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Article – Theme section

The data loop of media and audience

How audiences and media actors make datafication work

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Abstract

As our digital footprints are collected and analysed by the media and fed back at us as new experiences, providing more data to collect, data circulates in a loop from audiences to media and back. This data loop is for media studies an occasion to revisit the media–audience nexus in an age of datafication. We argue that an audience perspective is needed in order to break with the structure–agency linearity in current understanding of datafication. In this article, we develop a model of the data loop that first presents the fundamentals of data circulation between social actors and digital interfaces, then the moments of agency between actors in a relation of mutual dependence. The article closes with a discussion of previous models within media and communication that have addressed similar ideas, such as audience feedback, mutuality and circularity.

Keywords

Data loop, Datafication, Audience studies, Agency, Data collection, Data retroaction

As online media use has become widespread, our "digital footprints" are collected and analysed by the media industry (Athique, 2018) and fed back at us as new experiences, thus providing yet more data to collect, and so forth. This *data loop* is a new way to understand the media–audience nexus in the age of digitalisation and datafication. In media and communication studies, more often than not, this nexus has been studied as a linear process, one in which the "powerful" media send texts or messages to be "uncritically accepted" by the "passive" audiences. Worries for what media do to audiences have followed prevalently in both popular and academic culture, despite decades of efforts from audience studies to demonstrate agency and activeness of audiences.

Today, datafication—the transformation of human experience into data (Kennedy et al., 2015; Mayer-Schönberger & Cukier, 2013)—is generating similar concerns, from a perspective that we readily associate with the said linearity. Currently, the state of research suggests a "bulldozer theory" of datafication. Datafication is understood as a top-down process of colonisation of the life world (Couldry & Mejias, 2019), as an ideology—dataism (van Dijck, 2014)—that reshapes "the way we live, work and think" (Mayer-Schönberger & Cukier, 2013) or as a set of logics that characterise a "deep mediatisation" (Couldry & Hepp, 2017). Datafication is conceived as a weapon of "math destruction" (O'Neil, 2017), a social order imposed on and oppressing everyday life. Emerging from the field of critical data studies, these conceptualisations have their roots in the critique of power structures, which, quite similar to the critique once raised by the Frankfurt school, reduce audiences to the level of vulnerable, passive victims.

Not unlike the Frankfurt school, critical research in datafication is, with some exceptions, focusing on analyses of the production or of the technological systems that equip the bulldozer. In emphasising surveillance capitalism (Zuboff, 2019) or algorithmic biases (Bozdag, 2013; Noble, 2018), research is less sensitive to the notion of an active audience capable of reacting to, appropriating and resisting datafication. In 2019, Sonia Livingstone captured this imbalance in research in a quintessential quote:

> In today's heady climate of media panics—over so called fake news, election hacking, Internet and smartphone addiction, the algorithmic amplification of hate speech, viral scams, filter bubbles and echo chambers, discriminatory data profiling and data breaches, the crisis in quality journalism, the demise of face-to-face conversation, and a host of digital anxieties about youth—Fears about audience gullibility, ignorance, and exploitation are again heightened in popular and academic debate. (Livingstone, 2019, p. 2)

Audience research needs to join critical data studies in their examination of datafication to diversify the debate on the workings of datafication. In this article, we suggest a model of the data loop which foregrounds the agency played by media audiences and actors in media production in making datafication work. Our aim is not to reduce the value of critical data studies, it's focus on privacy, attempts at datactivism, discussions of data literacy or data justice. Instead, we wish to complement the political-economy perspec-

tive on datafication by suggesting an approach in which actors, in their interaction with digital interfaces, can be conceived as sense-makers and active participants in experiencing datafication and making it work in their particular contexts. The data loop repurposes the classic communication model of producer, text, receiver[2] and feedback, adapting it to the context of datafication.

To break with the dominating media-structure debate, we see Derek Layder's domain theory (1997) as a useful framework to understand the mutuality of the roles of media actors and media audiences. Layder proposes four social domains with power dynamics within and in between them, each with their own analytical locus: 1) psychobiography, 2) situated activity, 3) social setting and 4) contextual resources. Thus, the model presents the agency of audiences and actors within the media not as an alternative to the discussions on injustices inflicted by data industries, but rather as adding nuance to the social processes in their complexities.

The model of the data loop will be presented in two layers. First, we present the fundamentals of the process of circulation of data between social actors and digital interfaces—what is already known from the existing literature, albeit in a fragmented manner. Second, we expose the moments of agency by looking at formative and transformative possibilities associated with the circulation of data within the loop.

Auto-ethnographic vignettes

Inspired by "situational analysis" as suggested by Clarke (2005), we have worked with situational maps in the process of elaborating the data loop, thus providing grounding to the formation of the theoretical model. These situations were inspired by our own auto-ethnographic reflections of being confronted with the data loop and datafication processes, mapping for instance interaction with Netflix recommendation algorithms, experiences with searching for information on buying a new car or looking for new books on Amazon or Goodreads. It is well acknowledged that researchers are also media users and can usefully draw on their experiences in order to explore research questions and ideas (Chimirri, 2013; Dhoest, 2014). We have used these maps to get our assumptions, experiences and ideas on the table in the spirit of constructivist grounded theory (Charmaz, 2006). Throughout this article, we will offer these auto-ethnographic maps in the form of vignettes that exemplify how experiences of datafication travel within the loop and how the different moments of the loop are interconnected. These vignettes illustrate practices of resourceful and reflexive users who consider the signals sent by datafied media and seek to fit these to their sociocultural realities.

The fundamentals of the data loop

The data loop is a circuit model in which media actors and audiences interact, in a relation of mutuality, throughout digital interfaces of data collection and retroaction (see Figure 1). The model highlights interconnected moments in the experience of datafication (described as inputs and outputs in Figure 1). As such, the data loop describes a main characteristic of media production in the age of datafication and digitalisation: digital media are increasingly in a state of "permanent beta" (Hernández-Ramírez, 2015), always being reshaped and modified in light of the incoming stream of data collected on media users. Data collection and data retroaction provide the digital infrastructure of the data loop, while sociocultural and institutional practices take place in the context of the four social domains, providing various motivations and resources to the actors involved.

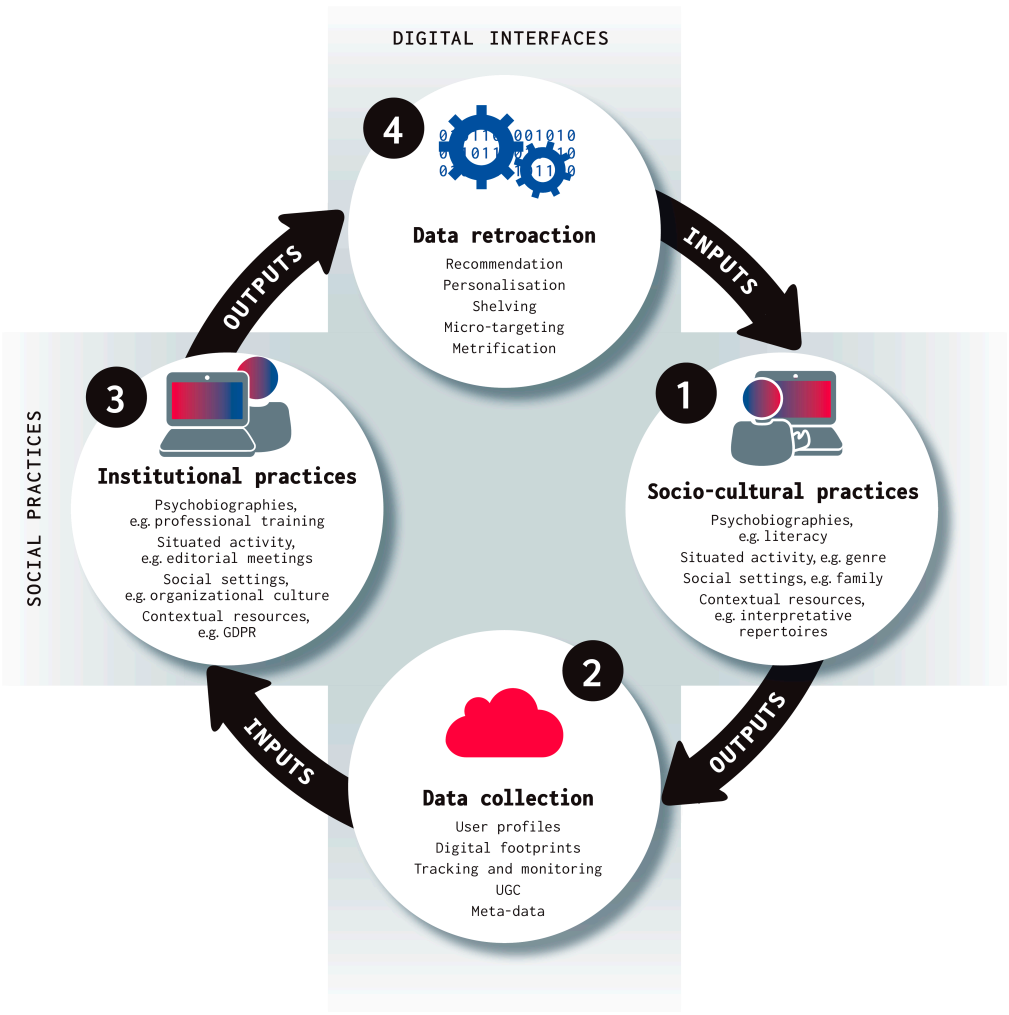

Figure 1: The fundamentals of the data loop

In shifting the attention from media to users, we initiate our model with the sociocultural practices of the users as datafication gives them new possibilities to provide feedback to media makers. As the *sociocultural practices of audiences* (1) increasingly take place online, audiences are providing a broad range of data about themselves as *outputs*. *Data collection* (2) provides *inputs* to *institutional practices* (3), whose *outputs* shape media texts. Media texts produced and disseminated on the impulse of datafication are then presented to users as *retroaction* (4) on the same digital interfaces that are used for data collection. These media *outputs* are, from the user's point of view, inputs to their own experiences of consumption (1), experiences that form the basis for yet another round of data collection (2). And so on.

Sociocultural practices of media audiences (1)

Sociocultural practices correspond to the ordinary activities of viewing, reading, watching, "produsing" (Bruns, 2008) and participating that audiences perform in their everyday life. These activities take place, as Ien Ang (1991, p. 157) puts it, in "the uneven and variable everyday context in which the practices and experiences of (…) audiencehood are shaped and take on meaning for actual audiences". These activities involve the selection and interpretation of media texts based on the motivations, resources, interest, etc. of specific audiences. Audiences are always situated within the psychobiography—a combination of personality and personal history, influenced by situated activities and social settings of social relations, and framed by the contextual resources of social positions (age, gender, education, etc.). These influences provide them with varying literacies and interpretive resources that orient their consumption and interpretation (Michelle, 2007). As audiences negotiate media texts in varying situations through the prism of their unique resources and positions, this inevitably results in complex and diverse uses and interpretations of media texts.

Data collection (2)

Today's media platforms are increasingly designed to involve or create data points that allow collecting knowledge and insights into user behaviours (Alaimo & Kallinikos, 2017; Gillespie, 2018). Data collection includes, but is not limited to:

- Opening a user *profile* and filling in different information about oneself (Friz & Gehl, 2016);
- Online activities such as logging in, browsing, clicking, liking, sharing, commenting, etc.—that is, when our active use of media leaves "*digital footprints*" (Bechmann & Bowker, 2019; Madden, 2014; Muhammad et al., 2018);
- Digital infrastructure of surveillance/monitoring such as *tracking* technologies, e.g. the Facebook pixel or cookies where data is collected without a user's knowledge (Helles et al., forthcoming; Thatcher, 2014);

- The content that we upload, share or interact with, e.g. reflecting the creator of oneself, what is often called *user-generated content* (Lüders, 2008; van Dijck, 2009);
- The *metadata* associated with the content we create, upload or interact with, e.g. the time and location of a picture we uploaded (Jensen & Helles, 2017; see also Shulman, 2018 for a presentation of the extent of metadata on a medium such as Twitter).

***Institutional practices of media actors* (3)**

In the context of the model, institutional practices can be defined as the ongoing and strategic implementation of datafication by media actors into editorial decision making, media production and dissemination on the basis of considerations about technology, ownership, governance, business models, content and usage (van Dijck, 2013). Institutional practices are influenced by the psychobiographies of journalists, editors, programmers, etc. The situated activities framing the institutional practices can be, for instance, discussions in the newsrooms based on the collected data and their visualisation (e.g. the newsroom dashboard) or development of algorithms that organise content in online stores. These discussions, in turn, are framed by the social settings of organisational cultures. Institutional practices are developed within the contextual resources of the governing regulations. Within our model, these practices are the common denominator for a host of heterogenous practices that are likely to differ from one institution to another or even within the same institution depending on the actors involved.

With the data loop, we showcase data practices as social and human, rather than the result of technological determinism. Data analytical practices engaged by media institutions include, but are not limited to:

- The profiling of users (Couldry & Turow, 2014; Turow, 2011);
- The establishment of predictions (O'Neil, 2016);
- The identification of metrics (Anderson, 2011; Zamith et al., 2019);
- The visualisation of data (Engebretsen & Kennedy, 2020);
- The brokering of data (Helles et al., forthcoming).

***Data retroaction* (4)**

Through platforms, applications or websites, media providers can instantaneously and continually update and modify the means by which they form and deliver media texts to audiences. The malleability of today's media text is, to a large extent, motivated by the recent progress made by datafication. It is by analysing user data that media can "datafy" the textual production of data, and by the same process "retroact" data back at users. Several such examples of retroaction are visible in the vignettes, such as in Vignette 1.

Vignette 1 Buying a book on Amazon

David searches for a specific book title on Amazon. At the top of the search results, the website returns many other suggestions, organised under the label "Customers who viewed this item also viewed…". These suggestions are like shelves in a bookstore or library, providing an opportunity to encounter similar items. David browses these and clicks on some other titles, which then lead to more recommendations. At some point, nothing new seems to come up, David gets tired and interrupts the session without buying anything.

Without pretension to exhaustivity (or mutual exclusiveness), we have identified different ways by which data are retroacted to audiences, often labelled content curation (Gillespie, 2018; Rader & Gray, 2015).

- The Facebook EdgeRank algorithm, known as a *recommendation* algorithm (or filter algorithm), involves the processing of inputs sourced in the everyday use of Facebook to filter the content that appears in the newsfeed of a specific user (Airoldi et al., 2016).
- A variant of recommendation is the *personalisation* of content (Beam, 2014; Turow, 2011). Google, for instance, aims at providing users with relevant results according to the search terms entered by the user. Yet, personalisation could also be about the paths or options made available to users when matching specified criteria. For example, being identified as male or female on a dating site will lead to narrower access to content (profiles of members of the opposite sex) assumed to be relevant for that user. Another example is the customisation of news by preselecting topics and issues of interest.
- What we call *shelving* consists of categorising and ordering a series of items that are presented to the users. Examples of shelving include Netflix, which organises a discrete but dynamic selection of its content into categories (digital shelves) on which a limited selection of films and series are displayed for viewers to choose from (implications of this practice are discussed by Hallinan and Striphas, 2016). Another example of shelving is Amazon's way of recommending products such as books on its platform, which is organised according to categories (shelves) that help users orient themselves towards further possibilities of consumption.
- *Micro-targeting* is the use of data to profile users so that specific messages or tailor-made messages are sent to narrow categories of users (Couldry & Turow, 2014).
- Bolin and Velkova (2020) have documented how platforms such as Facebook are populated by a host of visible metrics that provide orientation to users. The number of likes, shares, friends, etc. provides users with indications of popularity which they

use to interpret and navigate the platform as well as develop their digital performance. Hence, *metrification* is another way by which data are retroacted on users.

Formative and transformative experiences in the data loop

Datafication is the transformation of human experience into quantities. But what is transformed in the context of media and audiences? Inspired by the work of Ien Ang on audience commodification in her groundbreaking book *Desperately Seeking the Audience* (1991), we argue that the data loop involves the transformation of the experience of audiences into the expectations of the media industry, and vice versa. The sociocultural practices—the everyday life world of audiences with its relevance and logics—are transformed into the world of concerns and interests of the media industry, which in turn informs the production and distribution of content to be appropriated by the sociocultural practices of audiences. Ang calls "institutional perspective" the logics and the system of relevance of a media industry concerned primarily with its survival and reproduction.

As media makers and audiences are providing outputs and receiving inputs from each other through digital interfaces, the circulation of data in the loop provides formative and transformative experiences between the sociocultural practices of audiences and the institutional practices of media actors. As can be seen in figure 2, by formative experiences (6) and (8) we mean that data circulating in the loop provide opportunities to reflect and learn or be shaped by the experience of data. Transformative experiences (5) and (7) are moments where actors change their practices in light of what they have learned from their experience of data. As such, digital interfaces mediate the input of data and output of transformed practice.

The terms "formative" and "transformative" also imply the possibility to eventually correct what is perceived as wrong or inadequate. Headlines of news items are changed in order to attract wider audiences, or audiences change their consumption patterns to avoid being captured by the media. Actors can be positioned as objects of these (trans-) formative experiences, in which case notions of effect, influence and manipulation become relevant (something is done to the actor). Or actors can be positioned as subjects of these (trans)formative experiences (actors do something with them), in which case they can be said to learn from these experiences.

We reason that "images" or "discourses of audiences" (Hagen, 1999) are primarily driving these transformative and formative experiences. These images or ways to imagine, perceive or represent the audiences are "mental conceptualization of the people with whom media producers communicate" (Litt, 2012, p. 330). We think, however, that these images are held both by media actors and by the audience itself. Most probably, the images held by these two actors are different, perhaps even competing. As we and others before us see it, the interplay between media and audiences regarding how these images travel in the loop is essentially defining the mediation operated by datafication:

> *The media, then, act here not as a camera, but as a mirror, reflecting back the image they capture. This, according to Gillespie (2012), creates a feedback loop by which "the algorithmic presentation of publics back to themselves shape a public's sense of itself" (p. 2).* (Fisher & Mehozay, 2019, p. 13)

In other words, media audiences use the inputs from data retroaction to imagine and understand themselves as audiences. We extend these images to include ideas about the self. A growing literature on self-tracking technology is making us aware of how data are used to mirror different aspects of the self (Lomborg et al., 2018; Lupton, 2016, 2020). A similar kind of imagination is at play regarding the texts that media actors produce for their imagined audiences. Media actors often have mistaken images of who their audi-

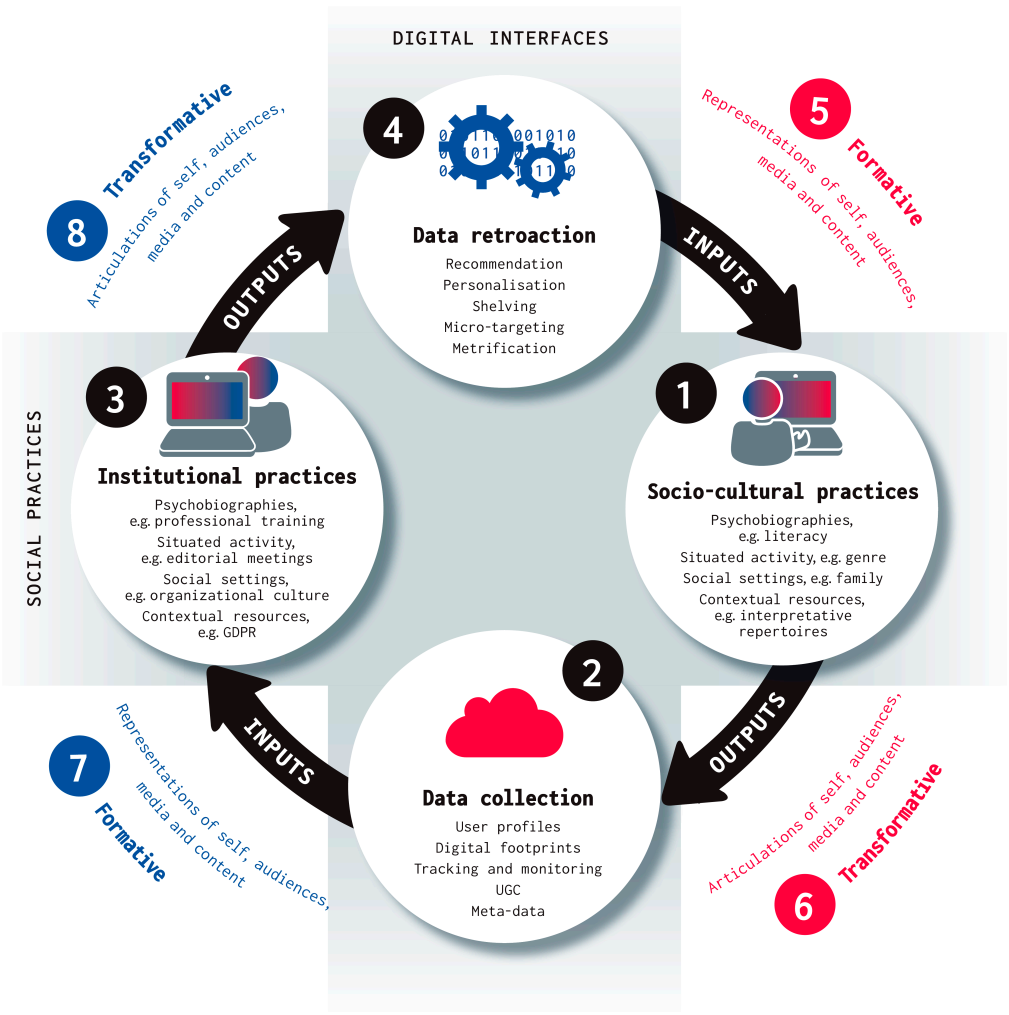

Figure 2: The formative and transformative experiences of the data loop

ences are, and they often invest intentions in media texts that clash with the expectations of users (Livingstone, 2007). While big data is often suggested as a response to this problem, we doubt it solves it at all. Audiences are "seen differently, but not more accurately" with big data (Fisher & Mehozay, 2019, p. 1). Hence, we understand the formative experiences to be about the ways datafication is mirroring the understanding of audiences, self, media and content, while transformative experiences concern the articulation or implementation of these understandings in the practices of media actors and audiences.

Formative* (5) *and transformative* (6) *experiences of media audiences

Many theorists assume that datafication gains its power because it is invisible to users (Cheney-Lippold, 2011). There is a tendency to regard responses to algorithms as automatic, unconscious and compliant. Eslami et al. (2015) argue that 62% of Facebook users were unaware of algorithmic newsfeed curation at the time of their study, a number which is likely to have diminished substantially as users have become more familiar with datafication. But even when data are invisible or not perceived, media texts can still provide a site of reflections on the implications of datafication. The algorithmic work behind the formation of filter bubbles (Pariser, 2012) may indeed be invisible and perhaps even incomprehensible to ordinary users. But the bubble can be felt and reacted upon.

Through the concept of "algorithmic imaginary", Bucher (2017) has looked at how users become aware of the algorithm and how this awareness affects their use of algorithmic media. Bucher documents the "whoa" moments where users discover the implication or workings of the algorithm on their mediated experience, what is often referred to as "creepiness" (Lupton & Michael, 2017). She points to users being able to recognise "faulty attempts at prediction" or seeing through the "popularity game" that is part of the logic of Facebook, for example. Other scholars have noted the awareness developed by users in the face of datafication. Dencik and Cable (2017), for instance, argue that data surveillance has a "chilling effect" on activists and citizens concerned with privacy (see also Lupton & Michael, 2017; Athique, 2018). Lomborg and Kapsch (2019) looked at how users "decode algorithms" as experienced through their use of media, uncovering both positive and negative experiences with algorithms.

While these scholars have opened up the idea that users are indeed aware of algorithms, we wish to expand their thinking to other aspects of datafication. In general, we argue that media provide formative experiences (5) to the audiences, an opportunity to consider the images of themselves reflected by datafied media texts (the algorithm, the recommendation, the personalisation, the metrics, etc.). Is this what I like? Is this what I want? Is this who I am? As illustrated in Vignette 2, data retroaction provides a mirror which audiences can use for self-reflection. Hence formative experience is related to the visibility that digital interfaces provide to datafication and to the literacy of users experiencing datafication. In the context of the data loop, these reflections and questions can have consequences for the choices made when consuming media—what we call "trans-

formative experiences" (6)—with repercussions for how data will be collected and carried further within the loop, and eventually back to them.

Vignette 2 Failing to train Facebook ad targeting

Searching for a new car, Pille starts paying attention to Facebook advertisements, a practice she otherwise avoids. She clicks on ads that show different car sellers, showcasing interest in local car dealers and their offers in hopes of receiving more ads that would support her search for a new car. Her attempts to narrow down her interest in hybrid cars do not seem to have the desired effect; the ads still show all kinds of cars and the promotion of hybrid cars does not increase. She suspects that the keywords supporting the algorithms are not specific enough, limiting her possibility to train the advertisements to meet her specific search.

It is generally admitted that users have little control over which data are collected or how this collection takes place (Brandtzaeg et al., 2018; Hargittai & Marwick, 2016). Acknowledging this, we should not deny the possibility that users can exercise some control over the transformative experiences that they provide via data collection. There is, for instance, a growing literature about the ways users cope with data collection and develop tactics to avoid being registered, seen, etc. (Mayer, 2016; Mollen & Dhaenens, 2018), or on the contrary, tactics for being seen by the algorithm (Ruckenstein & Granroth, 2019), which Vignette 3 illustrates. As Lomborg and Kapsch observe:

> While users may seem stripped of agency once they are looped in algorithmic systems in everyday life, the small acts of actively curating, withholding or flagging information to tweak the system to enhance privacy and evade precise profiling are indeed subversive means to speak back to the system. (2019, p. 14)

Vignette 3 Struggling with personalisation on Netflix

David is frustrated by his attempts to train Netflix to understand his and his spouse's overlapping interests. As they have diverging interest in watching films on their respective user profiles, they create an additional common profile in an attempt to obtain recommendations that match their interests as a couple. However, while they manage to curb the over-representation of antagonistic genres, their attempts to train Netflix algorithms to propose films to be enjoyed together is not working particularly well. David wishes he could simply tell Netflix about their tastes.

These transformative experiences can be frivolous and playful (Mahnke & Uprichard, 2014) as well as reflexive and strategic, such as when a user is trying to train or game the algorithm (as seen in Vignette 3). Individual experiences and encounters with data and data collection can strongly influence our practices in opening up profiles or leaving digital footprints. Users can deliberately obfuscate the data collected about them (Brunton & Nissenbaum, 2011) when they purposefully monitor the signals that they send to the algorithm or inscribe in data collection, in the hope of controlling the output (retroaction) of the algorithm. Similarly, users can be said to game the algorithm when they play along with the logics of algorithms, for example, when they purposively like or share a Facebook post in order to promote it, to have it reach a wider audience, taking advantage of the marketing logics of this social media platform.

Seen from the perspective of a loop, these formative and transformative experiences of media audiences have implications for the circulation of data within the loop and eventually for how datafication works in the media industry:

> As Rader and Gray (2015) point out, the feedback-loop characteristics of these systems make user beliefs an important component in shaping the overall system behaviour. When users 'click consciously', disrupt their 'liking' practices, comment more frequently on some of their friends' posts to support their visibility, only post on weekday nights, or emphasise positively charged words, these movements or reactions are not just affected by the algorithm (or, rather, by people's perceptions of the algorithm), these practices also have the ability to affect the very algorithms that helped generate these responses in the first place. If we want to understand the social power of algorithms, then, critiquing their workings is not enough. While algorithms certainly do things to people, people also do things to algorithms. The social power of algorithms—particularly, in the context of machine learning—stems from the recursive 'force-relations' between people and algorithms. (Bucher, 2017, pp. 41–42)

To better understand the context of the formative and transformative experiences of media audiences, we return to Layder's social domains (1997, 2013). From the perspective of *psychobiography*, we can ask to what extent the formative and transformative experiences of audiences are dependent on personality, personal history and varying literacies and interpretive resources.

Situated activities, e.g. social relationships, contexts of engagement and types of discourses, can intersect with datafication in a myriad of ways. For instance, early research was often critical about Internet users creating fake profiles or false identities in online spaces (Turkle, 1995; Wynn & Katz, 1997), yet today, we can see these practices as strategic impression management (Labrecque et al., 2011) or part of vernacular resistance (Brunton & Nissenbaum, 2011). In experiencing datafication, audiences react by implementing activist practices, formatting their behaviour to modify the data collected about them, yet we need to know more about what kinds of interaction and social situation spark these reactions.

Social settings, meaning friends, family, peers, work or study culture provide contexts of interaction with and interpretation of data and algorithms. Not only do social settings provide context useful for assessing our formative and transformative experiences, but they are also affected by datafication. The anecdotal evidence of a father who learns about his daughter's pregnancy by algorithmic recommendation of baby products (Ellenberg, 2014) is just one example in which data retroaction can become invasive and a source of reflection for audiences.

The capacity to resist or shape data collection or evaluate retroaction is dependent on *contextual resources*, such as age, class, gender, education, etc. Yet, other resources have the power to shape these experiences. The implications of legislative frameworks and regulations such as the General Data Protection Regulation (GDPR) need to be fully appreciated for the ways they affect formative and transformative experiences.

Formative (7) and transformative (8) experiences of media actors

In most large media organisations today, data collection is a purveyor of "audience insights". In other words, data collection provides formative experiences (7) to media actors concerning aspects of the sociocultural practices of audiences. From these insights, media actors can evaluate their performances, which they can then adjust in data retroaction, what we call transformative experiences (8).

Hence, for media actors, data collection provides both a mirror, from which they see themselves, and a sense of orientation into the world of the audience, sometimes challenging the gut feeling of journalists (Zamith, 2018). What Cohen (2018) labels as "measurability" invites reflection: "how well are we doing? How well did we do yesterday? What should we focus on today?" (p. 577). Zamith (2018) reviews the evidence from dozens of studies documenting how attitudes, behaviours, content, discourse and ethics of the journalists are affected by the quantified audiences—encompassing formative and transformative experiences.

Media actors, situated in the data loop, are involved in interpreting the insights provided by data collection and implementing these in media production and distribution. Hence, they also have an active role to play in making datafication work. There is a growing literature that argues how human and social processes need to be invested in order to make data work (Lupton, 2016). As observed by Gitelman (2013), stressing the dependence of data on culture, "raw data is an oxymoron".

More research is needed to understand the ways media actors make sense of audience data. According to Alaimo and Kallinikos (2017), two main assumptions are driving the formative experiences provided by data in the media industry: assumptions about popularity and similarity. In a similar way, Bolin and Andersson Schwarz (2015) argue that data support and provide feedback to media institutions in their anticipation of efficient delivery and popularity. We believe these assumptions are driven by the tight grip that

marketing has had on the development of datafication in media industries (Couldry & Turow, 2014).

As media actors implement the past experiences of users into the present of production and dissemination, they transform and incorporate their understanding of users' practice into media texts and digital interfaces. In doing so, media have possibly enlarged their grasp over audiences, or what Ang (1991) calls "discursive control": the control of audiences through the production of knowledge. These transformations incorporate into institutional practices insights from the audiences together with other aspects of social settings and contextual resources, such as a drive for profit, and marketing logics, but also understanding of journalistic culture, institutional values or expectations from regulators. Fisher and Mehozay (2019) comment on some of the motivations behind the use of algorithmic curation on Facebook: "The motivations for this procedure can be multiple and even contradictory: keeping users on the website as long as possible, creating as much engagement as possible, promoting one particular type of message over another, and so forth" (p. 2). In a manner that parallels what goes on for the audiences, the transformations within media institutions can be strategic. These can include, for example, A/B testing in news organisations performed to attract more readers (Groot Kormelink & Costera Meijer, 2018), or the practice of micro-targeting, which seeks to influence audiences (Turow, 2011), often without their awareness.

The production and distribution of media texts that follow data collection bear traces of datafication. Digital interfaces can signal in explicit or implicit ways the experience of datafication that they provide users through digital interfaces. As seen in Vignette 1, Amazon is shelving item recommendations in a way that signals how user data are being used and retroacted to users. Buried deeper within the Amazon infrastructure lies the possibility to "train" the algorithms by purposefully feeding more input information through removing items from view, or rating items. As such, Amazon seems to engage in more transparent data retroaction because it makes aspects of datafication visible to the users, affording the possibility of a more agentic and reflexive formative experience for the users. This is to be contrasted with the data retroaction deployed by news organisations, in which the transformations made to news items (such as changing headlines; see Groot Kormelink & Costera Meijer, 2018) are not visible to users, hence impeding on the possibility of a formative experience. Vignette 4 illustrates these issues of visibility in the experience of datafication.

Vignette 4 Participating on Goodreads

Pille reads and reviews a lot of books on Goodreads, and while she also rates books there using the star system, her Amazon digital shelves seem to be only affected by the Kindle purchases, and not by using Goodreads. She is curious about this, as

Goodreads is owned by Amazon, and it would make perfect sense for the algorithms to offer a good deal on the books that she marks as "want to read" on the Goodreads platform. Her recent attempts to broaden her reading horizons make very little impact on Amazon recommendations, as years of narrowly focused purchasing history possibly outweigh recent sporadic purchases.

Specific experiences with datafication happen across all of the social domains. *Psychobiographies* of journalists (Kõuts-Klemm, 2019), designers of algorithms (Svensson, forthcoming) and editors and media makers (Diakopoulos, 2019) are known to orient their data practices. A literature is emerging that documents the biases inscribed in algorithms (Noble, 2018), for instance, as designed by and for white people or men (Eubanks, 2017). There is also a literature showing how media actors may lack the skills to interpret user data. For instance, Groot Kormelink and Costera Meijer (2018) have documented 30 distinct meanings associated with the behaviour of clicking on a news item, while arguing that clicks provide a flawed measure of audience interest in the news. Essentially, these authors argue that media actors may be in need of a better "audience literacy".

The domain of *situated activities* can also be called the domain of encounters between people or between people and technology. Data encounters in the newsroom where journalists "meet" the preferences of audiences as mediated by data are balanced with the letters to editors, call-ins or other forms of audience feedback. Encounters can also include discussions with a newly established position as audience-oriented managers whose role is to help journalists to negotiate data about the audiences (Ferrer-Conill & Tandoc Jr, 2018).

Social settings stemming from professional cultures or a traditional paternalistic attitude of journalists (Nanì, 2018; Thomas, 2016) alternate with gamifying the chase after audience numbers (Ferrer-Conill, 2017). Diakopoulos (2019) stresses that the adoption of algorithms and automation in news production is inevitably a reflection of human values, including professional journalistic values.

We know that the practice of journalism, to continue on a well-studied example, is affected by gender and other *contextual resources* (Shoemaker & Reese, 2014), but it remains to be seen how these affect the formative and transformative experiences of journalists. Audience analytics are shaped by social and economic contexts and are part of larger socio-technical systems (Zamith, 2018). National and international regulations shape institutional media practices, for instance, by limiting certain data practices, providing competitive motivations, providing tools and technologies available for data collection and retroaction.

Discussion

There are many models within media and communication theory that incorporate audience feedback (Foulger, 2004), or even represent communication as a circuit. One can ask, in what way is the *data loop* similar to or different from these existing models? The model of the data loop breaks with the linearity and unidirectionality of what the study of datafication predominantly epitomises. The model sets media actors and audiences in a relation of mutual dependence and underlines their agency. Hence, the model offers a non-deterministic path to study how the datafication is made to work by media actors and audiences.

Audience feedback appears repeatedly in models of communication (Foulger, 2004), and yet the notion occupies little space in current thinking about the media (Schrøder, 2017). In media theory, considerations for audience feedback can be said to pale as an afterthought in comparison to the dominant role ascribed to media in defining reality.[3] There are certainly methodological challenges in appreciating how audiences' processes of selection and interpretation are looped back and eventually influence media production (see Ang, 1991, for an exposition of the epistemological tensions in this research). But in an age of surveillance, where data have become a channel for "many-to-one communication"—a way to talk back to the system (Jensen & Helles, 2017)—the idea of audience feedback needs to be taken more seriously.

The media–audience nexus is associated, with the help of social theory, with the structure–agency dialectic. It is hard to avoid seeing the linearity in this dialectic in which structure primes, and agency follows. While Giddens (1986) acknowledges the duality of structure as both "structuring" and "structured", in media studies, the agency of the audience is often pitched against the structure of the media. This is apparent in the conceptualisation of datafication as a structuring force of oppression, against which agency is then understood as resistance (for example in Zuboff, 2019 or Couldry & Meijas, 2019). A loop model allows underlining the recursiveness at play between media actors and media audiences and their mutual dependence. To break with the structure–agency debate, we see Derek Layder's social domain theory (1997) as a useful framework. This is especially the case as it also helps to showcase that individual agency (psychobiography, situated activities) is present, not only amongst the audiences, but also amongst media actors. There is no need to pick sides or present the agency of audiences as an opposite to the injustices inflicted by data industries; instead, Layder's four domains invite considering media actors and audiences as both situated within practices of datafication.

Mutuality stands for the idea that data collection and retroaction are both processes of providing inputs/outputs that can be observed from the perspective of either the media or the users. As we discussed above, users could be said to "collect" datafied experiences in the outputs that media produce and which feed into their consumption, serving as a basis to "retroact" datafication back to the media. Mutuality, then, underlines the mutual dependence between media and users in making datafication work for one

another. Accepting that media and audiences have different power positions in society, we do not imply equality in the relation between media and audiences. Still, we intend to break with a tradition of research that regularly associates media institutions with moulding structural forces. In our model, both actors are constrained by the contextual resources and social settings, meet through situated activities and constitute their experiences through their psychobiographies. In other words, we need to pay attention to the possibilities and limitations of both media makers and audiences within the context of datafication. As Zamith (2018, p. 431) concludes, it is crucial to keep in mind that there is an iterative process, where the data and external forces of datafication are not taking over, but rather negotiating their way into newsrooms and our living rooms.

The model of the data loop is also a "circuit model", describing how experiences of datafication are circulating within the data loop. The "circuit of culture" is a well-known model proposed first by Johnson (1986) and developed by Du Gay et al. (2013), which promoted the non-deterministic study of culture. The model supports the idea that the meaning of a cultural object is "shared" among five different moments from cultural production to consumption. While meaning ascribed at each moment has implications for the next, none of these moments alone captures the meaning of culture. In a similar way, we argue that the study of datafication needs to be broken down into distinct but interconnected moments. The model of the data loop underlines how one moment has implications for what is going on at other moments in the loop without determining them. Showcasing interrelationships among actors and digital interfaces, we want to raise awareness of the limitations with previous work in which datafication is studied as a single deterministic moment. The moments of formative and transformative experiences are thus interconnected and non-deterministic sites of reproduction and transformation of datafication.

The idea of circularity in the datafication of media has been discussed before (Alaimo & Kallanikos, 2017; Bolin & Andersson Schwarz, 2015; Willson, 2017), and it is essentially the premise behind the notion of a "filter bubble" as suggested by Pariser (2012). In these cases, circularity is the primary mechanism reinforcing the deterministic nature of datafication. For example, the collection and analysis of data is often motivated by assumptions of similarity between users (as seen in Vignette 1). As similarity is retroacted to users in the form of shelves, recommendations or personalisation, it narrows the choices offered to the audience. This, in turn, reflects back to media in a new round of data collection, reinforcing itself and becoming a self-fulfilling prophecy. However, paying attention to transformative experiences makes us aware that actors can also adapt to, change and even stop this circular reinforcement. Interactions among actors and digital interfaces are likely to lead to "loop fatigue", and users as much as media actors have the possibility of breaking out from the loop.

Conclusion

This article has modelled the data loop in order to study datafication in a non-linear, non-deterministic way, emphasising the agency of social actors in interaction with digital interfaces of data collection and retroaction and the experiences of datafication that these interactions afford. In doing so, we have emphasised an audience perspective to the study of datafication, which has until recently been largely ignored.

Our explorations of the data loop are only the beginning of a vast project. Empirical research needs to fill the gaps, bring nuances and develop the concepts in the model across a diversity of contexts. One difficulty in developing this model has been to find a middle ground between the need to generalise from different experiences and to refrain from doing so without a more extensive basis. We hope that the model can become an inspiration for others who can fill it with details from specific cases, specific media and specific sociocultural practices.

So many questions await answer. How do institutions translate their practice into the world of their users, and how can they make datafication more transparent? How do users experience datafication in data retroaction, and what can they learn from it? In what ways do users adjust, change or abandon their practices as they navigate an increasingly datafied environment? How can institutional actors learn from data, and notably, what affirmative actions could different media actors take in contextualising, interpreting and implementing data insights into their practices? What are the possibilities for institutional actors to resist the dominant logics shaping datafication, such as audience commodification and marketisation?

In looking at the data loop as a whole, across the multitude of contexts within the social domains, we insist on the attention to the mutual roles that institutional and sociocultural actors play in making datafication work. In response to the call for resistance towards data colonization (Couldry & Mejias, 2019), we believe that both media actors and audiences have a role to play for the reproduction and hopefully for the transformation of datafication.

Notes

1 We appreciate the challenges and suggestions brought by Susana Tosca, Martin Berg, Jakob Svensson, the two anonymous reviewers, as well as the participants at the Data Society programme seminar (Malmö University) in which we presented our paper. They have helped us formulate a better experience for our coming readers.

2 In this article, we use the term "audience" in order to attach our rationales to the tradition of audience research which sees audiences as agentic and active. However, we use "audience" interchangeably with the term "user" in connection to digital media, in spite of some conceptual differences between the two terms (see Livingstone, 2005, or Picone, 2017, for discussions).

3 It is even said that "feedback" was later added to the Shannon and Weaver model, the mother of all communication models, by Norbert Weiner in a bid to overcome the linearity of the model (Gordon, 2019).

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