

Exploring Data Intermediaries as Infrastructure for a Human-Centric Data Economy: Speculations & Critical Reflections

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Abstract

Through participating in our contemporary digitally-mediated society individuals are surveilled, generating data about them that is analyzed and aggregated to create computational models of their everyday habits, behaviors, desires, and anxieties. The concept of data intermediaries has recently been proposed and gained purchase as digital services that could enable people to have more control over what data is collected about them and how it is used. Yet, data intermediaries currently exist as a high-level aspirational concept. Little is known about how they could or should be designed. In this pictorial, we propose a diverse range of concepts and scenarios that, taken together, offer a range of possibilities and consequences that personal data, shaped by data intermediaries, might hold for mediating data exchanges in people's everyday lives.

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CSS Concepts

• Human-centered computing → Interaction design; Interaction design theory, concepts and paradigms. https://dl.acm.org/ccs/ccs_flat.cfm

Introduction

The scale at which the *data economy* will impact society is considered by the European Union (EU) to be “a transformation as fundamental as that caused by the industrial revolution” [20:2]. The industrial revolution held both opportunities for the advancement of society and social harm, and so too does the emergence of the data economy. The data economy is fueled by the *datafication* of society, where the activities of human life become seemingly never-ending streams of data generation [10,27,41]. Through participating in our contemporary digitally-mediated society individuals are often surveilled where data is generated about them that is analyzed and aggregated to create computational models of their everyday habits, desires, anxieties, and wellbeing [11]. This algorithmically mediated big data is increasingly exploited by corporations and governments and can lead to reduced capacity for personal agency [51,72,73]. Consequences resulting from these socio-technical shifts also include the

proliferation of social injustices [7,15,28,73], such as predictive policing [56,61] and predatory marketing [47].

For individuals, providing data is typically the cost of using digital services, yet the processes of datafication are opaque. Not only is it difficult to keep track of what data is being extracted from one's digitally mediated interactions, but the ways in which such data will be used in the present and future are challenging to anticipate or imagine [51,52,59,60]. Once data about an individual has been generated, they have little meaningful control over how it is used [73,74]. Surveillance capitalism scholar Shoshana Zuboff describes this deal as ‘Faustian’ as it comes with a “psychic numbing that inures people to the realities of being tracked, parsed, mined, and modified – or disposes them to rationalize the situation in resigned cynicism” [73:84].

Increasing transparency and individual agency over personal data collection has been widely touted as an approach to address consequences emerging from the datafication of society, most notably by the EU's General Data Protection Regulation (GDPR) [75]. While GDPR has a positive impact, its implementation in practice is complex and has resulted in tensions. For example, to be compliant with GDPR (and the ePrivacy Directive) “cookie banners” have emerged as a primary tactic; essentially they ask the user to consent to the level of data activity tracking and usage that they desire, before using a website [30]. Despite GDPR being

well-intentioned, these banners have helped formalize the data-for-service model, which legitimizes the collection and use of personal data, while shifting the responsibility for privacy to individuals [18]. Research has shown that these banners often employ dark patterns which reduce an individual's capacity for meaningful consent [26]. This approach has also produced high levels of privacy notification fatigue among end-users and, as a consequence, contributed to the rise of web browser extensions that actively blocked them [66].

The tensions reviewed here also make clear that there is a critical need for more diverse approaches to conceptualize the roles, agencies, and potentialities that should be afforded to people within the data economy. In light of emerging social consequences and in recognition of possible beneficial opportunities generated by datafication, the proposition of a *human-centric data economy* has recently surfaced [6,54]. Specifically, the concept of *data intermediaries* has been proposed as a potential technological and governance infrastructure that could be readily mobilized by designers to support the higher-level ambitions of the human-centric data economy [54].

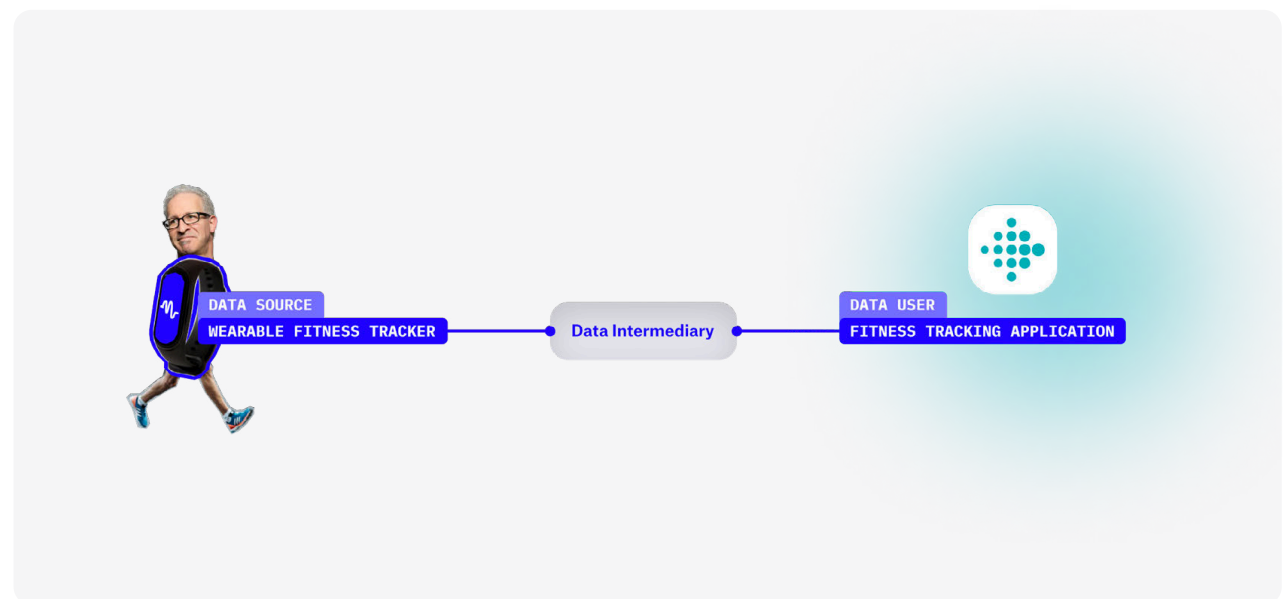
Data Intermediaries

Data intermediaries mediate data exchanges between an individual, a source of data, and a data user, to ensure equitable, more transparent uses of personal data [33] (see example in Figure 1). First developed by data activism organization MyData as “human-centric data operators”, this infrastructure would:

- *offer individuals more control over what data is collected and how it is used;*
- *it would afford the agency to stop the flow of data and even to request the deletion of previously shared data;*
- *while opening opportunities to re-use the data about them in new ways [34].*

While many of these rights exist across different jurisdictions and may be offered by individual data-driven services and corporations, data intermediaries would offer individuals “transparency, understandability, and convenience” [34] through centralizing and standardizing an individual's ability to manage and control the flow of personal data. Data intermediaries have been embedded in the EU's recently passed Data Governance Act (DGA), which considers them as infrastructure which will support individuals in “[exercising] their rights under the General Data Protection Regulation” [76]. Thus, there is the potential to rapidly expand the presence of data intermediaries and to increase individual and corporate trust in them.

Data intermediaries aim to address tensions that can emerge from imbalances among data openness, ownership, usage, and distribution [37], yet it requires a trusted ecosystem with data portability standards [33,55]. An analogy for how data intermediaries could work can be seen in the SWIFT network, which standardizes the inputs and outputs of banks and thus supports an individual in choosing among a wide collection of banking providers that differentiate themselves by offering different services and value propositions, operating in different regulatory environments, and through having different business models [55]. In the same way, an individual can choose between data intermediaries depending on their respective requirements, service offerings, and value propositions.

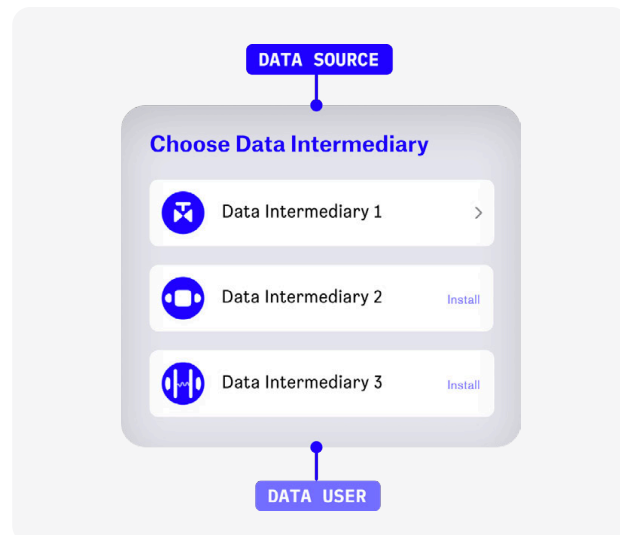


↑ Figure 1: A data intermediary mediating the flow of data between a data source, a wearable fitness tracker, and a data user, a fitness tracking application.

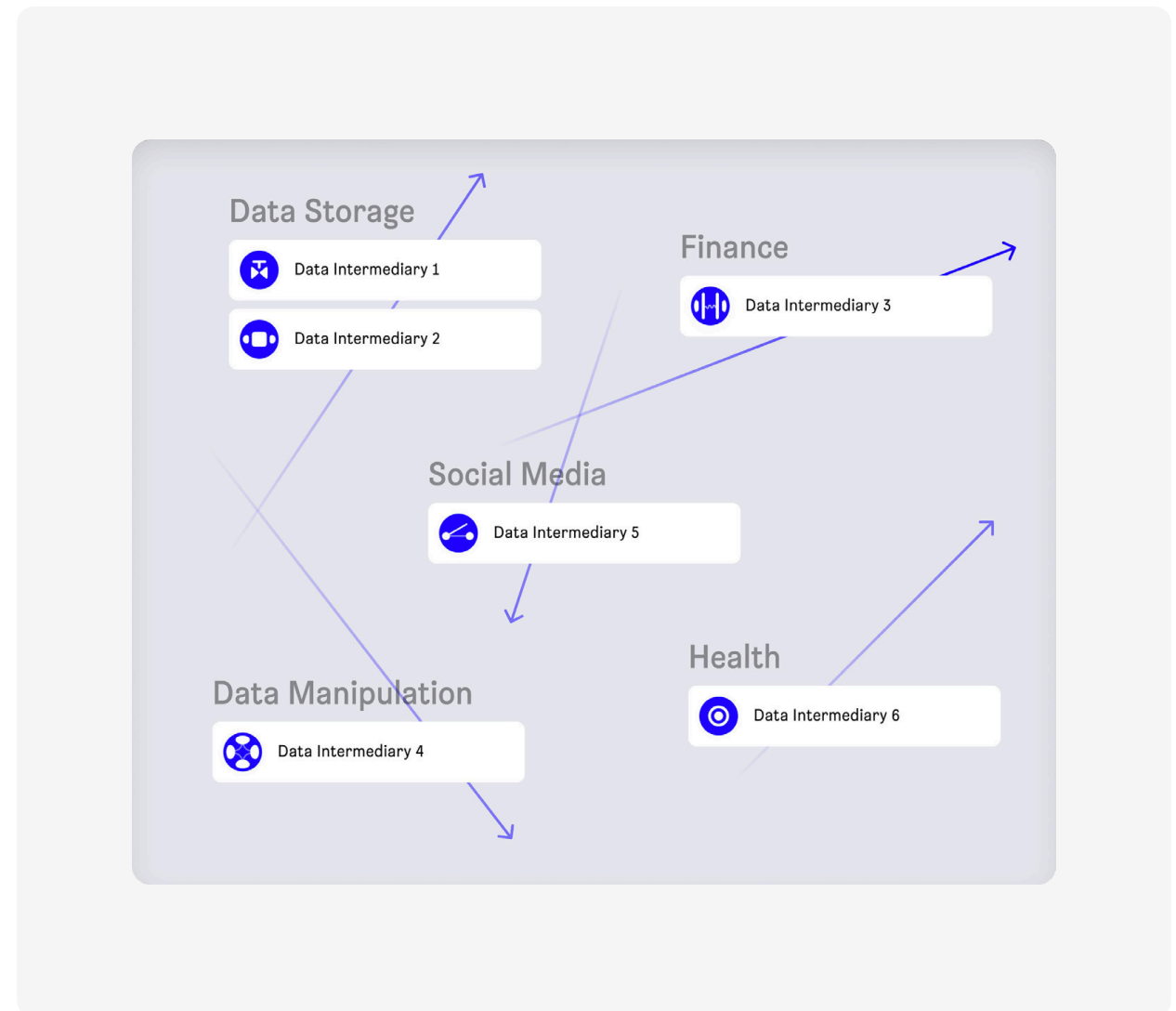
As interaction designers and HCI researchers, we approach data intermediaries from the perspective of the end user. In light of the related literature, we interpret and define data intermediaries as:

- *a digital service that mediates the flow of personal data between an individual, and service or entity that uses personal data;*
- *the data intermediary holds a duty of care over the user's data and is beholden to their desires for fair use;*
- *for the benefit of both individuals and data users, data is verified and authenticated;*
- *an individual has the ability to choose between one or more data intermediaries, that have different specializations and foci* (Figure 2 & Figure 3).

In this pictorial, we are interested in the implications of data intermediaries being required as a mediator in all transactions involving personal data. We adopt this perspective because it will enable us to explore potential benefits, conflicts, and entanglements among different data intermediaries as they exist and operate in parallel to each other.



← Figure 2: While connecting a data source to a data user, an individual can choose between one of the data intermediaries that they already use, or choose a new data intermediary.



↑ Figure 3: Different data intermediaries might offer different value propositions, within their ecosystem. Some may specialize in different categories of data, while others may focus on different functionalities, such as the storage or manipulation of data.

The emerging data intermediaries' design space is encouraging because it may hold the potential to develop new interventions that could counterweight the asymmetries of power structures in the current data economy, from those who collect and use data to the individuals that generate it. Yet, data intermediaries currently exist as a high-level aspirational concept. Little is known about how data intermediaries could or should be designed and the new forms of data-driven services that they could give rise to. In what ways can data intermediaries increase personal agency for individuals and social groups in everyday life? How might data intermediaries provide ways for individuals to benefit from their personal data? What services might be enabled through data intermediaries and how could they encourage participation in a more human-centric data economy? What potential benefits, tensions, and consequences exist in this emerging design space?

The goal of our work is to use design practice to creatively, imaginatively, and critically inquire into these questions. While our research questions are expansive, our investigation of them is increasingly narrowed throughout this pictorial. We describe our design-led inquiry and then propose and critically reflect on a diverse range of concepts and scenarios that envision potential interactions with everyday data intermediaries.

Our research makes three contributions. First, it advances the HCI community's understanding of what data intermediaries are through visualizing and framing this largely intangible aspirational concept. Second, through concrete design proposals, it alludes to potential future product and service forms entangled with data intermediaries and highlight where tensions might emerge. This helps broaden and define the human-centric data economy design space which can be used as a generative resource for future research and practice. Third, our research provides a case demonstrating how speculative design proposals can work to provide provoke new questions about emerging socio-technical design spaces and, in this way, invite participation in debating what could or

should be. This helps support and extend HCI's adoption of speculative methods and approaches to probe on potential technological futures and raise questions for debate about their desirability.

Design Research Approach

Our approach unfolded over two years, as the research team engaged with: an ongoing review of literature on data intermediaries and a human-centric data economy; an exploration of the related areas of privacy, data policy, data activism, and surveillance capitalism; a hands-on exploration of current data intermediary services; and the development of design fiction proposals that shaped a design space for data intermediaries in a human-centric data economy. We will illustrate this over the next two pages.

Our design research into data intermediaries is specifically informed by prior work that has explored the creation of fictional products and concept collages to formulate design proposals and visual narratives [9,13,22,44,48,53] and, more generally, works that situate the design of fictional interactions and concepts at the core of design research practice [3,8,38,62,64,68,69]. We were drawn to their capacity to catalyze a sense of familiarity through the visual semantics, while then sparking critical reflection as the viewer recognizes, upon deeper inspection, a distinctly different technological future that raises 'what if' questions through the products and their attendant details. We aim to show that the proposed products do not exist in isolation, but rather in relation to other services, products, and social systems within a sociotechnical world.

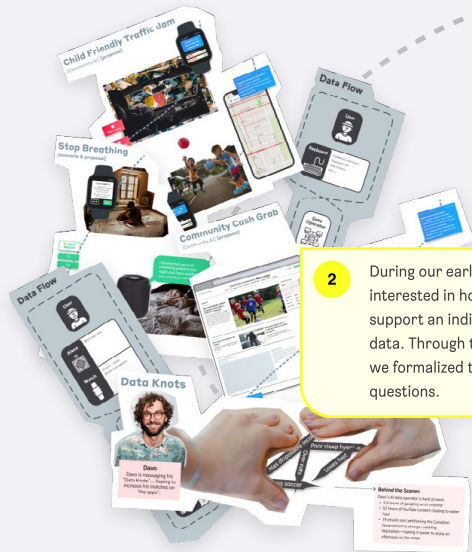
Our Process

Spring Research

- 1 Our process began with an engagement with literature and an exploration of current implementations of data intermediaries. While this is where we began, research continued throughout our process.



Summer 2021
First Explorations



2 During our early explorations, we were interested in how data intermediaries support an individual in benefiting from their data. Through this ideation and exploration, we formalized this into our research questions.

Define Research Questions

RQ - 1

In what ways can *data intermediaries* increase personal agency for *individuals* and *social groups* in everyday life?

RQ - 2

How might *data intermediaries* provide ways for *individuals* to benefit from their personal data?

RQ - 3

What *services* might be enabled through *data intermediaries* and how could they encourage *participation* in a more human-centric data economy?

RQ - 4

What potential benefits, tensions, and consequences exist in this emerging design space?

DESIGN DESIGN DESIGN

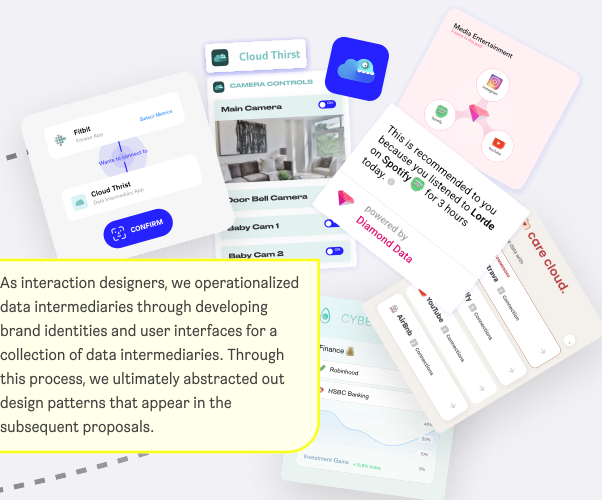
Fall 2021



3 As an exercise in exploring data intermediary design space, we ideated a series of micro design fiction proposals that explored novel services predicated on the emergence of data intermediaries, as well as how existing services might change.

4

As interaction designers, we operationalized data intermediaries through developing brand identities and user interfaces for a collection of data intermediaries. Through this process, we ultimately abstracted out design patterns that appear in the subsequent proposals.



Spring 2022

Final Design Ideation

Data Sources

Finance

IoT

Services

Quantified self

Data Source

Description of data source.
• Data type

5

Gather Data Sources

In this stage of design ideation, we ideated on what data we generated in our everyday lives. This served as fertile ground to spark a wide variety of concepts.

Exterior security camera

- Facial recognition
- Movement patterns
- Behavioural analysis
- Neighbourhood analysis & classification

Credit Card

- Location
- Movement
- Speed
- Who you are with

Social Media

- What you watch
- Preferences
- Interests
- Attention span
- What you'll engage with
- Comments, likes, dislikes, comments liked, who you follow
- How long you'll watch an ad, how many ads you'll watch
- Consumer spending

6

Ideating Services Through Connecting Data

In the subsequent two design workshops, we ideated design proposals to populate the design space for data intermediaries. As an introductory exercise, we randomly grouped disparate data sources and speculated on the services that might emerge or change if there were able to be combined.

SERVICE

Spark Ideation

Spark Ideation

7

Design Fiction Proposals

We then situated these services in everyday scenarios, developing narratives (design fiction proposals). Through this process, we also drew from earlier design work.

8

Iterative Process

We then evaluated the ability of the design fiction proposals to address our research questions and to explore the emergent data intermediary design space. Through this process we sorted, grouped, and contrasted the proposals with each other; we refined some and discarded others. We then reflected on the design space, populated by our collection of proposals, and used this as a guide to iterate further.

9

Critical Reflections

As we developed the proposals, we reflected on them in the context of our research questions and the emerging design space, before synthesizing our responses to them. These critical reflections appear alongside each proposal on the following 9 pages.

Reflect

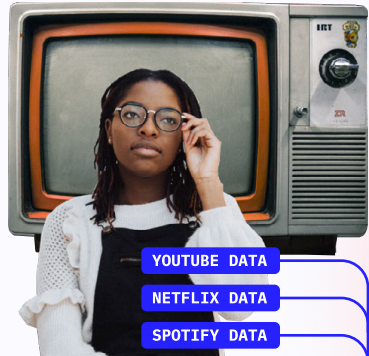
Framing The Speculation

We (the design research team) approach this project from a multidisciplinary lens, combining our experience in HCI research, Interaction design, and UX design practice. This work is conducted in a Canadian context, with an interest in EU's data legislation as it has an international impact, and inspires similar legislation elsewhere (i.e. California, Australia) [42]. Thus our design research inquiry is limited to these social, cultural, and geopolitical boundaries. Clearly, more research is needed to understand how concepts like data intermediaries might be envisioned, imagined, and enacted across different contexts worldwide, and we hope our pictorial may take a modest step toward inspiring such future research.

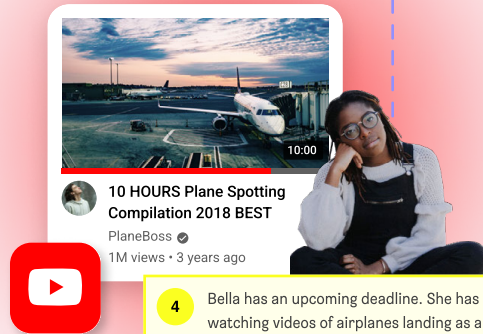
Over the next 9 pages, we present a series of annotated and unpacked design fiction proposals. In these proposals, we are speculating on a near and possible future, in which data intermediaries have been mandated by law and have been integrated into everyday interactions with technology. These data intermediaries hold a duty of care for an individual's personal data and their agency over it [33] and are neutral [76], and as such we are speculating on a world in which there is a human-centric data economy.

The proposals take place in the interconnected and fictional neighborhood of West Wimbles, with a recurring cast of characters.

Data Enricher



1 Bella, 26, consumes content across a range of different entertainment platforms, interacting with their respective content recommendation algorithms.



4 Bella has an upcoming deadline. She has been watching videos of airplanes landing as a form of procrastination and to calm her nerves. Over the last week, she has watched 9 hours of airplane-themed content. The data representing this activity appears within her data intermediary.

Data Intermediary

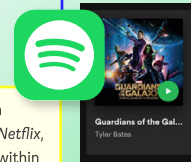
COMBINED DATA POD

NETFLIX Spotify YouTube

2 Bella uses her data intermediary as a centralized hub to store the personal data that she generates from interacting with the services. Each of her services' content recommendation algorithms analyses the central "pod" of data.

⚡ This concept is, in part, inspired by HCI research into the design of personal data stores and personal information management systems [2,16,43,67], and situates them in speculative everyday engagements with data-driven services.

3 When Bella watches the film Guardians of the Galaxy on Netflix, she generates viewing data within Netflix that is also stored in her data intermediary. Spotify's recommendation algorithm parses this data and recommends the soundtrack to her.



Data Intermediary

ADD TAGS

PRODUCTIVE PROCRASTINATION
WORK MENTALLY UNHEALTHY

+ ADD TAG

REFINE DATA

What got you so excited about Airplanes this week?

UPDATE DATA

5 Within her data intermediary, Bella adds context to the data that this activity generated. She tags this as procrastination. The data intermediary shares this enriched data to Netflix, Spotify & YouTube, and their recommendation algorithms stop suggesting airplane-related content during working hours, to better serve her needs.

Discussion & Reflection

This proposal presents ways that an individual can enrich their personal data to manifest what they perceive as a more authentic representation of their current interests and future desires. What would it mean for individuals to directly participate in replacing inferred data about themselves, with their own truths? This raises questions about which version of oneself is more authentic and more preferred—the algorithmically inferred representation, or the one that we try to shape ourselves.

This proposal addresses the tension between the commercial interests of tech corporations (i.e. YouTube, TickTock, or Instagram) vying for an individual's attention with hyper-personalized recommendation algorithms, and an individual's agency to take ownership over what they are exposed to. What would be the benefit to these corporations to stop recommending content it knows a user will consume, and instead recommend content that a user will want to consume? This scenario probes into a potential human-centric data-for-service contract, where the benefits are distributed more equally—a data intermediary enables people to create enriched data so they are shown content that is more attuned to their interests and goals; in exchange, the corporation benefits by being able to sell more targeted and personalized advertisements. Could this be a reasonable value proposition, or will this enriched and authenticated personal data lead to new forms of exploitation?

It is well known that identities are contextual—an individual has a different identity in their home life to their work-life (c.f., [5,24,25]). In the same way, an individual behaves differently across different online services, which creates different data trails that are interpreted uniquely and in isolation by that service's recommendation algorithms [14]. While on the surface there is value in bringing homogeneity between services for both users and tech corporations, it ignores the larger question of whether an individual's fractured digital identities should be merged in the first place.

Data Therapy

1 Linus, 28, has finally decided to try therapy. His partner has progressed in their career, and he is ashamed that he isn't happy for her. He is struggling with jealousy and wants to address the deeper issues.

BROWSING HISTORY

TEXT MESSAGES

YOUTUBE HISTORY

EMAILS

2 Linus' therapist has requested his **personal data** through his **data intermediary** so that they can get to know him better before their first session. This data is used to build a behavioral profile of him, a common therapeutical method.

3 Linus is not comfortable with sharing his **raw data**, so within his **data intermediary**, he adjusts the granularity of the data to a level of synthesis that feels right.

⚡ This model of data intermediary expands on entities and precedents that are discussed as "consent intermediaries" [36] and as "mediators of individual data" [35].

Data Intermediary

GRANULARITY OF DATA

```

textMessage:
  time: 09:24:12:11
  text: >
    Sarah just got promoted..
    😊 can you meet me at the
    Sunshine Palace? It's
    Margarita Monday 😊 I
    need to get f*cking
    wasted.
  
```

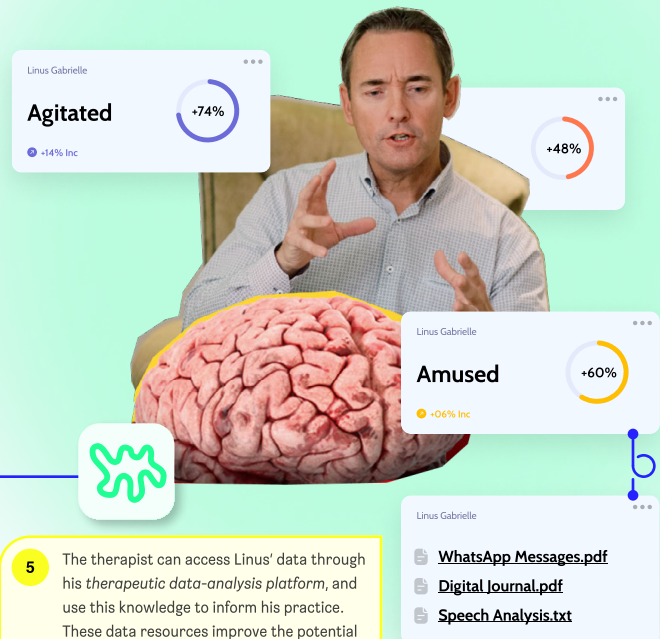
4 As Linus' relationship with his therapist develops, he is comfortable with disclosing **more raw data** to build a better behavioral profile.

Data Intermediary

GRANULARITY OF DATA

```

data:
  youtube: [synthesizedData]
  email: [synthesizedData]
  
```



Discussion & Reflection

The narrative of what individuals should receive in exchange for their personal data within a human-centric data economy has evolved from monetary compensation to a broader conception of value [21,76]. To understand the value of personal data, Fenwick and Jurcys propose asking, "If I was able to have all the data that I have generated with me, how could I benefit from such data?" [21:24]. In this scenario, Linus' data intermediary has the functionality to consolidate and then share his personal data with his therapist, who uses it to provide a better service for him. Linus benefits from his data because he is empowered to use it in his journey of self-growth. In a human-centric data economy, how else might individuals benefit from their personal data?

Additionally, through his data intermediary, Linus has the agency to modulate the granularity of the data he wishes to disclose, from synthesized dashboards to unfiltered raw personal data. We propose this through a metaphorical slider that adjusts the relative level of data synthesis. Yet, more broadly, this scenario suggests opportunities for mobilizing data intermediaries that enable people to modulate levels of personal data disclosure, so that individuals can benefit from their data, without having to lay it all bare.

Local Babble

1 Belinda is a book lover and an influencer on the *Local Babble* social media site, where she contributes her **personal conversations** on books. *Local Babble* is a social media network that curates **snippets of voice recordings** from users' everyday life to share locally, here in West Wimbale. Belinda also loves listening in on what books are being discussed around her.

SMARTPHONE MICROPHONE

I was thinking about you yesterday morning! Have you read *On The Road*? I finally read it and I feel like I was born into the wrong generation! I've started listening and jiving to Miles Davis now too... Let's go dancing tonight at Sunshine Palace!

Data Intermediary

BOOK QUOTES

If your conversations are about **books** ▾ **allow** ▾ quote sharing **unless** ▾ the conversation gets too personal.

WOLF-RELATED ROMANCE NOVEL QUOTES

Don't allow ▾ quote sharing about any wolf-related romance novels.

2 Belinda is comfortable with her **phone's microphone listening to her conversations** because she trusts her **data intermediary** to follow her granular rules for data sharing. Her **data intermediary** parses all of the **raw data speech data** collected from her phone's microphone. It only shares quotes about books, that do not get too personal.

3 Belinda is insecure about her mild obsession with wolf-related romance novels, a surprisingly rich genre of predominantly young adult fiction and erotica. She feels as if they do not represent her as a budding literary critic. She does not allow **this data** to be shared.

Book Conversations in West Wimbale

12 Stories



Belinda

Listening



James



???



Jessica



???



Julia

Belinda



Belinda Jones

I love to talk about books, and I love that people are tuning in :)

782 Follower

Discussion & Reflection

It is difficult to imagine a service like *Local Babble* existing in the present data economy, where individuals feel as if they do not hold agency over how their personal data is shared, and managing privacy presents a cognitive burden. This proposal speculates on how trusted data intermediaries could encourage the disclosure of personal data (in this case recorded speech data) in a way that not only facilitates the sharing of data that is currently considered taboo or dangerous but also redefines agency. What other opportunities might emerge if individuals were able to disclose such personal data, to their chosen online communities, on their own terms, in safe and controlled ways?

Local Babble points to new uses of personal data that can accumulate into local digests among community members. Belinda's data intermediary provides her with peace of mind, such that she is comfortable with her phone's microphone always listening to her, secure in the knowledge that it will follow the granular rules that she has set for data sharing.

What novel data-driven services might emerge in a human-centric data economy that is predicated on trusting the data intermediary ecosystem?

Driving Lessons

- 1 Troy, 52, loves **smart cars** and **smart devices**. All his gadgets provide him with insights into how he is performing, on his journey of self-improvement.



CREDIT CARD
SMART WATCH
CAR SENSORS

- 2 Troy uses his **data intermediary** to connect **streams of his personal data** to the *Driving Insights* service, to shine a light on his blind spots.

Data Intermediary

CONNECTED SERVICES

Smart Watch
Car
Credit Card

```
braking:
  time: 09:24:12:11
  amount: 12.214%
  duration: 00:00:04:11
```

- 4 Now that Troy has assembled **all of this data** within his **data intermediary**, his *insurance company* demands it. They refuse to reinsure him without him granting access to this data.



Mr. Car Insurance



Driving risk detected!

You've had 60% less sleep than usual. You break 6 times more aggressively when you're tired. Make sure to watch 3 cars ahead.



Driving risk detected!

You **speed up 12%** when a car moves to overtake you.



DANGER!

You accelerate dangerously when there is a female driver in the car next to you at a traffic light.

- 3 Troy receives live, personalized driving advice, that is made possible by the combination of and access to **granular data**.

Discussion & Reflection

This proposal extends *Data Enricher* and *Data Therapy* to speculate on how these applications could benefit individuals through contextualizing data in new ways and providing insight into their complex online and offline behaviors. It explores how the intertwining of data sources could lead to the proliferation of small-scale services that provide personal data tools, such as *Driving Insights*.

This scenario exposes how a potentially beneficial application enabled by the pooled data within an intermediary could be subverted and become a tool of oppression. Once Troy has collected his data, his insurer demands it in exchange for a continuation of his service, removing his agency over how his data is shared. In the current data economy, some car insurance providers correlate the cost of their service to an analysis of the customer's driving data [29]. Like other forms of algorithmic decision-making, this can disproportionately affect the poor and reinforces class structures [12,70]. What other types of personal data could insurance companies across different industries require? What other services could be predicated on the sharing of data after it has been aggregated and reformed into a new, potentially valuable resource?

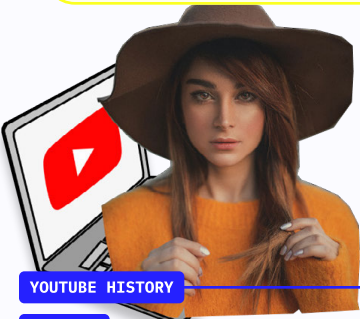
This highlights a key issue that data intermediaries cannot address: data intermediaries are a technical infrastructure and, without legislative and societal change, cannot stop things like what happened to Troy from happening. Through pooling data, data intermediaries may further exacerbate asymmetrical power relationships within the data economy.

University Admissions



50 Shades Of Data

1 Malory, 27, is single and ready to mingle. She is back on the dating apps and trying her luck on *50 Shades of Data*. She is looking to shake things up, to find someone different.



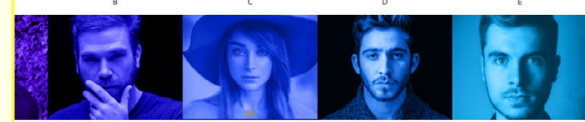
Data Intermediary

COMBINED DATA POD

Spotify ↔ YouTube ↔ reddit

2 Malory connects *50 Shades of Data* to her **data intermediary**. It parses her **Spotify**, **YouTube**, and **Reddit** data, as well as a **copy of their algorithmic profiles** of her.

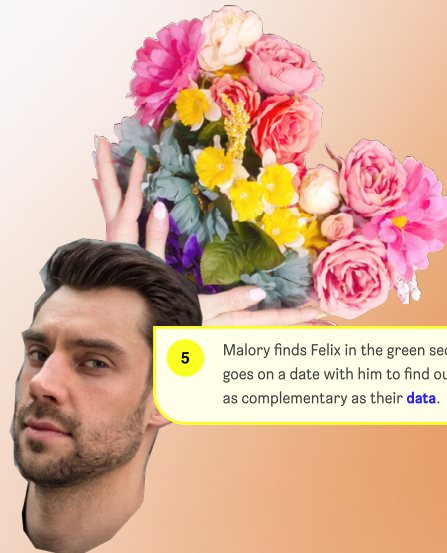
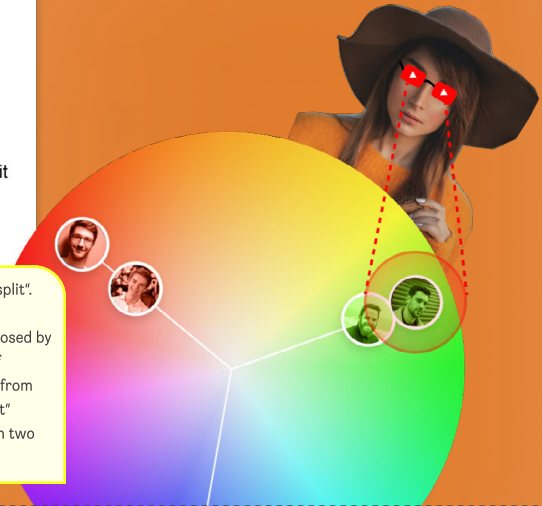
3 Malory begins exploring *50 Shades of Data*, by searching for potential matches with the "analogous" filter, and her ex-boyfriends appear. After the initial shock fades, she is relieved to have quantified what she has always known... Nick, Mark, Keil, and Travis are different shades of the same man... and none of them were ever right for her.



Analogous

- ☐ Analogous
- ☐ Monochromatic
- ☐ Triad
- ☐ Complementary
- ☒ Complementary Split
- ☐ Square
- ☐ Compound

4 Malory searches by "complementary split". Under the hood, the app filters for **algorithmic profiles** (enabled and disclosed by each individual's **data intermediary**) of potential partners that are divergent from Malory's profile. "Complementary split" presents her with profiles divergent in two directions within this spectrum.



5 Malory finds Felix in the green section. She goes on a date with him to find out if they are as complementary as their **data**.

Discussion & Reflection

Recommendation algorithms are increasingly creating traps, built upon algorithmic profiles, that are difficult to break free from [58]. These profiles are inaccessible and opaque. There are few opportunities for an individual to see them, manipulate them, or leverage them beyond the confines of the service they are bound to. This proposal asks... what if you could?

Would leveraging our diverse algorithmic profiles lead to even better matches on dating service applications? More insightful and spontaneous connections in everyday life? Would we value the edge cases and weird encounters if we roam far away from our digitally-mediated comfort zones? In short, can we derive benefits in the everyday from emancipating our algorithmic profiles?

Data Donation



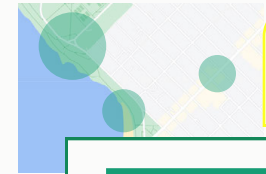
1 *Pitter Patter Little Paws* is a community-focused animal shelter and pet store that will soon be opening in West Wimble. It will be operating as a social enterprise.

⚡ Small businesses may operate at a disadvantage, as they do not have access to large data sets to make data-driven decisions.

2 In the lead-up to their grand opening, *Pitter Patter Little Paws* has organized a crowd-sourced **data collection campaign**. The local residents of West Wimble can safely donate their **data profiles** so that the store's algorithms can better understand and serve their potential customer base.

Best Promoting Area

based on 122 entries



5 The **collated data** is synthesized to determine when and where the residents of West Wimble walk their dogs, and to map the best opportunities for face-to-face advertising.

64 Data Profiles Donated

of 120 goal

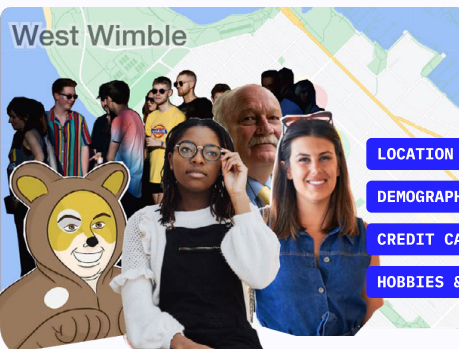
12 days to go

Support this project

🔔 Remind me

🔗 Share

4 The amalgamation of **TikTok viewing histories** demonstrates what types of dogs West Wimble residents are most drawn to, which informs how the store organizes its window displays.



Data Intermediary

DATA DONATION
Connected to Data Donation

Donation

Donation

Donation

Donation

3 West Wimble likes their dogs! So far 64 people have shared their **data profiles**. Mallory and Betsy Lentis are among the West Wimble residents who donate their data.

Discussion & Reflection

Moving beyond how data intermediaries may bring value to an individual, our process led us to explore how personal data might be shared to bring value to a community.

Data altruism has been characterized as the consent regarding an individual for the use of their personal data to benefit communities and society [49]. Data altruism is an area of growing interest, however, it has been explored primarily in a medical context [49]. This proposal moves beyond this to formalize an example of how data intermediaries could support data altruism, by showing how individuals might donate data to a local social enterprise. This interpretation of data altruism relates to some activities of citizen science and data activism, where individuals actively collect and analyze data to improve society (e.g. [1]), but without requiring a high level of technological skills or effort to participate, as the data intermediary provides a familiar interface.

In the current data economy, the same data that is described in this proposal is extracted from individuals surreptitiously, without their consent, or in exchange for the use of a service. In a possible near future, would it not be preferable to agentically share this data with a cause one might support?

Community Newsletter



SOCIAL MEDIA

LOCATION DATA

Data Intermediary

2 Malory organized a litter clean-up through an event on social media. It was a great success with **22 West Wimble residents attending**. They collected garbage in the park and from the sides of the main road. On the way home with her dog, Malory **walked through the park and caught up with the other local dog owners**.



CREDIT CARD HISTORY

Data Intermediary

3 Terry has been returning to Sunshine Palace most days for a Bingo Burger. He used to wait at Sunshine Palace, across the road from the medical clinic, while his wife was undergoing chemotherapy. Now that she is gone, he returns here to remember her. When the article was published about him in the community newsletter, old friends reached out and he connected with other regulars of the Sunshine Palace.



SOCIAL MEDIA

Data Intermediary

4 Betsy Lentis' daughter, Lily, tied for first place in the fourth-grade freestyle competition at the local school. She proudly **posted on Facebook** about her daughter's win (neglecting to mention that it was a tie). **No data points exist** to represent Evangeline, the other winner.

1 West Wimble has outsourced the production of its community newsletter to an AI-writing service. It identifies patterns and anomalies in the **streams of data** from members of the community and writes stories.

Recent HCI research has demonstrated that anomalies within personal data are rich stimuli for narratives [17].



Discussion & Reflection

This proposal extends the discussion of data altruism in Data Donation to situate how data intermediaries could support opening up the social and cultural value of personal data in everyday life. This value lies in "strengthening the cohesion of communities and societies [and] in enhancing the quality of communal living" [15:621]. Sharing or combining social data among consenting users has been found to lead to social connection, collective reflection, and intimacy (e.g., [32,46,57]). This proposal explores opportunities that are created when a community can harness their collective personal data to provide decentralized services and generate community resources.

What other forms of data could be valuable to a community, and once emancipated by data intermediaries, what new community services could be offered? How could data become a communal resource? And, through what social processes should these decisions take place?

The personal data that enables these community resources are not neutral, they are messy, political, and come with inherent power structures [4]. Furthermore, research within HCI has demonstrated that the interpretation of such data is nuanced and difficult [17,65]. Its potential for misinterpretation is highlighted through a somewhat optimistic lens in Terry's story, however, in the story of the swim competition, Evangeline, the girl who is not represented by data, is ignored and erased from history. These scenarios help illustrate that designing systems with access to rich accounts of personal data presents a critical challenge to the field of interaction design. It is incumbent on designers and researchers to be cognizant of how personal data may be interpreted to avoid consequences that continue or worsen the asymmetries of power structures present in the current data economy.

Proposal 9

Neighborhood Watch

1 The neighborhood of West Wimble has peace of mind. They have assembled all of the **community's private camera feeds** into a *central community-managed hub*, in the basement of their community center. Each day, parents from the local school take turns in watching the children walk home.

Data Intermediary

VIDEO FEED CONTROL

Connected to **Neighborhood Watch**

☒ ON Smart Door Bell

☒ ON Security Camera A

☒ ON Dash Cam



2 David, 37, recently moved into the neighborhood. He feels safe knowing his neighbors are looking out for him. He sends the feeds from his **Smart Door Bell**, his **Dash Cam**, and the **Security Camera** that looks down the lane next to his house to the *Neighborhood Watch community hub* through his **data intermediary**.

Data Intermediary

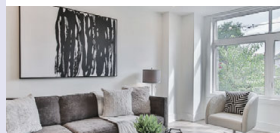
VIDEO FEED CONTROL

Connected to **Neighborhood Watch**

☒ ON Smart Door Bell

☒ ON Interior Camera

☒ ON Baby Cam #1



LATER

Data Intermediary

COMMUNITY ACCESS VOTE

The community is voting to **revoke the West Wimble Police Department's access to the Neighborhood Watch application**.

5 It was discovered that the West Wimble police department was using the video feed for *predictive policing*. This went against their agreement with the local council (that each participating community member agreed to within their **data intermediary**). After much debate, the community suspended their access.



4 Ranger, 13, comes to the community center to skate on the weekends. When he can escape from his friends, he goes down to the basement to check the *feeds*. This started 6 months ago after his eighth-grade teacher Ms. Lentis forgot to disconnect her **interior cameras** when she came back from her holiday.



6 After his garden hose disappeared, retiree Benny, 68, spends every day in the basement of the community hall, watching the *camera feeds*, looking for people that don't belong. Last week, Benny didn't recognize his new neighbor David, who was out for an evening jog. Benny followed him in his truck for 20 minutes, to make sure he wasn't up to no good.

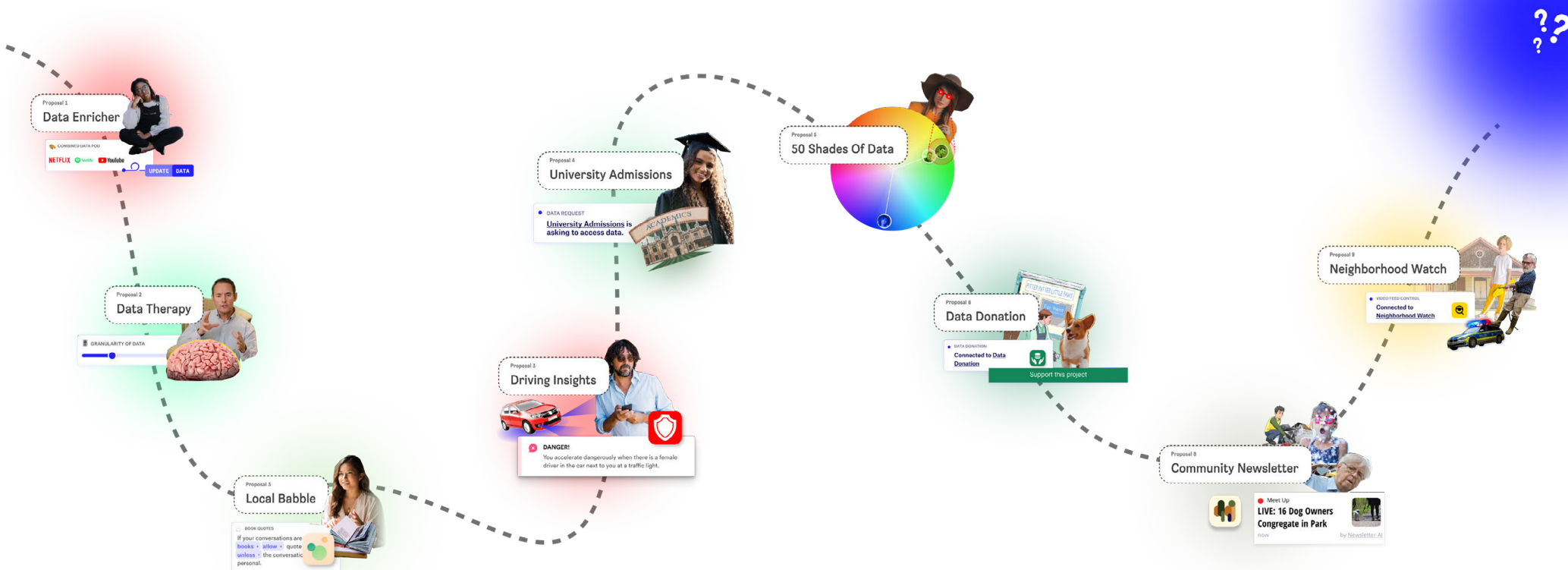


Discussion & Reflection

The *Neighborhood Watch* proposal expands on the role of personal data in building community, initially explored in *Community Newsletter*, and further manifests potential tensions latent in this design space. There are also tensions bound up in how the personal video feeds are shared, used, and interpreted. The human-centric data economy gives rise to the potential for accidental data leakages (see [50]), where an individual is neglectful in managing their data flows because they have trust in the ecosystem. This can be seen in Betsy Lentis forgetting to disconnect her private security cameras when she needed to. Furthermore, individuals may not have the time nor the technical ability to manage their personal data through a data intermediary [31]. Alongside calls for data intermediaries to have a duty of care for their users [33], we propose that designers of data intermediaries consider proactive approaches to data transactions.

In this proposal, the local council revokes the police's access to the community's video surveillance hub as they are discovered to be using the recordings for purposes outside of the context of their agreement. This extends the ideas manifested in *Driving Insights* where the aggregation of previously separated data sets enabled by data intermediaries leads to unwanted and adverse consequences. Although, in this proposal, the social harm is mitigated by the ability for individuals to revoke a bad actor's access to personal data within their data intermediaries. This underlines the importance of ecosystem governance, where revoking access to a data user is respected [33]. These mechanisms are a requirement for there to be trust within the human-centric data economy.

This proposal also explores the tension that Tan et al., refer to as "the conspiracy of the mundane", where the video recordings of mundane everyday life are considered not neutral and ripe to be (mis)interpreted without context [63]. Betsy Lentis' act of leaving her internal cameras on for security while she is away, is interpreted by her neighbors as peacocking—a way of her showing off her wealth. While this is petty and unneighborly, *conspiracies of the mundane* are often an extension of whiteness and policing [63]. These lenses are embodied in the proposal by the character Benny, who is searching the video feeds for stereotypes. Unlike the previous tension, this is not addressable through technological fixes. As interaction designers considering the infrastructure of a human-centric data economy, this proposal makes clear that the potential effects on both primary and secondary stakeholders must be taken into account from the beginning and throughout the envisioning, design, and study of such systems in future research.



Conclusion

Designing strategies that enable people to have more choice and control over their personal data opens potential for participation in a more sustainable human-centric data economy that foregrounds agency over exploitation. These concerns intersect with recent calls to “break data free” such that it can be creatively manipulated and given new and unexpected forms by end-users [17,19,71]. Despite becoming encompassed by various recent international governmental policies, data intermediaries currently exist at an abstract, inspirational level. The overarching goal of this pictorial has been to take a step toward understanding what data intermediaries are, how they could be thought about, conceptualized, and become entangled in people’s everyday lives.

We proposed nine data intermediary concepts and scenarios that, taken together, explore different ways that data intermediaries might create spaces for deeper participation in how personal and shared data might be used. The core

contribution of our research is these design proposals, each of which demonstrates their own unique opportunities and tensions. **Data Enricher**, **Data Therapy**, and **Local Babble** each demonstrate concrete new applications that data intermediaries could generate if a user could alter and modulate the degree to which their personal digital data trails were disclosed to a range of trusted third parties. **Driving Insights** unpacks an entanglement of consequences that could emerge once correlations among differing data points were established and new precedents for personal data requests became the norm. **University Admissions** illustrates how the mere existence of data intermediaries could trigger social and political action as previously hidden processes of data surveillance become more transparent. **50 Shades of Data** explores the potential for the use of algorithmic profiles as a resource to counter homogeny and connect with people in opposing content recommendation traps. **Local Babble**, **Data Donation**, **Community Newsletter**, and **Neighborhood Watch** each explore what people might be willing to share if there was trust in the respective data ecosystems that

they participated in. However, **Community Newsletter** and **Neighborhood Watch** also illustrate consequences that can emerge from a lack of accountability over data-driven narratives and the potential for accidental data leakage through a complacency developed through trust.

Importantly, our aim is not to be prescriptive or conclusive. Rather, the goal of our work is to make concrete portions of the data intermediaries’ design space to invite participation in and debate around the fundamental questions of: What is data? How is it made? Where does it go? Who ought to make these decisions? And, if people are given more understanding, agency, and control over their personal data, what kind of future could, or should, this collectively lead us toward?

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