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4.   Sensitizing for Algorithms: Foregrounding Experience in the Interpretive Study of Algorithmic Regimes

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Abstract

Investigations of algorithmic regimes benefit from attention to people's experiences. However, when applying methods that involve users and lay people to this topic, particular challenges arise: unequal and low awareness of algorithmic systems, digital inequalities, varied meanings of "algorithm," and the fact that people are often not involved as users in such systems. We propose "sensitizing activities" as a technique to address these challenges: preparatory exercises that subtly foreground the presence of algorithms, thus raising algorithmic awareness and establishing a shared understanding among participants without distorting their experiences and expectations. Drawing on our experience with sensitizing activities in three studies, we provide suggestions to researchers and practitioners who want to deploy this technique in their own investigations.

Keywords: interpretive methodology; co-creation; interaction design; algorithmic awareness

Introduction

As software is eating the world, various kinds of algorithmic systems increasingly play a role in many of our daily activities (Willson, 2017). Algorithms and the technical systems in which they are embedded are no longer the exclusive concern of computer scientists and programmers but have become a relevant topic to many academic disciplines. Due to

the power they exert over people and societies (Beer, 2017), algorithms become a matter of public relevance (Gillespie, 2014). Considering these developments, "algorithm" is no longer merely a technical term referring to a sequence of computational steps acting on data structures and producing output. The notion of "algorithmic system" refers more broadly to those systems that "operate semi-autonomously, without the need for interaction with, or knowledge of, human users or operators" to which we often delegate everyday tasks (Willson, 2017). In this sense "algorithm" refers to the broader assemblages of which these computational sequences are a part, thus drawing attention to the socio-technical nature of these systems (Burke, 2019). In this chapter, we use "algorithm" and "algorithmic system" to refer to these broader assemblages.

Algorithmic systems become publicly relevant when they select or exclude information, infer or anticipate user information, define what relevant or legitimate knowledge is, flaunt impartiality without human mediation, provoke changes in the behaviour of users, or categorize users or publics according to their preferences (Gillespie, 2014). The increasing importance of such systems in our personal and public lives gives rise to new knowledge regimes which can be called "algorithmic regimes" (see Jarke et al., in this volume). Investigations have highlighted that these algorithmic systems can negatively affect users and society. Findings include biases in penalization outcomes (Bozdag, 2013), increased anxiety among social media users (Bishop, 2018), lack of control and meaningful feedback to users of recommendation systems (Eiband et al., 2019), and an extensive list of ethical issues, such as unjustified actions, opacity, discrimination, and challenges to the autonomy of users (Mittelstadt et al., 2016).

In a previous publication (Alvarado, Storms, et al., 2020), we explored how a co-design approach rooted in participation and co-creation (Sanders & Stappers, 2008; Sanders & Stappers, 2012) can promote the active involvement of users in the design process of user-facing algorithmic systems. More specifically, we identified challenges to end users' involvement in the context of algorithms and how researchers might overcome them, such as low "algorithmic awareness" and the various meanings of the term "algorithm." To address these challenges, we proposed including preparatory activities that "sensitize" participants to the presence of algorithms in their daily interactions with technical systems.

In this chapter, we expand on these ideas to make them useful not just for co-design but for the study of algorithmic systems and regimes more broadly. The leading for this chapter thus is: *How can we subtly prepare participants for active involvement during interpretive research on algorithmic*

systems? We first identify two additional challenges to interpretive research on algorithmic systems: digital inequalities and indirect involvement. We then suggest that "sensitizing activities" can help researchers understand how people perceive and experience algorithmic systems. To make our case, we revisit three research projects in which we deployed such sensitizing activities: sensitizing interviews (in research on video recommendations), a sensitizing diary study and workshops (in a project on news recommendations), and sensitizing online questionnaires (in research on tangible interactions with movie recommenders). Reflecting on our experiences, we then provide suggestions for researchers and practitioners who wish to develop and apply similar activities in their projects. Finally, we call for further methodological innovation in the investigation of algorithmic systems from a social sciences perspective. We hope this chapter helps to highlight some of the methodological challenges to the study of algorithmic systems and provides a departure point for further exploration of methods to engage participants in this research context.

Imaginaries and Folk Theories: An Interpretive Approach

Any investigation into how people relate to algorithmic regimes needs to consider how they understand the presence or absence of these technical systems. One tradition in philosophy and the social sciences that puts how people perceive and experience things at the centre of its epistemology, is phenomenology. Phenomenological inquiry pays particular attention to how phenomena appear to individuals (Baert, 2006). Such emphasis on experience and perception is crucial, the argument goes, because how people act is based on how they "make sense" of the world around them. In the context of complex technical systems such as algorithmic systems, a phenomenological lens emphasizes the importance of considering how lay people and experts alike relate to such systems: how they perceive them, which meanings they attach to them, and how their understanding alters behaviour.

Recent research on social media has shown the usefulness of such an approach. Bucher (2017, p. 31) developed the notion of *algorithmic imaginary* to refer to "the way people imagine and experience algorithms [on social media] and what these imaginations make possible." These "imaginaries" have productive and affective power, as peoples' perceptions impact how they interact with and use algorithmic systems.

A related concept is that of *folk theories*. In human–computer interaction (HCI) this notion refers to "the intuitive, informal theories that individuals

develop to explain outcomes, effects, or consequences of technological systems" (French & Hancock, 2017). Previous research has explored how these folk theories are formed and how people use diverse sources to form these intuitions, describing their complexity and malleability (DeVito et al., 2018). Others have deployed the concept of folk theories in the context of Twitter (DeVito, Gergle, & Birnholtz, 2017) and Facebook (Eslami et al., 2016) to focus on users' understandings and reactions to algorithmic curation of their feeds and, in turn, how such understandings influence their interactions with these platforms.

The algorithmic imaginary and the folk theory concepts share a "phenomenological sensitivity" as they direct our attention to peoples' perspectives, experiences, and understandings, and how these influence interactions and behaviour. We refer not merely to "experience" in the sense of "user experience" (which is typically the domain of HCI; see the critique by Dourish, 2019), but use it in a broader sense to include tacit and embodied knowledge and emotional affects. Regarding methodology, the phenomenological approach, with its attention to experience, is well represented in interpretive studies in the social sciences (Schwartz-Shea & Yanow, 2012). This methodological framework emphasizes the relevance of local and situated knowledge of those involved and attempts to uncover understandings and experiences through qualitative research techniques such as observations and interviews. While such an interpretive approach is promising for studying algorithmic regimes, there are specific challenges when it comes to involving peoples' experiences with and views on algorithmic systems, which we discuss in the next section.

Methodological Challenges to the Interpretive Study of Algorithmic Systems

The interpretive approach to algorithmic regimes and automated systems discussed in the previous section depends on (some degree of) "involvement" by respondents. In this section, we identify four challenges to such an investigation: (1) limited awareness of algorithms, (2) broader digital inequalities, (3) multiple meanings of the word "algorithm," and (4) indirect involvement.

Limited Awareness of Algorithms

Assessing how knowledgeable people are about algorithms is challenging. Recent work has highlighted the importance of determining how much

users understand and are aware of algorithms. For instance, Hargittai et al. (2020) call for more empirical studies into how users approach algorithmic systems and the extent to which they possess the knowledge to use them. Hargittai et al. (2020) note "that there is not necessarily a ground truth to which researchers themselves are privy" since such systems are often proprietary and rarely made public. Such limitations make it challenging to accurately measure people's knowledge about algorithms, yet some assessments exist.

Previous research has exposed how users are often unaware of the presence of algorithmic systems. Hamilton et al. (2014) assessed that less than 25% of regular Facebook users were aware that their news feeds were algorithmically curated. Similarly, Eslami et al. (2015) reported that less than 37.5% of participants in their experiments were aware of algorithmic filtering of their Facebook news feed. Other studies have attempted to measure algorithmic awareness more precisely and in different contexts. Gran et al. (2021) examined awareness of and attitudes towards algorithmic recommendations across 1,624 participants in the highly digitised country of Norway, concluding that 61% of the Norwegian population has no to low awareness of algorithmic intervention in recommender systems. Similarly, Swart (2021) notes that algorithmic awareness among highly educated young people in the Netherlands varies significantly. "Some had never heard of the word 'algorithm' at all," she writes, pointing to crucial gaps in their knowledge (Swart, 2021). Likewise, Koenig (2020) focused on young technical and professional communication students, confirming that they possess some essential yet superficial algorithmic awareness.

Furthermore, researchers have found that becoming aware of algorithmic intervention often involves strong negative emotions (Koenig, 2020) and can provoke feelings of anger, betrayal, and discomfort among participants (Eslami et al., 2015). Crucially, when people become aware of previously hidden algorithmic processes, this consciousness impacts how they behave (Rader & Gray, 2015; Bucher, 2017).

Consequently, algorithmic awareness varies considerably among different populations (as discussed further in the next section). At the same time, it is essential to remember that awareness is not merely "measured" but also "co-constructed" through interactions between researchers and participants when the former presents design scenarios and questions to the latter. Regardless of the "actual" level of awareness among the general population and while being cautious of generalizing all too easily, it is evident that researchers and designers cannot take for granted that users are aware of the algorithms in the technological systems they interact with.

Digital Inequalities

The limited and varied awareness of algorithms is related to broader digital inequalities. Various investigations have highlighted how knowledge about digital infrastructure, including algorithmic systems, differs according to demographic characteristics.

Knowledge and awareness of the presence of algorithms on online platforms seem to vary according to socio-economic characteristics. Such differences reflect the long history of structural, digital, and information inequalities that are related to socio-economic disparities: those with more resources experience more significant opportunities for education and the development of digital skills, create and belong to social networks that sustain more pertinent technical insights and possess greater autonomy of access to digital technologies. They are, therefore, more likely to have experience with, learn how to use, and understand algorithms they interact with (Cotter & Reisdorf, 2020). As a result, knowledge about algorithms "remains the domain of a select few users" (Klawitter & Hargittai, 2018).

For example, people with higher socio-economic status in the United States seem to possess more knowledge about how algorithms work. A high level of education is positively associated with knowledge about algorithms, while age could correlate negatively (Cotter & Reisdorf, 2020). Similarly, in Norway, researchers discovered differences in algorithmic awareness related to age, education, and gender (Gran, Booth, & Bucher, 2021). A study in the Netherlands revealed erroneous algorithmic beliefs are more prevalent among older people, people with lower education, and women (Zarouali, Helberger, & Vreese, 2021). The prevalence of such misconceptions is, in sum, related to the broader digital divide within contemporary society.

These findings underscore that researchers studying algorithmic systems need to be aware that not everyone has equal access to these systems or can relate their experiences to the presence (or absence) of algorithms. Any investigation into the role or impact of algorithmic systems on daily life needs to take such disparities into account, and when people are involved in such research, scholars need to pay attention to socio-economic and demographic diversity.

The Multiple Meanings of "Algorithm"

Besides the low level of algorithmic awareness and the related digital inequalities, a more profound challenge is related to the concept of "algorithm" itself. It is particularly difficult to adequately define what algorithms are

to "fully grasp their influences and consequences" (Beer, 2017). Moreover, previous research has proven how terminological differences can affect people's perceptions of algorithmic systems (Langer et al., 2022).

Gillespie (2016) distinguishes different understandings and uses of the term. "Algorithm" can be a concept used by computer programmers to refer to a model that achieves a particular goal. It can also be a synecdoche that refers to its broader socio-technical implications (similar to how we use the concept in this chapter). Sometimes it is used as an adjective to describe a type of phenomenon, as in "algorithmic journalism" or "algorithmic experience." Sometimes the term is used as a "talisman," for example, when companies refer to it to avoid responsibility. These varied uses of the concept point out that "the algorithm" can have different meanings for different contexts or groups, an aspect to consider when investigating algorithmic regimes.

Even people with expert technical knowledge conceptualize algorithms in many ways. Paul Dourish (2016) proposes to approach algorithms as a "term of technical art" used by members of a specific profession to explore how these actors use the word. He suggests an ethnographic approach, considering algorithms as a term used within a particular professional culture. Responding to this call, anthropologist Nick Seaver (2017) emphasizes that algorithms are not technical objects embedded *in* culture but are *themselves* culture. Seaver points out that even among technical experts and practitioners, "the algorithm" does not appear as a singular technical object. It is enacted in different ways, causing the algorithm to become "multiple" (Seaver, 2017). He underscores that even at the level of engineering, the algorithm is everywhere and nowhere at the same time. Algorithms, Seaver concludes, are "composed of collective human practices" and thus do not "heed a strong distinction between technical and non-technical concerns" (Seaver, 2017). Algorithms are thus best approached as "sociotechnical systems, influenced by cultural meanings and social structures" (Seaver, 2019).

This diffuseness and heterogeneity of the term "algorithm," even when used by technical experts, presents a significant challenge when researchers and designers aim to involve participants in their studies of algorithmic regimes. As participants understand the term radically differently, comparing and synthesizing their ideas and experiences becomes difficult. In addition, researchers must be aware of the broader contexts within which participants share and reflect on their experiences, keeping in mind that a single, technical understanding of "the algorithm" fails to account for these multiple meanings of the concept.

Indirect Involvement in Algorithmic Systems

A fourth challenge is related to the multiple ways in which people can be involved in algorithmic systems. While both the algorithmic imaginaries and the folk theories refer to ideas held by users directly interacting with algorithmic systems, we need to look *beyond* the conceptualization of "the user" to identify how algorithms affect people, precisely because people are involved in different capacities than simple "users."

Fields such as human–computer interaction traditionally conceptualize human subjects as users of computer systems. Such emphasis on direct interaction obfuscates the many other ways people are implicated in digital infrastructures (Baumer & Brubaker, 2017). There are subject positions beyond simple use, such as when someone uses a system on behalf of someone else or when a system impacts people who do not directly interact with it. It is therefore vital to consider "subject positions other than that of the classical user" (Baumer & Brubaker, 2017).

This idea is fundamental in the context of algorithmic systems, for example, when they filter job candidates, assign credit scores, calculate insurance fees, or identify people based on their facial characteristics (O'Neil, 2016). While these systems are obviously "used" by someone, these users are not the same as those subjected to and affected by automated decisions. These examples emphasize how people can be unwillingly or unwittingly involved in algorithmic systems.

Consequently, investigations into algorithmic systems need to consider more people than just users. To investigate how those that are "indirectly involved" in algorithmic systems relate to them, it is crucial to include these people in research and design initiatives. Involving them as stakeholders, however, requires careful consideration of their position and the types of knowledge they possess. Moreover, they might not even recognize algorithmic systems, might be unaware of them, and have difficulties conceiving them. In this context, we argue that *sensitizing activities* can be helpful.

Addressing the Challenges: Introducing Sensitizing Activities

With digital inequalities, limited and varied levels of algorithmic awareness, the multiple meanings of the concept algorithm, and the indirect involvement, we have at least four specific challenges that can hinder the active contribution of participants in the research on these systems. To address these challenges, we argue that it is helpful in subtly guiding participants'

knowledge, attention, and understanding during the research process. Importantly, researchers need to do this without directly affecting users' personal experiences and understandings of these systems.

In this context, the notion of "sensitizing" can help us develop such strategies. We use the term "sensitizing" similarly to how sociologist Herbert Blumer (1954) used it in the context of social theory. For Blumer, theoretical concepts first and foremost guide the attention of researchers. He used the term "sensitizing concepts" to highlight that they do not provide direct descriptions of phenomena but "suggest directions along which to look" (Blumer, 1954). This approach to theoretical concepts has been very influential in interpretive methodologies and qualitative research in the social sciences and related fields.

In the field of human–computer interaction, researchers have used "sensitizing" to refer to concepts that can foster attitudes and sensibilities in designers, practitioners, and other researchers. For instance, researchers have applied "sensitizing concepts" to consider the consequences of proxemics in interaction design (Krogh et al., 2017), to inform the design of systems that promote playful interactions with children (Rennick Egglestone et al., 2011), or to help designers consider the diversity of human needs when conducting user experience research (Krüger et al., 2017). Other human–computer interaction practitioners have used the term "sensitizing" to actively define activities involving specialists and end users in the design process. For example, researchers have devised role-playing scenarios to sensitize different design teams and introduce them to complex theories about museology (Waern et al., 2020), deployed "sensitizing techniques" to involve children in the design of serious games (Sim et al., 2016), or used sensitizing terms to guide participants who experience, evaluate, and report on open-ended interactive art (Morrison et al., 2011).

Departing from these examples, we use "sensitizing" to denote a similar idea. In the context of algorithmic systems, we use "sensitizing activities" to refer to the *subtle efforts and exercises* via which researchers, designers, or practitioners can sensitize participants to the existence of these algorithmic systems and suggest a shared understanding of what the algorithm is concerning the research context or goal. Such activities should prepare participants for more elaborate reflection on their experiences and more direct engagement with "the algorithm" in subsequent research activities.

For our purposes, *sensitizing* is not focused on theoretical concepts used by researchers (as used by Blumer). Instead, we focus on the participants who are sensitized and who become receptive to algorithmic regimes and

their specific qualities via hands-on activities. Sensitizing activities are small tasks and exercises that participants carry out in preparation for research activities and involve them in further reflection on their experiences and perceptions of algorithmic regimes.

Without calling them "sensitizing activities," previous research in HCI has employed these kinds of preparatory exercises before exploring algorithmic regimes. In the context of algorithmic curation on Facebook, Alvarado and Waern (2018) applied "priming tutorials" before a co-design workshop. This tutorial explained to participants "how algorithms are used in several common apps," focusing on Facebook. According to the authors, this explanation improved the awareness and understanding of the participants on how algorithms produce recommendations and select specific information, facilitating subsequent co-design workshops. Follow-up studies also applied similar techniques highlighting the challenges of low algorithmic awareness, one in the context of movie recommendations (Alvarado et al., 2019), and the combination of priming tutorials with group discussions to explore tangible algorithmic imaginaries (Alvarado et al., 2021). Similarly, Swart did not mention "sensitizing activities" explicitly but asked participants "to move through two to three social media apps as they usually would while thinking aloud about the context these platforms presented to them and theorising why these platforms would display these stories" (Swart, 2021). The author mentions this exercise "proved extremely helpful for having interviewees reflect on algorithmic curation and provided plenty of avenues to probe for algorithmic awareness, experiences, and tactics" (Swart, 2021).

It is important to note that the directness of sensitizing activities increases the risk of directly influencing or distorting the original insights and experiences of participants regarding algorithmic systems. Researchers, designers, and practitioners should therefore try to reduce this influence, mainly when we consider that the actual everyday experiences of participants are a crucial ingredient for fruitful research on algorithmic regimes (Willson, 2017; Bucher, 2017).

In the paragraphs below, we share our experiences developing and using sensitizing activities. We do so by discussing three case studies: an investigation of algorithmic video recommendations, a study on algorithmic news recommendations, and research on tangible interactions with movie recommendations. Without claiming a definitive methodological solution for the challenges outlined above, we hope these insights provide a starting point for further reflection and methodological discussion on sensitizing activities and similar approaches.

Sensitizing Interviews

In a study carried out in 2019, we explored how middle-aged consumers of YouTube videos understand their video recommendations and which interactive solutions they would suggest in such an interface (Alvarado, Heuer, et al., 2020). We interviewed 18 participants aged 37 to 60 years, with a mean age of 43.88. Since these participants belong to a generation that did not grow up with these technologies, they possess a high risk of low algorithmic awareness. As discussed above, research has highlighted how algorithmic awareness generally decreases as age increases. To address this issue, we attempted to sensitize participants as part of the research activities. To this end, we opted to start our research with what we called a "sensitizing interview." These sensitizing interviews were applied individually and consisted of common questions about YouTube to trigger reflection on the video recommendation system. Questions were: "Do you know you have video recommendations on YouTube?," "Do you watch the recommended videos that appear on the landing page?," "To what extent do you feel you understand why specific videos are included in your recommendations and others are not?," and "How much control do you think you have over the content that appears on your YouTube recommendations?" After these initial questions, we continued with the semi-structured interviews to explore how participants believed the recommender system on YouTube works and decides what to recommend. We allowed participants to visit and check their YouTube accounts during both parts of the interview.

These sensitizing interviews and complementary preparatory activities proved helpful. It reduced the effects of possible digital inequality in this middle-aged population, ensured algorithmic awareness among participants, helped provide a similar understanding of what to look at when referring to "algorithm" during the study, and thus improved our data collection process. During the interviews, participants felt secure and willing to provide their ideas about algorithmic regimes without restrictions, expressing questions, criticisms, and doubts about the system.

Sensitizing via a Diary Study and Workshops

In 2019, we participated in an interdisciplinary research project on algorithmic news recommendations. Together with legal scholars, we set out to investigate the extent to which news recommender systems are transparent about the data they collect and use, and how we might use co-design methods to develop an interface prototype that would make such

algorithms more understandable to everyday users. Here, we focus on the second goal of this research project. We organized co-design workshops where we invited users to reflect on their experiences and subsequently ideate new interface elements that could help increase the transparency and legibility of algorithmic news curation (Storms et al., 2022).[1]

As we know that only a minority of users are conscious of the algorithmic curation of social media feeds, we decided to take extra effort to sensitize participants before they participated in the research and co-design activities. To this end, we opted to (1) include a diary exercise for participants in preparation for the workshops and (2) organize two workshops with the same participants.

During the recruitment process and in the written invitation, we considered avoiding terms such as "algorithms" or "recommender systems" because we wanted to reduce the chances of recruiting overly critical participants about algorithmic regimes. Instead, we said we were looking for participants in a study focused on increasing transparency on how news spreads on social media. In total, 11 people participated in the workshops with various professional backgrounds such as finance, information technology, engineering, the cultural and social sector, and with ages from 18 to 65 years old.

Five days before the first workshop, the principal researcher assigned participants a diary exercise. The exercise aimed to sensitize participants to the algorithmic ranking of their news feeds. We took inspiration for this approach from previous research that explained how people became aware of algorithmic selection and ranking on Facebook by noticing that items were not shown in chronological order (Eslami et al., 2015). In their short, daily diaries, we asked participants to take note of the news they encountered in their Facebook feeds. They filled out a brief questionnaire via Google Forms for the first five items they saw in their feeds, and were asked about the position of each item in the feed, how old the item was, whether friends had previously interacted with it via likes or comments, and how closely it was connected to their interests. By asking participants to look at the time of publication of an item and its position in the news feed, we subtly encouraged them to reflect on the (algorithmic) selection process behind the system.

Feedback from the participants showed that we were successful in this regard. At the end of our study (after the workshops), we sent out a short

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1   More information about the "Algorithmic Accountability and Transparency in Practice" project is available in Storms et al. (2022), in the format of a poster (https://lirias.kuleuven.be/retrieve/651017) or in the work package reports (https://www.law.kuleuven.be/citip/en/research/atap/reports).

survey to learn from their experiences. Overall, participants found the diary helpful and the exercise informative. One participant mentioned that it caused them to "think more consciously, for once" about what they encountered on Facebook. Another stated that it was "interesting to focus on which news appeared on Facebook and why [it appeared] in this particular order." Other participants mentioned that it helped them prepare better for the subsequent workshop.

We paid additional attention to sensitizing during the first of the two workshops. We provided participants with printed versions of their diary entries and asked them to pick three items that stood out to them. Next, the workshop moderator explained that Facebook has a ranking system that determines how items appear in their news feed. We did not go into technical detail and only mentioned that Facebook has a ranking system that uses many factors to calculate a "relevancy score" for each item. To convey this message, the moderator used simple visuals from the Facebook press website.[2]

The workshop continued with a brainstorming exercise during which our research moderator instructed participants to reflect on their news feeds and write down factors that Facebook might consider when ranking the items. Under the guidance of the moderator, participants then combined these insights into a single diagram via a collaborative affinity mapping activity (Lucero, 2015). During this exercise, the research moderator invited the participants to comment and reflect on the ranking factors they thought were influential. This exercise served both as a complementary sensitizing activity and a way to explore the "algorithmic imaginaries" (Bucher, 2017) of the participants. The resulting insights were used later in the co-design activities during the second workshop.

In this phase, the moderator gave the participants co-design exercises. They presented their designs, shared and discussed goals and motivations, and voted on their ideas. The participants collaboratively proposed possible interface elements that could improve the transparency of personalized news recommender systems. Later in the research project, these ideas served as input for low-fidelity prototypes that we qualitatively evaluated with potential users.

In the end, the earlier sensitizing activities combined with a diary study and a collective brainstorming exercise during the first workshop proved

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2   We used screenshots from a video from the Facebook Newsroom, titled "News Feed Ranking in Three Minutes Flat" (https://newsroom.fb.com/news/2018/05/inside-feed-news-feed-ranking/). The screenshots did not show any of the factors considered, but only suggested that a "relevancy score" is generated for each item.

fruitful in making these co-design exercises work. These activities encouraged participants to reflect on the algorithmic curation of their news feeds without directly asking them about their opinions. The activities also helped foreground the algorithms in the participants' daily experiences in a subtle manner, to avoid steering their opinions. Moreover, the first workshop's collective nature helped unify the understandings and notions about algorithmic regimes among the participants prior to their co-design contributions.

Sensitizing via Online Questionnaires

In 2020, we studied tangible interface alternatives for movie recommender systems to investigate how to achieve better transparency, control, and awareness among users (Alvarado et al., 2022). In this study, we wanted to follow a co-design approach, inviting participants to propose their considerations for tangible user interfaces meant to interact with such recommender algorithms. Unfortunately, the COVID-19 pandemic created extra difficulties: actively exploring tangible alternatives requires meeting with participants to try and use various interfaces was impossible, as it would have increased health risks for researchers and participants. Given this context, and considering the digital inequalities, low awareness, and multiple meanings of algorithms, we created an online sensitizing activity to prepare our participants for a later study. For the current chapter, we will describe the sensitizing part of the study because of its pertinence, omitting the collaborative design, evaluation, and tryout of our tangible interfaces.

Considering our previous suggestions on sensitizing activities (Alvarado, Storms, et al., 2020), we created an online questionnaire that participants filled out at home that encouraged self-reflection in preparation for later steps in the study. The online questionnaire invited the participants to log into their favourite movie streaming platform and navigate the system briefly to find a movie they would like to watch next weekend. The questionnaire then asked participants what they knew about the movie recommendations, whether they knew that the recommendations were personalized, and whether they considered these recommendations to decide between movies. We also included questions in line with the design for algorithmic experience in movie recommendation systems (Alvarado et al., 2019), such as the perceived level of transparency and control, awareness about profiling, and opinions on various features and usefulness of the system.

After the questionnaire, we invited participants to a study session. With a moderator, participants revisited their answers to the online questionnaire so that they could expand on them. This step served to "refresh" their

experiences and allowed them to include more insights, thus reinforcing the sensitizing effect. We then proceeded with the design exercise.

These activities ensured that participants had some level of awareness of the recommendation algorithm in the movie platforms and provided a departure point for further discussion of their understanding of the algorithmic processes behind the recommendation system. While we did not intend to analyse the results of this sensitizing activity, a cursory analysis of the questionnaires yielded similar results to those from previous studies on movie recommendations (Alvarado et al., 2019, 2021). These similarities suggest that the sensitizing activity was effective in eliciting participants' experiences.

Learning from Our Experiences

The value of sensitizing is that it combines users' situated experiences and general understanding of the presence of the hidden, more technical aspects of computing. In the context of algorithms, people develop "intuitive theories" (Rader & Gray, 2015) and "folk theories" (DeVito, Gergle, & Birnholtz, 2017; DeVito et al., 2018), which implies that any reflexive preliminary exercises can foreground the perceptions of algorithmic systems in the participants. However, sensitizing activities and similar techniques require careful deliberation by the researchers: the activities need to be subtle and not directly influence the original algorithmic imaginaries of participants. The focus needs to be on guiding attention without direct interference.

In the context of video recommendations, the sensitizing interviews we conducted resulted in an effective preparatory exercise to introduce an "algorithmic mindset" among participants, with questions that triggered their own and previously hidden experiences and understandings of the algorithmic system. After the study, participants shared that the interviews focused their attention on the "recommender systems [they] encountered almost every day." The sensitizing interviews thus seem adequate to prepare participants for design exercises later in the study.

In contrast with organizing a diary study and two-phase workshops, sensitizing interviews require less preparation and are more comfortable and faster to organize. As Hargittai et al. (2020) remark, in-depth discussions and interviews with users can also help assess the understandings and awareness of algorithms among users. Consequently, we consider sensitizing interviews a practical, lightweight approach when it is more convenient to meet participants individually.

Similarly, online questionnaires were effective in guiding participants to reflect on the movie recommendations they encountered. From our

experience, this approach is even more lightweight and quickly applicable, as it does not require researchers to meet participants individually before data collection or workshop activities. Moreover, this technique allows participants to do the sensitizing activity at a time that best suits them while keeping the researchers' time investment to a minimum. These characteristics can also be weaknesses, as researchers cannot assess whether participants take their time to fill out the questionnaires. Therefore, we suggest that researchers revisit the answers to the online questionnaire during subsequent meetings with participants.

By comparison, combining a diary exercise with a two-phase workshop is more time-consuming. Asking participants to keep a diary and answer short questions daily about their interactions with the algorithmic system encourages close attention to their experiences but also requires time and effort from researchers and participants. Conducting workshops in two phases, while time-consuming, has an additional benefit. In our case, the two weeks separating the two workshops proved fruitful for additional sensitizing, as we asked participants to further reflect on the algorithmic system during their regular social media use.

We consider that sensitizing techniques such as interviews, diary studies together with two-stage workshops, and online questionnaires are approaches that deserve more exploration and application. To be sure, we do not claim these are the best or even the only approaches. We wish to inspire other researchers and encourage further exploration and experimentation with sensitizing activities that help elicit participants' experiences without directly influencing them.

Deploying Sensitizing Activities: Suggestions for Researchers, Designers, and Practitioners

To conclude this chapter, we share some points of attention when applying sensitizing activities when researching algorithmic systems. We hope these suggestions are relevant for researchers, designers, and practitioners interested in this design context.

The Challenges of "Already Sensitized" Participants

Some researchers might consider recruiting participants who already know about algorithms or are already aware of their inner workings to avoid the challenge of low algorithmic awareness. For instance, previous studies

investigated expressions about algorithms found on Twitter to recruit this kind of population (DeVito, Gergle, & Birnholtz, 2017; Bucher, 2017). Similarly, Klawitter and Hargittai explicitly mention that they investigated creative entrepreneurs selling their creations online because this section of the population is highly motivated to understand and pay attention to the algorithms that significantly impact their business (Klawitter & Hargittai, 2018).

Nevertheless, we argue that applying sensitizing activities can still be necessary when participants have already expressed some level of algorithmic awareness. As explained earlier in this chapter, the multiple meanings of the word "algorithm" could result in problems when engaging the participants in studies of algorithmic regimes. Consequently, we consider it essential to ensure that participants also understand the algorithm in terms of the research and design goals. Sensitizing activities can help achieve this.

Avoid the Term "Algorithm" during Recruitment

Since the term "algorithm" is fraught with connotations, partly because of increased media attention, it is a good idea to avoid using it during recruitment. Research indicates that the terminology used to describe algorithmic systems (such as "algorithm," "artificial intelligence," "robot," or "computer") can strongly affect how people perceive and evaluate such systems (Langer et al., 2022). Moreover, including technical concepts such as "algorithm" explicitly in the recruitment call, for example, might attract overly critical participants or can bias participants' ideas. Recent literature also mentions this suggestion: both Swart (2021) and Hargittai et al. (2020) did not use the term "algorithm" in conversations with participants to avoid steering their opinions.

The sensitizing activities must focus on the authentic experiences of the participants rather than on the possible preconceptions they might have. Therefore, we recommend avoiding the term in all communications with possible participants, such as emails, posters, or other types of recruitment calls.

Be Aware of Potential Biasing

Even if the general population might not be aware of the algorithmic systems around them, they are still very likely to encounter and engage with them in their daily lives regularly. Likely, they have already heard about algorithms in the context of scandals about platforms collecting data, the ethical dilemmas with self-driving cars, or other related topics that commonly appear in social media or traditional media. Depending on the research and the algorithmic

regime context, it can be essential to avoid influencing (and significantly enlarging) such preconceptions as much as possible.

We want to emphasize that the only goal of sensitizing activities is to foreground participants' "algorithmic experiences." They should not steer those experiences towards a specific perception of algorithms. Sensitizing activities should focus on heightening the sensibilities of the participants without interfering with their original and natural conceptions of algorithmic systems.

Attune the Level of Sensitizing to the Research Goal

The required level of sensitizing will depend on the research goal in question. For instance, when the goal is to explore existing algorithmic imaginaries or folk theories, sensitizing should merely guide the attention of the participants to their experience of automated systems. Moreover, researchers might even need to avoid any sensitizing activity in some conditions. When evaluating an interface from a behavioural perspective, for example, or when a quantitative approach with self-answered surveys is used, any form of priming participants, including sensitizing, is undesirable. If, on the other hand, researchers require the participants to engage directly with algorithmic systems during co-design activities or when they are required to actively reflect on previous experiences so that they can provide inputs, sensitizing activities can play an essential preparatory role.

Be Creative

Developing and implementing sensitizing activities implies a reflection during which researchers and practitioners think of ways to make participants sensitive to their own experiences, thus foregrounding algorithms in preparation of further participation during research activities. Consequently, sensitizing activities are inherently creative, opening new and unexpected ways to provoke the same effect on participants. We hope this chapter inspires readers to create similar techniques and share their experiences with others.

This chapter does not present formal methodological guidelines to follow when sensitizing participants to the presence of algorithms. To the best of our knowledge, these do not exist in previous literature. We therefore want to encourage researchers and practitioners to explore and develop different sensitizing techniques, taking the above case studies as examples.

There are various methodological innovations in the existing literature that can inspire future research. Eslami et al. (2015) have developed prototypes

with a "seamful design" philosophy, showing traces of algorithmic ranking to elicit participants' experiences with and opinions of algorithmic systems. Other researchers have deployed focus groups to exchange experiences in a collective setting (Siles et al., 2019), used card sorting as an elicitation technique (DeVito et al., 2018), or assigned drawing exercises (Hargittai et al., 2020). While we have no firsthand experience with these techniques, these promising and creative approaches might inspire the development of future sensitizing activities (and might benefit from such an exchange).

Conclusion and Further Opportunities

This chapter explored the challenges of researching algorithmic regimes proposing a question: *How can we subtly prepare participants for active involvement during interpretive research on algorithmic systems?* We used the concept "sensitizing activities" to refer to exercises or questions that subtly guide the attention of participants so that they can more easily reflect on their experiences with algorithmic systems. We do not claim, however, that such sensitizing activities are the single definitive answer to these methodological challenges. On the contrary, we are convinced that methodology can only advance through continued reflection and conversations between researchers.

We wish to conclude this chapter with suggestions for the further development of methodological tools for interpretive research of algorithmic systems. Recent initiatives have attempted to develop ways to measure people's algorithmic awareness, for example, with an "algorithmic literacy scale" (Dogruel, Masur, & Joeckel, 2021), or an "algorithmic media content awareness scale" with different dimensions (Zarouali, Boerman, & Vreese, 2021). Such scales and measures can serve as complementary tools that help prepare participants. One potential use is the measurement before and after sensitizing activities to determine their effectiveness. These measures work via questionnaires, however, while merely asking questions can already produce "sensitizing effects" on participants. Both possibilities and potential effects of such questionnaires are thus relevant areas for future research.

Previous studies have proposed different theories and frameworks related to algorithmic awareness that could inform sensitizing activities. While we have not discussed these studies exhaustively, we want to emphasize their relevance to the creation of future sensitizing activities. Promising examples are Koenig's (2020) levels of algorithmic awareness and the framework by Zarouali, Helberger, and Vreese (2021) of algorithmic misconceptions. These

and similar theoretical structures can be useful when devising sensitizing interviews, diary studies, workshops, or questionnaires and can help with the "be creative" guideline we suggested earlier.

Finally, we want to return to the digital inequalities mentioned earlier in this chapter. As research has pointed toward lower algorithmic awareness among women, older age groups, and people with lower income and less education, it is essential to emphasize that disadvantaged social groups are often disproportionally affected by the ethical issues associated with algorithmic decisions. Involving them more actively in research and design could result in more inclusive and publicly beneficial algorithmic systems. While we did not have the opportunity to specifically research intersections between algorithmic systems and disadvantaged populations in our case studies, we would like to encourage future research projects to take economic and power disparities into account to combine interpretive research with a more critical aim.

As outlined above, we consider sensitizing activities to deal with some of the diverse challenges to interpretive research and participatory design of algorithmic systems. We want to invite researchers to continue exploring the methodological issues raised in this chapter, move beyond sensitizing activities as needed, and, above all, aim for more active inclusion of a variety of people when designing algorithmic systems, particularly those populations that are more heavily affected by algorithms and their decisions.

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