practices become irrelevant for the discussion on data justice. This critique does not defeat Heeks and Shekhar (2019), but requires that new perspectives are brought to the fore so as to avoid falling into an echo chamber in the inquiry of data justice and move "in favour of the nuanced and contingent" (Dalton et al., 2016, p. 1).

Secondly, these cases are devoid of alternative accounts of knowledge-based perceptions of data and non-Western cognitive traditions. Rather than relying only on "case-specific" or global scales, data justice frameworks could be leveraged to draw cross-scenarios connections (Pritchard et al., 2022). Calls for including non-Western inserts in theory has also been commanded by Dencik et al., (2022) when they agreed that data justice "continues and builds on historical debates and struggles relating to oppression and emancipation" and disregarding in this way data justice' established vision "as a novel normative theory based on a view of datafication as a revolutionary shift in social relations" (p. 6). The capability approach can give useful pointers for a data justice idea that is not perfect, but that is based on the agency, choice and individual role of those that seek to change their relationships with

data and their wellbeing. This nascent perspective towards the topic enables new discussions in favour of decentred discourse with distinct epistemological and ontological approaches that open space for data futures (Selwyn, 2021).

Considering all of this, I situate this paper into a critical data justice framework that furthers thanks to data feminism perspectives (D'Ignazio & Klein, 2023) and decolonial grounding (Thatcher et al., 2016; Milan & Treré, 2019). Therefore, it acknowledges the importance set in Taylor (2017) and Heeks and Renken (2016) in framing injustices in data-driven processes through the capability approach, but moves forward by pinpointing the human experience in the operationalization of these theories through alternative issues of embodiment, senses and emotion. In doing this, I already situate an original dilemma of data studies, that is, the "emotional distance" given to quantification and datafication process in order to be objective and true, getting rid of feelings and emotions (Gray, 2020, p. 315). As we will see next, this emotional distance has much to do to the epistemic violence that data and technological feminists denounce in their works (Haraway, 1991; D'Ignazio & Klein, 2023). In situating this turn for the sensorium as part data futures within a non-Western ontology, I draw lines with data feminism and queer studies on data and technology that allows for the consideration of other ways of knowing through the body (Floegel & Costello, 2021). What new integrations might perceptual relations with data bring to data justice frameworks? Learning from other 'practices of living' such as *buen vivir*, where the sensorium has a central role, redeems uncovering unjust scenarios regarding data and their impact in wellbeing through non-cognitive inputs.

5. The Sensorium: binaries and technics as intersections of capabilities and data justice

In this last section, I attempt to draw a connection between the individual valuation of life adapted from the capability approach and the critical stance of data practices advanced by data feminism. I will do that by looking at the set of physiological, internal, emotional, psychological, cognitive and metaphysical perceptions from and of humans within the world, englobed in what is called the "sensorium". The emphasis on the sensorium follows the "sensory turn" that took over much theoretical basis in history, anthropology and sociology since the 1990s, by aiming at searching for "ways of sensing" in their epistemologies (Classen, 1997; Vannini et al., 2012; Howes, 2024). In recent years, the 'sensory turn' has gained some track in the search for new epistemologies challenging the "depoliticized boosterism and hype" around data (Selwyn, 2021).

While, for some, the sensorium is still not regarded as a strong analytical lens for social sciences (Sayer, 2011), others argue for its critical role in mainstream political theory. According to Tonder (2015), engaging with the sensorium entails rejecting its separation from the normative and instead recognizing sensory input as embedded with "a wide range of normative expectations" (p.6). Instead, in order to uncover the entanglements between people's normative and sensorium quest for a just and fair society, the main route appears to be that of creativity (Ibid). Building on this perspective, I propose for a creative space in data practices that positions the sensorium as modem for the creation of knowledge, value and agency.

To situate this perspective, it is necessary to acknowledge the longstanding debate between cognition and perception in the normative plight of the 'sensory turn' in technology studies. Traditionally, the sensorium has been disregarded in favour of cognitive defences of technology. In fact, through the feminist lens of Donna Haraway (1991), Coté (2010) derives a binary between technology and nature, to which *technology* is seen as masculine, disembodied, factual and rational, and *nature* as feminine, sensorial, affectual and irrational. This binary has also been acquired by data feminists (D'Ignazio & Klein, 2023) when dealing with the rejection of affect in design. All these perspectives redeem the

sensorium for its role in questioning the normative in the political, and rely on feminist, non-Western epistemologies and creativity as input routes for understanding the human lived experience with data.

Considering all this, there is no way we can understand data justice and data practices within the context of a capabilities approach without inputting on the sensorium, by ways of also making peace with non-Western epistemologies. In fact, as Howes (2024) well expresses: "the sensorium is a historical formation; there is no escaping the political life of the sensorium" (p. 60). By grounding data practices in the sensorium, we can foster creativity and justice in a way that enables a deeper understanding of the intersections between data, agency and wellbeing.

In its applicability, I align the debate on the sensorium and data by taking Coté's (2010) work on technics as tools for human cognition, perception, memory and knowledge, and the role of the sensorium instilled through all of them. For Coté (2010), technics (artifacts per se) are not a prosthetic thing from human bodies and experiences, but it is rather that the sensorium only gets calibrated through technics. He unites the human experience and its externalization through technics and makes the whole indivisible. His position benefits from non-Western epistemologies such as Ong (1991), who defends how ancient Greek, Chinese and Indian conceptions refer to the sensorium as isomorphic to the cosmos, not just as anatomical. Technics require considering the externalization of knowledge, the perceptual power of the sensorium and the situational or spatial distribution of these two tasks within the universe and ecology of human experience.

Coté (2010) justifies technics through the work of Leroi-Gourhan (1994), who pinpoints that, in terms of evolutive history, "everything starts at the feet", referring to hominids' first encounters with the world coming through their hands when they were standing on their feet. Science has proven that the evolution of the brain only came after, suggesting that the brain cognitive function "was neither a priori to technics nor a coterminous driving force" (Coté, 2010). This perspective undermines greatly the role of much of the input on cognition and *logos* as a purely internal exercise and the primordial way of understanding the world, aligning in this way within much of the 'sensory turn' of technology studies. Coté (2010) even goes further to acknowledge that it is the externalization of the sensorium through technics that "marks the very threshold of the human", and therefore, there cannot be a defence of the sensorium without technics.

Other scholars on the sensorium such as Howes (2024) adopt this viewpoint, conceiving that "the senses are our first media", and that technics elucidate 'ways of sensing' and 'the worlds of sense' (p. 8-9). As such, it brings forward how "thinking with things" (e.g., Clark & Chalmers, 1998 in Stusak, 2016) or "cognitively gripped objects" (Kirsh, 2013) change the way we see the world, and how technics take up on roles in our perception that would not exist without them. Registering this transdisciplinary term of 'technic' helps us elaborate on the sensorium through data in non-Western epistemologies by elucidating the various ways of knowing and sensing of the different peoples of the worlds, calling again also for creativity in data justice. It would be derivative to approach the sensorium as the first and most direct way for people to experience data, before any *episteme* thinking, memory or rational input.

Therefore, I will go over data representations as technics of human experience with data. Within these, I will approach visualizations and other analogous areas of representation such as embodiment and physicalization, to review the sensorium as way of knowing and sensing data. This review is a way of showing different ways of producing data within creative methods and alternative viewpoints that would allow for reconfigurations of justice and wellbeing. In this way, I ask what are the various forms that the sensorium can take shape through data in a way that calls and brings about an individual valuation of wellbeing and justice? In other words, how can my senses and feelings take place through

data in a way that I get compelled to value a specific information or exert my agency towards a specific impetus?

6. Knowing and sensing with data: data representations for its moulding of the sensorium

6.1. Data visualizations:

In principle, I choose to favour data visualizations instead of a purely written/oral data material since, as Valsiner (2006) explains, "where verbal language fails in encoding feelings and emotions", visualization enters the scene (p. 270). By focusing on visualizations, I attend to the representation of "data worlds" (Gray, 2018) as a "discursive resource, abstraction and reduction of the world, […] and cultural artifacts with distinct semiotic, aesthetic and social affordances" (Kennedy & Engebretsen, 2020, p. 22). When defining data visualizations, the literature often presents it as either an objective and rational representation of life or, aggregating Coté's (2010) externalization of knowledge as technics, as *phantasmagrams* (Murphy, 2017) with life of their own, which create new worldviews, propagate imaginaries and lure feeling and technocratic dreams. Some of these worldviews are a continuity of the relationship of oppression against emancipation brought forward by Dencik et al., (2022) in data justice frameworks, and which has also been shown throughout the examples of data visualizations on the history of slavery in the work of Klein et al., (2024). This position helps bringing a data justice analysis of visualizations for what they are and do, why they are what they are, and what they could be (Kennedy & Engebretsen, 2020) as technic. In contrast, conceding that data visualizations are made up and affected by other technologies (computational or not), I question the sensorium characteristics that are embedded in the technologies (old and new) that bring visualizations into being. Consequently, the main discussion points for approaching the sensorium through data visualizations requires that we expand the understanding of technologies of data visualization and their input in people's experience.

One way to address this would be to investigate accessibility, adaptiveness, and openness in visualization tools for ordinary citizens, in search for data justice. This would touch on the epistemological components of an individual's interactions with interfaces (aesthetics, variables, multimodality, etc.). Such angle aligns with the Human-Computer Interaction (HCI) discourse, which focuses on user experiences with computers, and the data visualization literacy framework (DVL-FW), which integrates a set of core types and key steps required for constructing and interpretating data visualizations systematically (Börner et al., 2019). However, informed by the growing data feminist scholarship (D'Ignazio & Klein, 2023) and acknowledging the affective relatedness of visualizations and their material-semiotics (Lan et al., 2021), it seems relevant to call for the exploration of routes in visualization design that privilege the experiences of end users and centralise the sensorium as modes of knowing.

For example, Ruppert (2016) conceives "sensory sociology" as a medium specific, live, performative and inventive methodology for understanding ways of knowing and experiencing data visualizations. The term attends to people's everyday evaluative relations with the world through sensorial inputs and aligns itself with other general approaches to everyday sensory studies (Seremetakis, 2019). By putting weight on the diverse human, material and technical aspects that shape the structure of embodied everyday knowledge, Ruppert (2016) acknowledges the "heterogeneous togetherness" that exists between the human and non-human. Therefore, sensory sociology enables attention to be paid to assemblages and flow-of-affects that are associated with environmental factors, including ephemeral conditions like atmosphere (Mallgrave, 2015, p. 15-16), and that can define much of data visualization design. This perspective highlights that a methods for acquiring, measuring and reproducing senses (i.e., visualizations) cannot stand apart from the social and natural world in which

they are embedded in. Despite Ruppert's relevant point towards a methodology that accounts people's relationships with the technologies and visualizations that enable their understanding of their world, he falls short in bringing a global perspective of the sensorium in data visualizations and the ways of knowing and being connected to non-Western epistemologies, as we seek to centre in this paper.

Actually, a thorough examination of the previous points raise important weaknesses in favouring data visualizations as sensorium's technics of human experience and enablers of agency and value for capabilities. First of all, conceiving data visualizations as *phantasmagrams* relates to perceptual notions, specially *phantasia*, which is "that in virtue of which we say an image [*phantasma*] occurs to us" as introduced by Aristotle (Rabinoff, 2018, p. 33). For Aristotle, human thinking needs of images (*phantasmata*) and imagination (*phantasia*), where the latter calls for perception to occur as a bodily process; as such, he concludes that thinking is not without body (Ibid, p. 78) and that our mental states are *about* something, i.e., *phantasmata* (Ibid, p. 80). Subsequently, we shall concede that Aristotle does not regard the visual solely for this bodily process.

Secondly, mainstream data studies favour a technological and computational perspective for data visualizations, and even within Ruppert's (2016) work, there was a predisposition to analyse the sensorial input only in digital data visualizations. This conundrum urges me to exercise caution and emphasize the significance Coté's (2010) query on the sensorium intersection with data and technology: "how might we better understand conscious interiority in relation to an inorganic material exteriority?". In other words, how can we configure knowledge, expectations and judgements through the sensorium when the technics of experience rely on inorganic materials such as digital data visualizations? For Coté (2010), betting for post-phenomenology is the answer, as it considers human's immersion in technological artifacts that are as quotidian as they are fantastical.

Therefore, instead of focusing solely on data as visual inputs of inorganic materials of computational creation, I will be expanding and redirecting the data technics discussion to include physicalization and embodiment as ways of experiencing data through means that are integrated in ordinary activities like body expression and eating. I align this to bring about further empirical considerations to the sensorium that recentre the importance of other senses (hearing, taste, smell and touch) as body experiences, to which emotions and feelings can gain alternative insights so as to create viewpoints that totally transgress non-Western debates (Howes, 2024). In fact, I concede that there might be a surge in demand for more organic and human methods of representing data given the recent rise of technological dependency, including AI. The 'sensory turn' could materialize itself if we disconnect and disassociate the continuous understanding of the world and ourselves from digital representations. Yet, what follows is not meant to be a non-computational defence of the body and physical materialization of data; rather, it is an examination of the ways in which computational imaginaries and affects are ingrained within body expressivity and physicalizations, drawing challenges and tensions for data justice.

6.2. Data embodiment:

Attending to sensorium perceptions when interacting with data means attending to how our bodies feel and sense it through the five senses, what types of observable and internal proxies does data bring up and to which extent can our bodies become tools for its reenactment. Embodiment cognition is a longstanding theoretical discussion on the way we think and become to be (Shapiro & Spaulding, 2021). It assumes that thinking is not limited to the brain, but that the entire body functions as cognitive parts of our thinking and analytical state (Clark, 1996; Kirsh, 2010; 2013). As such, it tabulates the role of experience and knowing to the wholeness of the body, not only the sensory organs (skin, ears, nose, mouth and eyes), but also kinaesthesia, spatial orientation and pain perception.

When reviewing the idea of embodiment in data representations, "embodied interaction" as introduced by Dourish (2001), emerges as one main route of inquiry. The term defines a design model of HCI that considers tangible and social computing approaches to everyday practices and mundane experiences. 'Embodiment interaction' highlights the environment in which data interactions occur, pays attention to the ways in which computation shapes the world we live in and emphasizes observational techniques that focus on real people doing real tasks (Stusak, 2016, p. 14). One of the big routes of inquiry with 'embodied interaction' is that of virtual reality. The exploration of forms of data transmission through the sensorial immersion of the body in a virtual reality encompasses the computational transformation of the senses. However, even in this new route, there has still been a lack of progress in the inclusivity of smell and taste inputs in virtual environments (Gutiérrez Alonso et al., 2023), favouring sensorial transmission through sound, touch and the almighty visual perception.

Though useful, 'embodied interaction' is defined along computational and HCI lines, which makes it unsuitable for re-centring experience through the body as technic. Therefore, data embodiment has to seek for an engaged approach in-between data visceralization (D'Ignazio & Klein, 2023)— a related area that redeems data as affective and psychophysiological experiences in the body— and data physicalization (to be discussed next) — which ultimately reviews the body towards an object. As an example of this reviewed data embodiment, Derry (2023) brings an interest perspective to data representation through a set of choreographed movements (knitting, staging, and dancing/acting). Her research demonstrate that the sensorium achieves better expressivity and accessibility of abstract data by inputting on the body as kinetic device and a complex information processor (Derry, 2023). For Derry (2023), like others (Mifsud, 2016), the representation through the body is the analysis in itself of a dataset or a situation; as such, in turn, the body becomes data in itself. If there is a need for examining how data can be made more comprehensive and approachable in situated scenarios of data justice, then, allowing body experiences in the embodiment of data to take centre-stage might have to rely on somatic approaches (Perovich & Zizzi, 2024). And it is this stance that cannot be yet inputted in this work, as there is a lack of academic research that relies on the body as kinetic medium for supporting capabilities in data unjust scenarios. However, we can attend to the idea of embodiment through physical data that allows to consider body experiences when immersed in the use, exploration and construction of representations such as data physicalizations.

6.3. Data physicalization:

Data physicalizations offer sensorium entryways for organic, tangible experiences with technics, assuming that the physical aspects of representations "can extend or influence our perception and cognitive process" (Stusak, 2016, p.14). In general, data physicalization is a research area that "examines how computer-supported, physical representations of data can support cognition, communication, learning, problem solving and decision-making" (Jansen et al., 2015). Despite their innovative study on data physicalizations, Jansen et al., (2015) make no attempt in looking at the what physicality of interactions with data visualizations entail, but rather focused only on making data visualizations physical (p. 3230). Consequently, their work does not offer any understanding into how sensorium magnitudes such as the body and touch regain modes of "feeling-thinking" (Jasper, 2014) in the act of discovering physical data visualizations that emphasize human capabilities (Stusak, 2016).

Surprisingly, very little has been explored on data physicalization among data justice frameworks, even though such approaches could benefit significantly from the playfulness of physicalizations in world-making. Jansen et al.'s (2015) work would have been more useful if they had grounded the design of physicalizations in ordinary citizen's hands and accounted for their input on what form should data physicalizations take. Luckily, there has been some nascent inquiries into what does it entail to make data physicalizations from a more design and humanistic-way by accounting to the perspectives of

those who are in charge of making them (Huron et al., 2023). Furthermore, there is some evidence to suggest that an integrative design process for physicalizations, where the end-users take part in the making, can reclaim space for physicalizations in its actuation of everyday data justice. As a matter of fact, handmade physicalizations have the same value in transmitting data both in its constructions and fabrications (Dragicevic et al., 2021, p. 18) as well in its interactions and cultural symbolism, unlike manufactured physicalizations. Therefore, inclusive modes of participatory data design that favour handmade physicalizations would also account the physicality of the interaction with physicalizations as part of the ways of knowing and sensing. The act of manual-making data physicalizations accounts for another level in the physicality of data reverting to the power of touch and handling as "new modes of understanding and incorporating personal data into everyday life, living with and alongside these data" (Lupton, 2017, p. 1600). More interestingly, according to Thudt et al., (2017), integrating end-users in the hand-making of data physicalizations increases the perceived value and recollection for daily data, reverting into judgements for capabilities in data justice. The physicality of interactivity with physicalizations has also regards to data embodiment, already explored before.

Apart from the issue of the physicality of interactions, Jansen et al.'s (2015) also seems to rely heavily on physicalizations being necessarily computer-supported for their construction, design or actuation. Though physical, their data representations are constructed with computer-software, depicted within computerised design methods and, most of them, acted through technological tools. I do, however, redeem the task of creative exploration of world-representation through human ways of knowing and sensing by situating organic physicalizations of data instead of computer configurations like bar, line or pie charts which are Jansen et al., (2015) types of physicalizations. This would mean incurring in more creative depictions and physicalizations that rely on humanistic and natural forms, materials, textures, smells, sounds and even tastes.

Such creative exploration has already gained impetus in various artistic works of data physicalization such as data sculpture (Zhao & Vande Moere, 2008; Sauvé et al., 2020), with interesting new explorations like Desjardins and Tihanyi's (2019) ListeningCups: a set of 3D printed porcelain cups embedded with datasets of everyday ambient sounds. Data physicalization has also explored non-computational, non-visual designed versions through food (Wang et al., 2016). While in Rüst's (2014) well-known work of a pie-based pie chart for gender equality food still acquires the shapes of computational data visualization design, Wang et al., (2016) uses taste characteristics for their advantage in the transmission of data. They elucidate emotions related to attributes in the food such as in the 'STEM degree titles' physicalization, the use of arugula in the representation of 'PhD' was considered adequate as its bitter taste reflected the emotional bitterness of the position in itself (p. 413). Upon reflection, physicalizations that lead way for the use of broad senses such as taste and touch and are appreciative of organic materials and shapes, have a bigger opportunity of enabling social interactions and reactions on and about data, and ultimately, data justice.

Overall, in this section I have established the sensorium as conceptual paradigm for understanding data. First, it was determined that the plight of the sensorium on normative expectations received in mainstream political studies has many connections to the overall binary of internal cognition and perceptual technics explored by a feminist lens of technology studies. Secondly, the sensorium was arranged in relation to the externalization of knowledge as technics. To use the plight of the sensorium in our debate of data representation as technics, to what extent do they integrate the same normative imperatives? I have reviewed this through the tendency of data representations to favour inorganic and intangible technics such as digital data visualizations, embodiment scenarios like virtual reality and computerized physicalizations. I redirected the dissonance with the sensorium by offering three

alternative considerations for data representations. First, there is a link between technics and non-human factors that have effect in the sensorial perceptions of data representations. Whether within HCI or embodiment, social and environmental factors of interactions cannot be forgotten in drawing lines between data representations and the sensorium. Secondly, bodies can act as medium for data perceptions as well as its representation. Through kinetic and somatic inputs, we can offer new ways for participatory data representations. Lastly, making data physical still requires that we pay attention to how data is being presented so that it doesn't follow the same computational designs. With handmade physicalizations, the task of experiencing data with the sensorium actually gains new perceptions through organic and material affects in act of making. Considering all this, I meant for this last section to give some input on to the further discursive and conclusive part of this paper; the idea that framing a data sensorium can input value on the capability approach.

7. Conclusion: towards an inclusion of creativity in forms of data justice

This paper set out to explore the intersection between the capability approach, data justice and the sensorium, advocating for a more holistic understanding of how data interacts with 'ways of sensing'. Much of Western epistemology is built on an objective and disembodied view of knowledge, where the cognitive agency of the person is supposed to be the sole instrument for grasping the world (Leslie et al., 2022). In contrast, this paper defence for the inclusion of the sensorial and emotional seems a bold move towards decentring the data justice approach. However, as we have seen, the three lines of inquiry can learn much from backing up the non-Western epistemologies and feminist approaches, in ways summarized now.

- The capability approach, usually focused on the ethics of agency and value, regains new sources of inquiry through the neutral-valuation of 'free agency' and people's own definition of wellbeing and justice. Through the use of decolonial perspectives and a life-satisfaction lens, the paper reexamines human diversity in ways of knowing and being, offering alternative inquiry lines such as relationality or *buen vivir*. A logical next step of this would be to explore grounded examples of these ontologies within data justice frameworks.
- In its examination of data justice for development, the paper delineates the intrinsic connection of data with power and capital. Data practices are framed as performative assemblages that mediate the relationships between people and the world. It is vital that the way data is collected and communicated reflects their identities, cultures, and knowledge systems. Too often, data is collected to fill gaps that shouldn't be there in the first place, relying on methods that neglect the richness of people's experiences and deny existing, non-Western ways of knowing. Addressing the unequal and unjust data scenarios of the Global South the paper advocates for biospheric and non-Western meaning-making as central for people's understanding of data justice (Leslie et al., 2022).
- Lastly, the sensorium brings out the binaries between technology/cognition and nature/perception as well as a 'sensory turn' in academia. Rejecting reductionist methods that dominate technology and data studies, the paper recognizes the sensorium as a multidimensional phenomenon with physiological, emotional, cognitive, and metaphysical elements. Specifically, the analysis of the sensorium acquires a three-pronged critique of its transposition in data representations: data visualizations for their digital and visual reliance, embodiment lacking considerations on kinaesthesia, and, physicalizations for unaccounted participatory-making processes and organic forms and materials. Some of the works presented here open up the conversation towards new routes of creativity and non-Western ontologies. However, more is needed to work towards the alternative of modernity in aesthetics where

decoloniality takes on not as an alternative but an integral part of such construction (Mignolo, 2015).

Within it all, the paper offers the following stance: that the sensorium is an essential feature for data to acquire importance for capabilities of wellbeing and justice. In other words, framing the sensorium as essential for understanding data practices, provide an elaborate push forward for capabilities of wellbeing and justice to redeem new grounds in data justice. The paper has relied on 'technics' as objects of experience and knowledge that are the first and most natural way of regulating human sensorium. Deeming data (and its representation) as technic, the main points of discussion are how the sensorium takes place in data practices and how that 'place' relies on capabilities of people's everyday wellbeing. The sensorium is not only a *tool* to understand the data capabilities people hold in their interaction with representations, but, it is also a *resource* that could be used to enhance such interactions.

Throughout the paper, it is supported that data representations comprising the sensorium could lead way for decentralizing knowledge by including non-Western perceptions and cognitive states into operationalizable processes in data justice. The sensorium could be used as an operative tool for the capability approach to be grounded in pure human and cognitive connections of data that make data a value factor for wellbeing. Therefore, appreciating "the differences among the senses as alternate ways of knowing and being" (Howes, 2022; 2023), adds on to the open debate of capabilities' valuation and agency. If the capability approach brings out the need for freedoms and value of a certain aspect of life for people to fulfil their wellbeing (such as being able to use data or understand their surroundings and lives), then a sensorium position aims at bringing alternative routes for accessing and using data for their wellbeing. In other words, I advance that sensorium experiences are not merely peripheral but central to how people perceive and engage with data, achieve valuation and choice and making them, ipso facto, crucial to the pursuit of wellbeing.

This position is not far-fetched; work has already been done in this direction. Kennedy (2018) and Kennedy and Hill (2018) offer some ground on the sensorium as a *tool*. By analysing participants engagement with data visualization and their emotions and feelings[1] evoked in such interactions, they use the sensorium to determine a series of capabilities influencing such emotions (lack of education connected with feeling "stupid" while looking at a complex visualization). Their work is a clear example of how the sensorium helps achieve an understanding of people's data capabilities for justice. Approaching the sensorium as a *resource* would entail considering localized appropriations of technology by data users, the everyday embeddedness of data representations, and the emerging technics that demand basic senses such as touch, sound, and taste. Consequently, we would need to input on creative perspectives. With a creative stance, data representations can capture new sensibilities of socialities and decentralize modes of knowing between designers, users, observers, and participants, conceptualising the sensorium as *resource*.

In fact, the reason for using the sensorium as line of inquiry to challenge conventional binaries, input in other epistemologies and ontologies and conceptualise data practices, was to ground theory on creativity. I have mentioned creativity numerous times throughout the analysis as an important factor to be deployed when talking about physicalizations, wellbeing ideas of life-satisfaction, the normative

[1] Kennedy (2018) and Kennedy and Hill (2018) only offer the emotional and feeling perspective of the sensorium, and for that it lacks a further multidisciplinary approach on the sensorium as a tool for other forms of data representations such as embodiment and physicalizations, and the account of other sensorial inputs such as sound, taste and touch.

plight of the sensorium in politics (Tonder, 2015), and the feminist binary of technology (D'Ignazio & Klein, 2023). Other works made connections with the capability approach, such as Spratt (2017), who regards the creative arts (i.e., architecture) and affective sense experience as crucial in achieving engagement, critical thinking, empathy and ultimately, wellbeing. Macmurray (2012) as well deems spontaneity, imagination and creativity as valuable entryways in allowing the body, senses and emotions to take place in learning inquiry and research for latter adding to the flourishing framework. Moreover, the connection between the sensorium, creativity, and the capability approach resonates with Aristotle's distinction between experience and art. Experience is particular, it is the foundation of judgment and virtue, and this experience —mediated through the sensorium and embedded in the universality of art— is crucial for realizing the capabilities necessary for wellbeing (Rabinoff, 2018, pp.119-125). Considering virtue in connection with wellbeing, thus experience within the sensorium (inclusive of creativity and art) is the way for capabilities.

This idea is echoed in Tim Jackson's (2023) reflections on the role of art in shaping a wellbeing economy. He contends that, although art may not always have direct political traction, it nevertheless plays a significant part in the emotional fabric of our lives by offering vision, resolution, and consolation. Using these tools, Jackson suggests that the true value of art lies in its ability to foster more sustainable ways of flourishing, which is, at its core, an artistic endeavour. This sentiment aligns with the paper's argument that, by incorporating the sensorium into the capability approach, data justice can be seen as more than just a technical or policy issue; it becomes a vital part of the human experience, deeply intertwined with our sensory and emotional lives. Doing so would do great favour for the achievement of new grounds on the decoloniality of aesthetics for art, as Mignolo's (2015) observes, to finally move away from the designs offered by histories and power structures.

I am aware that the sensorium might still induce to error due to the way people concede their wellbeing in attendance of their feelings, sensations and emotions. But, as it stems, this has been an unresolved issue researched for decades among the cognitive and justice scholars and it was not the task of this paper to solve it. This paper's set to defend the sensorium as a more than relevant stance for inquiry on data justice and the acquisition of capabilities by people in their quest of wellbeing. By recognizing the sensorium as a crucial entryway into the capability approach, this paper defends the idea that the pathway to enhancing human wellbeing through data lies not just in the cognitive processing of information or the accessibility to data, but in the rich, embodied experiences that data can evoke.

References:

Anderson, E. (2010). Justifying the capabilities approach to justice. In Brighouse, H. & I. Robeyns (Eds.), *Measuring Justice: Primary Goods and Capabilities* (pp. 81-100). Cambridge University. https://doi.org/10.1017/CBO9780511810916.004

Baggini, J. (2019). *How the World Thinks: A Global History of Philosophy*. Granta Books

Ballet, J., Koffi, J.M. & Pelenc, J. (2013). Environment, justice and the capability approach. *Ecological Economics*, 85, 28-34. https://doi.org/10.1016/j.ecolecon.2012.10.010

Börner, K., Bueckle, A. & Ginda, M. (2019). Data visualization literacy: Definitions, conceptual frameworks, exercises, and assessments. *Proceedings of the National Academy of Sciences*, 116(6), 1857-1864. https://doi.org/10.1073/pnas.1807180116

Byskov, M.F. (2020). Beyond 'Having Reason to Value': Why We Should Adopt a Procedure-Independent and Value-Neutral Definition of Capabilities. *Journal of Economic Methodology*, 27(1), 18–35. https://doi.org/10.1080/1350178X.2019.1608584

Chiappero-Martinetti, E., Osmani, S., and Qizilbash, M. (Eds.) (2020). *The Cambridge handbook of the capability approach*. Cambridge University Press. https://doi.org/10.1017/9781316335741

Cinnamon, J. (2020). Data inequalities and why they matter for development. *Information Technology for Development*, 26(2), 214-233. https://doi.org/10.1080/02681102.2019.1650244

Clark, A. (1996). *Being There: Putting Brain, Body, and World Together Again*. MIT Press.

Clark, A. & Chalmers, D. (1998). The Extended Mind. *Analysis*, 58(1), 7-19.

Classen, C. (1997). Foundations for an anthropology of the senses. *International social science journal*, 49(153), 401-412. https://doi.org/10.1111/j.1468-2451.1997.tb00032.x

Claassen, R. (2020). Selecting a List: The Capability Approach's Achilles' Heel. In Chiappero-Martinetti, Osmani, and Qizilbash (Eds.) *The Cambridge Handbook of the Capability Approach* (pp. 188-205). Cambridge University Press. https://doi.org/10.1017/9781316335741

Coté, M. (2010). Technics and the Human Sensorium: Rethinking Media Theory through the Body. *Theory & Event*, 13 (4). https://muse.jhu.edu/article/407142

Dalton, C., Taylor, L. & Thatcher, J. (2016). Critical data studies. *Big Data & Society*, 3(1), 1-9. https://doi.org/10.1177/2053951716648346

Dencik, L., Hintz, A. & Cable, J. (2016). Towards data justice? The ambiguity of anti-surveillance resistance in political activism. Big Data & Society, 3(2). https://doi.org/10.1177/2053951716679678

Dencik, L., Hintz, A., Redden, J. & Treré, E. (2022). *Data Justice*. London: Sage Publications. https://doi.org/10.26441/RC22.2-2023-R1

Derry, L. (2023). Data embodiment: approaching the body as a choreographic medium for performing abstract data. *International Journal of Performance Arts and Digital Media*, 19(1), 60-82. https://doi.org/10.1080/14794713.2023.2175105

Desjardins, A. & Tihanyi, T. (2019, June 23-28). ListeningCups: A case of data tactility and data stories. [Conference Paper] *DIS '19: Proceedings of the 2019 on designing interactive systems conference*, San Diego, CA, USA, 147-160. https://doi.org/10.1145/3322276.3323694

D'Ignazio, C. & Klein, L.F. (2023). *Data feminism.* MIT press.

Dragicevic, P., Jansen, Y. & Vande Moere, A. (2021). Data Physicalization. In J. Vanderdonckt, P. Palanque & M. Winckler (Eds.), *Springer Handbook of Human Computer Interaction* (pp. 1-51), Springer Reference. https://doi.org/10.1007/978-3-319-27648-9_94-1

Dourish, P. (2001). *Where the action is: the foundations of embodied interaction*. MIT Press.

Feldman, F. (2004). *Pleasure and the good life: Concerning the nature, varieties, and plausibility of hedonism.* Oxford University Press. https://doi.org/10.1093/019926516X.001.0001

Floegel, D. & Costello, K. L. (2021). "Expanding on the almost": Queer world-building and institutional information worlds. *Journal of Critical Library and Information Studies*, 3(3). https://doi.org/10.24242/jclis.v3i3.141

Freeman, L. A., Nienass, B. & Daniell, R. (2016). Memory| materiality| sensuality. *Memory Studies*, 9(1), 3-12. https://doi.org/10.1177/1750698015613969

Fulkerson, M. (2014). Rethinking the senses and their interactions: the case for sensory pluralism. *Frontiers in Psychology*, 5, 1426. https://doi.org/10.3389/fpsyg.2014.01426

Garcés Velástegui, P. (2020). Humanizing development: Taking stock of Amartya Sen's capability approach. *Problemas del desarrollo*, 51(203), 191-212. https://doi.org/10.22201/iiec.20078951e.2020.203.69586

Gasper, D. (1997). Sen's capability approach and Nussbaum's capabilities ethics. *Journal of International Development*, 9(2), 281-302. https://doi.org/10.1002/(SICI)1099-1328(199703)9:2%3C281::AID-JID438%3E3.0.CO;2-K

Gray, J. (2018). Three Aspects of Data Worlds. *Krisis*, Issue 1, 3-17. https://archive.krisis.eu/three-aspects-of-data-worlds/

Gray, J. (2020). The data epic: Visualization practices for narrating life and death at a distance. In M. Engebretsen & H. Kennedy (Eds.) *Data Visualization in Society* (pp. 313-328). Amsterdam University Press. https://doi.org/10.5117/9789463722902_ch19

Gutiérrez Alonso, M. A., Vexo, F. & Thalmann, D. (2023). Smell and Taste. In *Stepping into Virtual Reality* (pp. 195-200). Springer. https://doi.org/10.1007/978-3-031-36487-7_11

Hamilakis, Y. (2017). Sensorial assemblages: affect, memory and temporality in assemblage thinking. *Cambridge archaeological journal*, 27(1), 169-182. https://doi.org/10.1017/S0959774316000676

Haraway, D., 1991. *Simians, Cyborgs and Women: The Reinvention of Nature*. Routledge. https://doi.org/10.4324/9780203873106

Heeks, R. & Renken, J. (2018). Data justice for development: What would it mean? *Information Development*, 34(1), 90-102. https://doi.org/10.1177/0266666916678282

Heeks, R. & Shekhar, S. (2019). Datafication, development and marginalised urban communities: an applied data justice framework. *Information, Communication & Society*, 22(7), 992-1011. https://doi.org/10.1080/1369118X.2019.1599039

Hepp, A., Jarke, J. & Kramp, L. (2022). *New Perspectives in Critical Data Studies: The Ambivalences of Data Power*. Palgrave Macmillan Cham. https://doi.org/10.1007/978-3-030-96180-0

Hoffmann, A. L. (2019). Where fairness fails: data, algorithms, and the limits of antidiscrimination discourse. *Information, Communication & Society*, 22(7), 900–915. https://doi.org/10.1080/1369118X.2019.1573912

Howes, D. (2022). *The Sensory Studies Manifesto*. University of Toronto Press. https://doi.org/10.3138/9781487528638

Howes, D. (2023). *Sensorial Investigations: A History of the Senses in Anthropology, Psychology and Law*. Pennsylvania State University Press. https://doi.org/10.1515/9780271096261

Howes, D. (2024). *Sensorium: Contextualizing the Senses and Cognition in History and Across Cultures*. Cambridge University Press. https://doi.org/10.1017/9781009329668

Hunt, L. (2006). Martha Nussbaum on Emotions. *Ethics*, 116(3), 552-577. https://doi.org/10.1086/498465

Huron, S., Nagel, T., Oehlberg, L. & Willett, W. (2023). *Making with Data: Physical Design and Craft in a Data-Driven World*. CRC Press. https://dx.doi.org/10.1201/9781003264903

Ibrahim, S. (2020). Individualism and the Capability Approach: The Role of Collectivities in Expanding Human Capabilities. In Chiappero-Martinetti, E., Osmani, S., Qizilbash, M. (eds.) *The Cambridge Handbook of the Capability Approach* (pp. 206-226). Cambridge University Press. https://doi.org/10.1017/9781316335741

Jackson, T. (2023, May 5). Echoes of immortality: Art and the Wellbeing Economy. *Centre for the Understanding of Sustainable Prosperity*. https://cusp.ac.uk/themes/a/blog-tj-art-wellbeing-economy/

Jasper, J.M. (2014). Feeling-Thinking: Emotions as Central to Culture. In Baumgarten, B., Daphi, P., Ullrich, P. (Eds.) *Conceptualizing Culture in Social Movement Research*. *Palgrave Studies in European Political Sociology* (pp. 23-44). Palgrave Macmillan. https://doi.org/10.1057/9781137385796_2

Jansen, Y., Dragicevic, P., Isenberg, P., Alexander, J., Karnik, A., Kildal, J., Subramanian, S. and Hornbæk, K. (2015, April 18-23). *Opportunities and Challenges for Data Physicalization*. [Conference Paper] CHI '15: Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. Seoul, South Korea, 3227–3236. https://doi.org/10.1145/2702123.2702180

Johns, F. (2021). Governance by data. *Annual Review of Law and Social Science*, 17(1), 53-71. https://doi.org/10.1146/annurev-lawsocsci-120920-085138

Johnson, J. A. (2014). From open data to information justice. *Ethics and Information Technology*, 16, 263-274. https://doi.org/10.1007/s10676-014-9351-8

Kennedy, H. (2018). Living with data: Aligning data studies and data activism through a focus on everyday experiences of datafication. *Krisis: Journal for Contemporary Philosophy*, 1, 18-30. https://doi.org/10.21827/krisis.38.1.37184

Kennedy, H. & Hill, R.L. (2018). The feeling of numbers: Emotions in everyday engagements with data and their visualization. *Sociology*, 52(4), 830-848. https://doi.org/10.1177/0038038516674675

Kennedy, H. & Engebretsen, M. (2020). *Data Visualization in Society*. Amsterdam University Press. https://doi.org/10.5117/9789463722902

Khader, S. (2008). Cognitive disability, capabilities, and justice. *Essays in Philosophy*, *9*(1), 93-112. https://doi.org/10.5840/eip20089122

Kirsh, D. (2010, August 11-14). *Thinking with the Body*. [Conference Paper] Proceedings of the 32nd Annual Conference of the Cognitive Science Society, Portland, OR, USA, 2864-2869. https://escholarship.org/content/qt3tc268fh/qt3tc268fh.pdf

Kirsh, D. (2013). Embodied cognition and the magical future of interaction design. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 20(1), 1-30. https://doi.org/10.1145/2442106.2442109

Kitchin, R. (2021). *Data Lives: How Data Are Made and Shape Our World.* Bristol University Press. https://doi.org/10.51952/9781529215649

Klein, L., Sharma, T., Varner, J., Li, S., Adams, M., Yang, N., Jutan, D., Fu, J., Mola, A., Fang, Z., Li, Y. & Munro, S. (2024). *Data by Design*. https://dataxdesign.io/

Lan, X., Shi, Y., Zhang, Y. & Cao, N., 2021. Smile or scowl? looking at infographic design through the affective lens. *IEEE Transactions on Visualization and Computer Graphics*, 27(6), 2796-280. https://doi.org/10.1109/TVCG.2021.3074582

Lee, C., Yang, T., Inchoco, G., Jones, G. M., Satayanarayan, A. (2021, May 8-13). *Viral Visualizations: How Coronavirus Skeptics Use Orthodox Data Practices to Promote Unorthodox Science Online*. [Conference Paper] CHI '21: CHI Conference on Human Factors in Computing Systems, Yokohama, Japan, 1-18. https://doi.org/10.1145/3411764.3445211

Leroi-Gourhan, A. (1994). *Gesture and Speech*. MIT Press.

Leslie, D., Katell, M., Aitken, M., Singh, J., Briggs, M., Powell, R., Rincón, C., Chengeta, T., Birhane, A., Perini, A., Jayadeva, S. & Mazumder, A. (2022). *Advancing data justice research and practice: an integrated literature review*. The Alan Turing Institute in collaboration with The Global Partnership on AI. https://doi.org/10.48550/arXiv.2204.03090

Lupton, D. (2017). Feeling your data: Touch and making sense of personal digital data. *New media & society*, 19(10), 1599-1614. https://doi.org/10.1177/1461444817717515

Macmurray, J. (2012). Learning to be human. *Oxford Review of Education*, 38(6), 661-674. https://doi.org/10.1080/03054985.2012.745958

Mallgrave, H. F. (2015). Embodiment and enculturation: the future of architectural design. *Frontiers in psychology*, 6, 1398. https://doi.org/10.3389/fpsyg.2015.01398

Mennicken, A. & Espeland, W. N. (2019). What's new with numbers? Sociological approaches to the study of quantification. *Annual Review of Sociology*, 45, 223-245. https://doi.org/10.1146/annurev-soc-073117-041343

Milan, S. & Treré, E. (2019). Big data from the South (s): Beyond data universalism. *Television & New Media*, *20*(4), 319-335. https://doi.org/10.1177/1527476419837739

Mifsud, D. (2016). Data representation with a dramatic difference: negotiating the methodological tensions and contradictions in qualitative inquiry. Confessions of a budding playwright …, *International Journal of Qualitative Studies in Education*, 29(7), 863-881. https://doi.org/10.1080/09518398.2016.1174902

Mignolo, W. (2015). Estéticas decoloniales: sentir, pensar, hacer en Abya Yala y la Gran Comarca. In W. Mignolo and P.P. Gómez (Ed.). *Trayectorias de re-existencia: ensayos en torno a la colonialidad/decolonialidad del saber, el sentir y el creer* (pp. 99-121). Universidad Distrital Francisco José de Caldas: Facultad de Artes ASAB.

Mol, A. (2002). *The Body Multiple: Ontology in Medical Practice*. Duke University Press. https://doi.org/10.1215/9780822384151

Murphy, M. (2017). *The economization of life*. Duke University Press. https://doi.org/10.1515/9780822373216

Ndlovu-Gatsheni, S. (2021). The cognitive empire, politics of knowledge and African intellectual productions: reflections on struggles for epistemic freedom and resurgence of decolonization in the twenty-first century. *Third World Quarterly*, 42(5), 882-901. https://doi.org/10.1080/01436597.2020.1775487

Nussbaum, M.C (2001). *Upheavals of Thought: The Intelligence of Emotions*. Cambridge University Press.

Nussbaum, M.C (2004). *Hiding from Humanity: Disgust, Shame, and the Law.* Princeton University Press. https://doi.org/10.1515/9781400825943

Nussbaum, M.C. (2005). Capabilities as fundamental entitlements: Sen and social justice. In A. Kaufman (Ed.). *Capabilities Equality (pp. 54-80)*. Routledge. https://doi.org/10.1080/1354570022000077926

Nussbaum, M.C. (2006). *Frontiers of Justice: Disability, Nationality, Species Membership*. Harvard University Press. https://doi.org/10.4159/9780674041578

Ong, W. J. (1991). The shifting sensorium. In D. Howes (Ed.). *The varieties of sensory experience: A sourcebook in the anthropology of the senses* (pp. 25-30). University of Toronto Press.

Oosterlaken I. (2020). Resources or Capabilities?: An Introduction to the Debate. In Chiappero-Martinetti, E., Osmani, S., Qizilbash, M. (Eds.). *The Cambridge Handbook of the Capability Approach* (pp.126-145). Cambridge University Press. https://doi.org/10.1017/9781316335741

Perovich, L. J. & Zizzi, N. (2024, February 11). *Feeling Data through Movement: Designing Somatic Data Experiences with Dancers*. [Conference Paper] TEI '24: Proceedings of the Eighteenth International Conference on Tangible, Embedded, and Embodied Interaction, New York, NY, USA, 1-11. https://doi.org/10.1145/3623509.3633371

Pritchard, R., Sauls, L. A., Oldekop, J. A., Kiwango, W. A. & Brockington, D. (2022). Data justice and biodiversity conservation. *Conservation Biology*, 36, e13919. https://doi.org/10.1111/cobi.13919

Rabinoff, E. (2018). *Perception in Aristotle's Ethics*. Northwestern University Press. https://doi.org/10.2307/j.ctv3znz09

Rawls, J. (1971). *A Theory of Justice*. Harvard University Press.

Richardson, H. S. (2020). Taking Multidimensionality Seriously: Capabilities, Rawls's Primary Goods and Guiding Action. In E. Chiappero-Martinetti, S. Osmani, & M. Qizilbash (Eds.), *The Cambridge Handbook of the Capability Approach* (pp. 146–164). Cambridge University Press. https://doi.org/10.1017/9781316335741

Robeyns, I. (2017). *Wellbeing, Freedom and Social Justice: The Capability Approach Re-Examined*. Open Book Publishers. https://doi.org/10.11647/OBP.0130

Ruppert, E. (2016). A Baroque Sensibility for Big Data Visualizations. In J. Law & E. Ruppert (Eds.). *Modes of Knowing: resources from the Baroque* (pp. 136-161). Mattering Press. https://dx.doi.org/10.1353/book.81379

Ruppert, E. & Scheel, S. (2021). Introduction: The Politics of Making Up a European People. In E. Ruppert & S. Scheel (Eds.). *Data Practices: Making Up a European People (pp. 1-29)*. Goldsmiths Press.

Rüst, A. (2014, August 10). *A piece of the pie chart: feminist robotics*. [Conference Paper] SIGGRAPH '14: ACM SIGGRAPH 2014 Art Gallery, New York, NY, USA, 360-366. https://doi.org/10.1145/2601080.2677713

Sauvé, K., Bakker, S. & Houben, S. (2020, July 3). *Econundrum: Visualizing the Climate Impact of Dietary Choice through a Shared Data Sculpture*. [Conference Paper] DIS '20: Proceedings of the 2020 ACM Designing Interactive Systems Conference, New York, NY, USA, 1287–1300. https://doi.org/10.1145/3357236.3395509

Sayer, A. (2011). *Why Things Matter to People: social science, values and ethical life*. Cambridge University Press.

Schimmack, U., Radhakrishnan, P., Oishi, S., Dzokoto, V. & Ahadi, S. (2002). Culture, personality, and subjective well-being: integrating process models of life satisfaction. *Journal of personality and social psychology*, 82(4), 582-593. https://doi.org/10.1037/0022-3514.82.4.582

Selwyn, N. (2021). Critical Data Futures. In Housley, W., Edwards, A., Montagut, R. & Fitzgerald, R. (Eds.). *The Sage Handbook of Digital Society* (pp- 593-609). SAGE Publications.

Seremetakis, C. N. (2019). *Sensing the Everyday: Dialogues from Austerity Greece*. Routledge. https://doi.org/10.4324/9780429198182

Sen, A. (1982). *Choice, Welfare and Measurement*. Blackwell.

Sen, A. (1985a). *Commodities and Capabilities*. North-Holland.

Sen, A. (1985b). Rights and Capabilities. In T. Honderich (Ed.). *Morality and Objectivity: A Tribute to J.L. Mackie* (pp. 130-148). Routledge and Kegan Paul.

Sen, A. (1992). *Inequality Reexamined*. Harvard University Press.

Sen, A. (2009). *The idea of justice*. Harvard University Press.

Shapiro, L. & Spaulding, S. (2021). Embodied cognition. In *The Standford Encyclopedia of Philosophy*. https://plato.stanford.edu/archives/win2021/entries/embodied-cognition/

Smith, T.S.J. & Reid, L. (2018). Which 'being' in wellbeing? Ontology, wellness and the geographies of happiness. *Progress in Human Geography*, 42(6), 807-829. https://doi.org/10.1177/0309132517717100

Spratt, J. (2017). *Wellbeing, equity and education. A critical analysis of policy discourses of wellbeing in schools*. Springer. https://doi.org/10.1007/978-3-319-50066-9

Stusak, S., 2016. *Exploring the potential of physical visualizations*. (Publication No. 20190) [Doctoral dissertation, LMU München]. https://doi.org/10.5282/edoc.20190

Syed, M. & McLean, K. C. (2022). Who gets to live the good life? Master narratives, identity, and well-being within a marginalizing society. *Journal of Research in Personality*, 100, 104285. https://doi.org/10.1016/j.jrp.2022.104285

Taylor, L. (2017). What is data justice? The case for connecting digital rights and freedoms globally. *Big Data & Society*, 4(2), 1-14. https://doi.org/10.1177/2053951717736335

Taylor, L. & Broeders, D. (2015). In the name of development: Power, profit and the datafication of the global south. *Geoforum*, 64, 229-237. https://doi.org/10.1016/j.geoforum.2015.07.002

Terzi, L. (2005). Beyond the dilemma of difference: The capability approach to disability and special educational needs. *Journal of Philosophy of Education*, 39(3), 443-459. https://doi.org/10.1111/j.1467-9752.2005.00447.x

Thatcher, J., O'Sullivan, D. & Mahmoudi, D. (2016). Data colonialism through accumulation by dispossession: New metaphors for daily data. *Environment and Planning D: Society and Space*, 34(6), 990-1006. https://doi.org/10.1177/0263775816633195

Thudt, A., Hinrichs, U. & Carpendale, S. (2017, July 5). *Data craft: integrating data into daily practices and shared reflections*. [Conference Paper] CHI 2017: Workshop on Quantified Data & Social Relationships, Denver, CO, United States. https://hdl.handle.net/10023/10910

Tiberius, V. (2006). Well-being: Psychological research for philosophers. *Philosophy Compass*, 1(5), 493-505. https://doi.org/10.1111/j.1747-9991.2006.00038.x

Tonder, L. (2015). Political Theory and the Sensorium. *Political Theory*, 1-9. https://doi.org/10.1177/0090591715591904

Valsiner, J. (2006). *Culture in Minds and Societies: Foundations of Cultural Psychology*. Sage Publications India. https://doi.org/10.4135/9788132108504

Vannini P., Waskul, D. & Gottschalk, S. (2012). *The Senses in Self, Society and Culture: A Sociology of the Senses*. Routledge. https://doi.org/10.4324/9780203805985

Wang, Y., Ma, X., Luo, Q., & Qu, H. (2016, May 7). *Data edibilization: Representing data with food*. [Conference Paper] CHI 2016: Conference Extended Abstracts on Human Factors in Computing Systems, San José, CA, USA, 409-422. http://dx.doi.org/10.1145/2851581.2892570

Zhao, J. and Vande Moere, A. (2008, September 10). *Embodiment in data sculpture: a model of the physical visualization of information*. [Conference Paper] DIMEA'08: Proceedings of the 3rd

international conference on Digital Interactive Media in Entertainment and Arts, New York, NY, USA, 343-3. https://doi.org/10.1145/1413634.1413696

University of Antwerp
IOB | Institute of
Development Policy