

# SIG on Data as Human-Centered Design Material

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## ABSTRACT

Designers and HCI researchers from industry and academia have been exploring the opportunities that emerge from incorporating behavioral data into the design process. For this, designers employ and combine data from multiple sources, multiple scales, and types to obtain valuable insights that inform and support design decisions. This combination unfolds through interdisciplinary collaborations, enabled by various methods and approaches, including participatory data analysis, sense-making interviews, co-design workshops, and data storytelling. However, due to the personal nature of behavioral data and the open-ended, iterative approach of Human-Centered Design, data-centric design activities clash with current HCI and data science practices. As both industry and academia increasingly use data-centric design processes, we recognize a need to share both examples and experiences to reinforce that most practices (and failed experiences) do not yet emerge solely from the literature. In this Special Interest Group, we aim to provide a space for design, data, and HCI researchers and practitioners to connect, reflect on the current practices, and explore potential approaches to further integrating behavioral data into design activities.

## CCS CONCEPTS

• **Human-centered computing** → **HCI theory, concepts and models.**

## KEYWORDS

Human-Centered Design; Behavioural Data; Participatory Design; Data-Centric Design;

### ACM Reference Format:

Alejandra Gomez Ortega, Janne van Kollenburg, Yvette Shen, Dave Murray-Rust, Dajana Nedić, Juan Jimenez Garcia, Wo Meijer, Pranshu Kumar Chaudhary, and Jacky Bourgeois. 2022. SIG on Data as Human-Centered Design Material. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '22 Extended Abstracts)*, April 29-May 5, 2022, New Orleans, LA, USA. ACM, New York, NY, USA, 4 pages. <https://doi.org/10.1145/3491101.3516403>

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CHI '22 Extended Abstracts, April 30– May 06, 2020, New Orleans, LA

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ACM ISBN 978-1-4503-9156-6/22/04.

<https://doi.org/10.1145/3491101.3516403>

Orleans, LA, USA. ACM, New York, NY, USA, 4 pages. <https://doi.org/10.1145/3491101.3516403>

## 1 INTRODUCTION

Traditional Human-Centered Design processes are iterative and collaborative, where designers and researchers often rely on Thick data [Bornakke and Due 2018] to understand the needs and wants of the participants. For this, designers and researchers employ various methods, including observations, focus groups, interviews, questionnaires, generative toolkits, and momentary assessment techniques (e.g., Experience Sampling Method). Through these methods, designers generate Thick data, for example, by creating the material for people to express their thoughts, feelings, and dreams [Sanders 2002].

The recent technological developments under the umbrella of the Internet and the Internet of Things have made available new types of Thin, Big, and Small data [Bornakke and Due 2018] to design *from*, *with* and *by* [Speed and Oberlander 2016]. Designers can employ and combine data from multiple sources, including connected probes and prototypes they build, people's self-reports, or data from existing infrastructures. They can do so at multiple scales from Big to Small, individuals, groups and populations. Designers also combine data from different timings (longitudinal data collection or short experiment setting) and locations (lab setting, semi-controlled or real life setting). Finally, they can mix data types from quantitative to qualitative and structured to unstructured. Designers can obtain valuable insights that inform and support design decisions by playing on these three dimensions.

In this paper, we use the term '*behavioral data*' to encompass a collection of specific information, referring to data from sensors, self-logging, telemetry, or social networks which capture people's behaviors and patterns. With behavioral data, designers and researchers can unlock new insights on people's behavior and characteristics as well as continuously monitor and improve design solutions [Gorkovenko et al. 2020]. As with Thick data, designers and researchers play a crucial role in generating behavioral data, for example, by developing sensor-enabled probes or prototypes.

## 2 EXAMPLES OF DATA AS DESIGN MATERIAL

Beyond the jargon and call for opportunities, several tangible examples emerged from the literature over the last decade. For example:

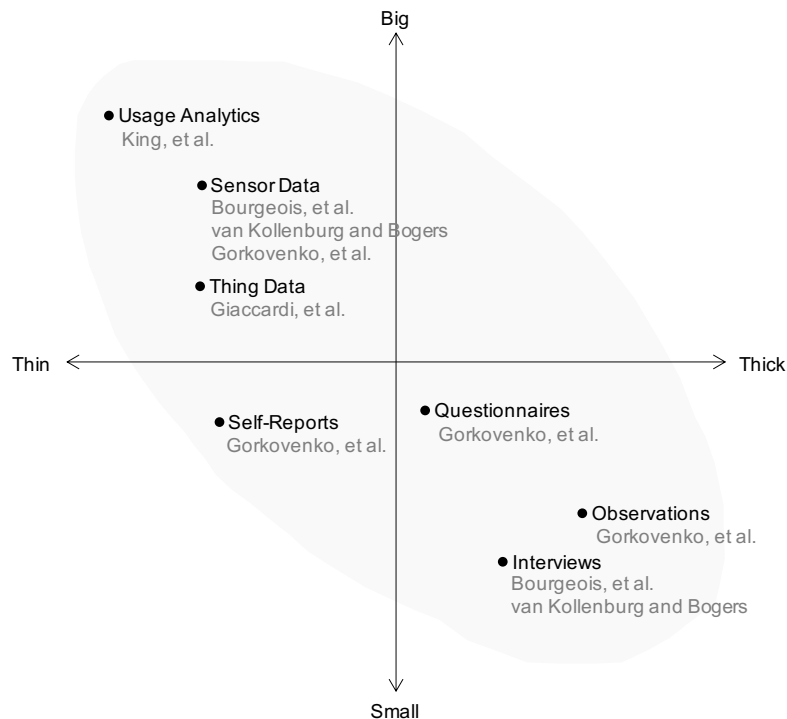


Figure 1: Initial map of the data types from the literature.

- Bourgeois and colleagues used participatory data analysis, combining data from sensors with in-depth interviews where the data is visualized and explored with people, as a tool for reflecting on specific behaviours and enriching the data [Bourgeois et al. 2014].
- van Kollenburg, and Bogers explored how sensor data, combined with contextualized insights from interviews, can be used as a design material for remote design interventions and translated their findings into a framework for data-enabled design [Bogers et al. 2016; van Kollenburg and Bogers 2019]
- Giaccardi and colleagues explored how the perspective of things can introduce new ways for humans and non-humans to collaborate and generate design insights [Chang et al. 2017; Giaccardi et al. 2016].
- King and colleagues, coming from a data-driven design perspective (originally evolving around big and thin data), argue for data-aware design. Describing a mindset for designers to validate design decisions by looking beyond 'clicks' and 'conversion rates' and thereby opens for a combination with thick data [King et al. 2017].
- Gorkovenko colleagues sketch and explore possibilities for future practices of design [Gorkovenko et al. 2020], and ethnographic processes around sensor data, observations, and probing questions [Gorkovenko et al. 2019].

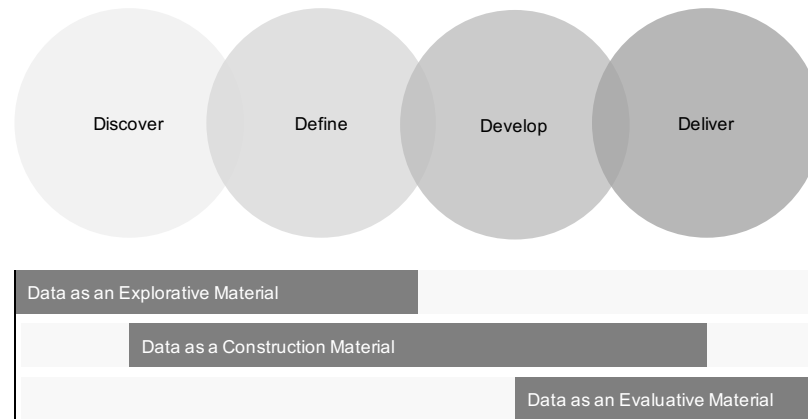
In Figure 1 draft an initial map of this data space within Bornakke's dimensions [Bornakke and Due 2018]. Other critical dimensions to explore among the community includes the product's physicality and the immediacy of data use.

### 3 OPEN QUESTIONS

These examples highlight how designers and researchers have been developing tools, methods, and approaches to integrate behavioral data with Thick data in close collaboration with people. Spanning across the whole spectrum of the design process:

- **Data as Explorative Material** – Close to the field of User Experience Research and with similar methods and approaches. Data fuels design solutions, either by being at the core of intelligent solutions (e.g., IoT) or by means of designing the role of data in the solution (what data, what purpose, what interactions?).
- **Data as a Construction Material** – Close to prototyping and generative design research. Data is a material that can be shaped, tailored, and visualized to augment the human experience and elicit emotional awareness. Data leads to new interaction paradigms based on stakeholders' requirements and needs.
- **Data as an Evaluative Material** – Close to usability and evaluative methods. Data is used to gain in-the-wild insights from the field with respect to the design decisions made. Behavioral data easily allows for longitudinal testing and with little interference of the studied experiences.

At its core and throughout the design process, we see that using behavioral data in design brings critical benefits such as stakeholder participation, focused inquiry, an exchange of values, and deeper understanding. However, it comes at the expense of uncharted



**Figure 2: Data materials along the Human-Centered Design process inspired by the Design Council's Double Diamond.**

exploration and potential frictions with stakeholders. These examples highlight that behavioral data has the power to influence and change the relationships between designers and participants with new responsibilities brought by the data and the data-driven prototypes. Behavioral data requires responsible approaches and engagement with a broad range of stakeholders, from data scientists to data privacy officers.

As industry and academia increasingly use behavioral data as design material, these examples remain isolated and scattered in several venues and communities. We recognize the need for a community that focuses on sharing best practices and experiences while working collaboratively towards developing tools and regulatory frameworks to facilitate designerly data-intensive activities.

#### 4 SIG GOAL

This SIG emerges as a continuation of a series of workshops on "Behavioral Data and Design" conducted in October 2021, in the context of the Dutch Design Week, in Eindhoven (The Netherlands). The discussions surfaced eagerness for sharing experiences, learning from each other's successes and failed ventures, aligning around the best practices, and furthering the field of Data-Centric Design. Thus, the aims of this Special Interest Group are three-fold:

- (1) **Identify Best Practices** – How and where in the design process is behavioral data collected, applied, and validated? What is a *designerly* take on collecting and using behavioral data throughout a process that is dynamic and iterative?
- (2) **Co-develop Appropriate Tools** – How to foster collaboration between designers and data scientists to create accessible, designer-friendly tools that enable a creative and holistic engagement with data? What are the existing tools and methods that support designers in using data as creative design material?
- (3) **Educate Stakeholders** – How to establish a common ground on responsibly setting up and running designerly, data-intensive projects with regulatory bodies (i.e., HREC, IRB)? How to reduce the frictions that emerge from an exploratory, rather than an evaluative, approach to data-intensive activities?

We see CHI '22 as an essential milestone for the community to bring together the active and prospective members of the data-centric design community to share ideas and approaches inherent to their work. To this end, the core activity will focus on collaboratively creating a map of existing works, tools, and methods along axes such as drafted in 1 and with phases of the Human-Centered design process 2. This activity will provide the conversation starter to open dialogues for future research and potential collaboration.

#### 5 DESCRIPTION OF THE COMMUNITY

The Data-Centric Design community emerges at the intersection of Human-Computer Interaction, Participatory Design, and Personal Informatics. As organizers, we have a strong foothold in these three areas. However, we envision engaging with a broader network of researchers and industry partners within the social sciences where behavioral data offers similar opportunities. The availability of behavioural data is changing the way academia and industry access and leverage data to generate knowledge. This SIG is thus also relevant to the whole spectrum of human-centred communities from social science to engineering. Finally, we aim to connect and engage with regulatory bodies such ethics committee members and data privacy officers.

We recognize an urgent need for developing an international, multi-disciplinary community across academia and industry focusing on the use of behavioral data throughout the design process of product-service systems. We believe that CHI is the venue that fits this ambition due to its scale, inter-disciplinary community, and inclusive environment.

#### 6 GOING FURTHER: NEXT STEPS

CHI '22 is a milestone in developing an international community on Human-Centered Design with data across design researchers and practitioners. Beyond this event, we aim to:

- Continue the discussions through the Data-Centric Design Lab MS Teams environment already in place, meant as a continuous live channel among community members.

- Invite the community to contribute to a white paper on designing with data as a conversation starter with the regulatory bodies.
- Encourage research collaborations through regular international, hybrid events mixing workshops, hackathons and experience sharing.
- Make a joint contribution to the CHI community.

## ACKNOWLEDGMENTS

This SIG evolved from discussions at the workshop on Designing with Behavioural Data held during the Dutch Design Week, October 2021 (Eindhoven, The Netherlands).

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