Towards Algorithmic Experience: Initial Efforts for Social Media Contexts

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ABSTRACT
Algorithms influence most of our daily activities, decisions, and they guide our behaviors. It has been argued that algorithms even have a direct impact on democratic societies. Human - Computer Interaction research needs to develop analytical tools for describing the interaction with, and experience of algorithms. Based on user participatory workshops focused on scrutinizing Facebook's newsfeed, an algorithm-influenced social media, we propose the concept of Algorithmic Experience (AX) as an analytic framing for making the interaction with and experience of algorithms explicit. Connecting it to design, we articulate five functional categories of AX that are particularly important to cater for in social media: profiling transparency and management, algorithmic awareness and control, and selective algorithmic memory.

Author Keywords
Algorithms; algorithmic experience; social media; user-centered design; research through design

ACM Classification Keywords
H.5.2. User Interfaces: *User-centered design*

INTRODUCTION
Algorithms have permeated our society to the extent that they have begun to influence our culture and daily practices [15,30], such as when Facebook's News Feed has become the main source of information of government and politics source for over 60% of the millennials [8:56]. Gillespie argues that the involvement of algorithms in sorting and recommending cultural products makes them part of culture in themselves [15], not only because they manage culturally related data, but also because they directly influence shifting opinions. Algorithms carry meaning and values; Bozdag [5] argues that they cannot merely be considered technical tools due to the influence of humans in their design and operations. Geiger argues that those who have the power to decide, write or design what is executed in code, also have the power to regulate the behaviors and opinions that algorithms entice [13:351–352].

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This means that algorithms have a direct relationship with the user experience of the systems of which they are part. Eslami et al. noted how some users who discovered the algorithm management of their Facebook news feed were surprised and angered [12], such as when close friends and family were not shown in their news feed [12:159]. They also found that a majority of the public does not know that their Facebook news feed is curated by an algorithm [12:156]. Also "algorithm aversion" has been observed [9], when people prefer human intervention, even if less accurate and efficient, over any algorithmic related solution.

The inner working of algorithms remains largely inscrutable [18:25]. The decisions made by algorithms result from complex processes, and are influenced by both use and by continuous changes in both algorithms and interface [18:25–27].

Hamilton et al [16] propose the "design of algorithmic interfaces" as an important research topic, striving to balance the users' need for transparency with the benefits of automatic adaptation. Diakopoulos [8] argues that such research must take the user experience into account. Bucher states that it is crucial to study how people feel about algorithms, "…and while algorithms might not speak to individuals, they might speak through them" [7:42]. We also need to understand more about how user knowledge about algorithms affects their interactions with algorithm-influenced systems and services [16] and what attitudes users develop towards algorithms.

Hamilton et al. [16] further explain that while the invisibility of these algorithms can be considered successful in that it produces less effort for the user, a seamful approach could improve the opportunities for new uses and for addressing some of the societal effects of algorithms [16:633–634]. Diakopoulos [8] strives for a particular focus on transparency, also including notifying users when *humans* have been involved in aspects of the presentation that users have come to understand as algorithmically controlled.

This article proposes the new concept of *algorithmic experience* (AX) as an analytic tool for approaching a user-centered perspective on algorithms, how users perceive them and how to design better experiences with them. Using Facebook's news feed as an algorithmic influenced case example, we performed a semiotic analysis and two participatory design workshops to develop an understanding of salient features for AX of algorithm-influenced social

media. Connecting the results to design, we propose five different categories to improve AX in social media contexts: algorithmic profiling transparency, algorithmic profiling management, algorithmic awareness, algorithmic user-control and selective algorithmic remembering. These five areas suggest an initial framework capable of promoting requirements and guide the design or evaluation of AX in social media contexts that look to increase awareness of the algorithmic influence on use and promote users' empowerment towards these tools.

BACKGROUND

Algorithms worthy of experience analysis

First, we should determine what characterizes the algorithms that become agent in this role; what kind of algorithms could be described as *experience worthy*. Willson argues that an important class of such algorithms are those to which we delegate everyday tasks [30], and further argues that delegating activities to algorithms is becoming an everyday practice in itself [30:146]. Relevant characteristics of these algorithms is that they "operate semi-autonomously, without the need for interaction with, or knowledge of, human users or operators" [30:139]. Their level of authority is a crucial factor in determining their experience worth; Beer argues that algorithms that are entitled to make decisions without or with minimal human intervention deserve particular attention [2:3].

In focusing on the concept of "trending" which typically is algorithmically determined, Gillespie argues that some relevant algorithms create specific audiences, as groups that have been algorithmically identified based on interest profile [15]. In another article, the same author considers "public relevance algorithms" and suggests six provisional dimensions as a way to delimit these [14]:

1. Patterns of inclusion: algorithms that select information and exclude other information.
2. Cycles of anticipation: algorithms that make inferences about its users.
3. Evaluation of relevance: algorithms that determine what is relevant, correct, or legitimate knowledge.
4. Perceived algorithm objectivity: algorithms that present themselves as impartial and exempt of human intervention.
5. Entanglement with practice: algorithms that impulse users to reshape their practices.

Gillespie calls for instructing audiences in how such algorithms work, which indicates that these constitute a subclass of the experience worthy algorithms. The characterizations proposed by Willson and Gillespie guided the choice of methods used in this article as well as the investigated algorithmic experiences.

To become encountered by end users, algorithms like any other material need to present a concrete experience. This experience will be framed by the technical context and situation of use; Dourish describes how the material manifestations of algorithms are shaped by the "specific instantiation – as a running system, running in a particular place, on a particular computer, connected to a particular network, with a particular hardware configuration" [11:5].

The algorithmic effects on social media

Social media have increasingly come into focus as having societal impact, such as in the discussion of their role in creating "filter bubbles" and "echo chambers" [1,3,4,6,19,20,24]. Algorithms provoke also other effects in social media through their ability to prioritize, classify, associate and filter various sources of information [8:57–58]. Rader and Gray discuss how the algorithms employed in e.g. Facebook create a feedback loop, in which the user's behavior (shares or likes) define what he/she also consumes, creating a loop in which the algorithm always presents items that the user in turn will almost certainly interact with [23:173]. Bozdag found that users predominantly trust their social networks as a source of information. When Facebook promotes recommendations from the user's most active friends and demotes actions from less active friends, this means that the system controls both the users' information and who they can reach [5].

Algorithmic experiences in social media

Using Facebook as a research case, Bucher studied the ways in which users related to its algorithmic behavior and called it *algorithmic imaginary*. She catalogued the following reactions to the influence of algorithms [7].

Profiling identity: the feeling of being classified or profiled, not necessarily accurately. An example of this experience is when a middle age woman is bombarded with losing weight advertisement, but she is not interested.

Whoa moments: situations in which people sense that they "have been found" by the system, such as if user is having coffee and simultaneously Facebook's ads show a coffee brand suggestion.

Faulty prediction: when the user sense that the algorithm is wrong, producing annoying experiences that does not match the user's beliefs and interests [7:35–36]. Users that have this feeling describe the system as broken or malfunctioning.

Popularity game: when users feel that they act to catch the attention of the algorithm and thereby get increased visibility, as well as the feeling of not getting enough likes, comments or shares due to algorithmic performance.

Cruel connections: the feeling that algorithms are insensitive and unable to relate to human feelings. Being reminded of the birthday of a recently deceased friend can trigger such reactions.

Ruined friendships: the feeling that the algorithm curates not only content but also relationships, and that you lose control over your friendships due to the way the algorithm shows content from certain friends and not from others.

It should be noted that these are primarily negative experiences, related to moments when the algorithmic behavior is foregrounded in the user's experience due to unexpected or undesirable results. In this article, we wish to develop a more value-neutral perspective on the experience of algorithms. Furthermore, *algorithmic imaginary* is "the way people imagine, perceive and experience algorithms" [7:31], that is, subjective and related to specific encounters. In this article we instead explore AX as a property of the service or the interface itself.

Rader and Gray 2015 [23] investigated user beliefs about the algorithmic influence over Facebook's news feed. They found that while many users made no assumptions about this at all, some common conceptualizations included the feeling that other Facebook users had made active decisions to "hide" themselves or specific posts, as well as the belief that one must actively set preferences to get the news feed sorted in any way at all.

Re-designing the AX of social media

There have been multiple experiments with re-designing social media to change their algorithmic experience. These serve as important inspirations to charter what potentially could be considered a desirable AX.

Eslami et al. [12] designed FeedVis as a way to illustrate the effect of algorithmic influence over the Facebook's news feed. This tool presents to Facebook users a comparison between algorithmically curated and not curated News Feeds. In their study, they found that some participants were unaware of the algorithmic influence over this function and upset when they discovered that some of their closest friends and family did not appear in their news feed.

A visualization tool proposed by Nagulendra and Vassileva shows which friends are inside or outside their users filter bubble [22], and allows users to manually include and exclude friends from their bubble.

Finally, Munson et al. [21] developed a browser plug-in that highlights the user's reading tendencies and most common political biases. While the plug-in was successful in making readers aware of reading bias, it did not change their behavior.

METHOD

A user-centered approach towards eliciting desirable qualities for AX is not straightforward, since the general awareness of algorithmic influence is low among users [12]. To address this issue, a three-step process was applied. The first step involved the author sensitizing himself towards the AX of Facebook through semiotic inspection method [29:26–33], eliciting an understanding of what use behaviors the design communicates as intended and encouraged. Algorithms need not be "black boxes" [17], but can and to some extent are expressed by the system's interface. To create a baseline understanding of the current designer intentions towards the algorithmic capacity of the system, Semiotic inspection was applied. Next, two sequences of workshops were conducted in which recurrent users of Facebook were gathered to discuss its AX and prioritize among possible features that potentially could enhance it.

Semiotic Inspection

The Semiotic Engineering Process (SEP) is based on elements of communication theory and semiotics. It was developed by De Souza and Leitão [29] and presents a way to expose interfaces as a communication process between the designer and the user. It differs from ordinary heuristic inspection in its explicit focus on the designer's intentions, rather than the end user experience.

The SEP framework proposes two methods for analyzing an interface: Semiotic Inspection Method (SIM) and Communicability Inspection Method (CIM) [29:23–25]. It is the first of these that was employed in this work. SIM provides tools to elicit the system's message for the user through inspecting an interface.

The method consists of five stages of inspection. The first, second and third stages are related to understanding signs, and relate to Metalinguistic Signs, Static Signs and Dynamic Signs, respectively. These stages need to be iterated in order to deconstruct the designer message [29:27]. The task is to look for graphic elements and their distribution, signs and space, specific terms and common words, the interaction opportunities and the interface elements related to interaction.

The final step in the SIM method is to compare the different aspects of meta-communication with the aim to detect consistent and inconsistent patterns and relationships between the uncovered elements [29:32]. This results in an overarching analysis, in which the researcher judges the system's communication strategy and identifies elements that define the designer's intended message to the user.

Semiotic inspection was applied to the Facebook app, as it appeared at the time of analysis (between January and March 2017) on less of 5 inches Android phones and delimited to the Newsfeed, including other post related features as Newsfeed configurations and user's system profiling.

Results

The most common metalinguistic signs found in Facebook's interface are texts used to explain each feature in the news feed. The profile picture and the user name are reiterated signs to associate posts with their creator. Features related to post creation are supported with text to specify creation of text content, and text & icons for types of contents and moods.

Metalinguistic signs for reading the news feed are related to features such as "Like" and other mood signs, and the option to comment on or share a specific post. There are both static and dynamic signs for these functions.

There was a distinct lack of signs for scrolling the news feed, for downwards (to read more) or for scrolling up (to refresh). Some other opportunities that were only weakly

communicated included signaling when a post had been created, and the navigation to an explanation as to why a suggested or sponsored post was shown, and to tools that allowed the user to un-follow a post.

While the app offered some ways to manipulate the news feed, these were hard to find as shown in Figure 1. Other hard to find options included the management of which friends are shown first, who the user wants to un-follow, the opportunity to reconnect to those previously un-followed, and recommended pages to follow.

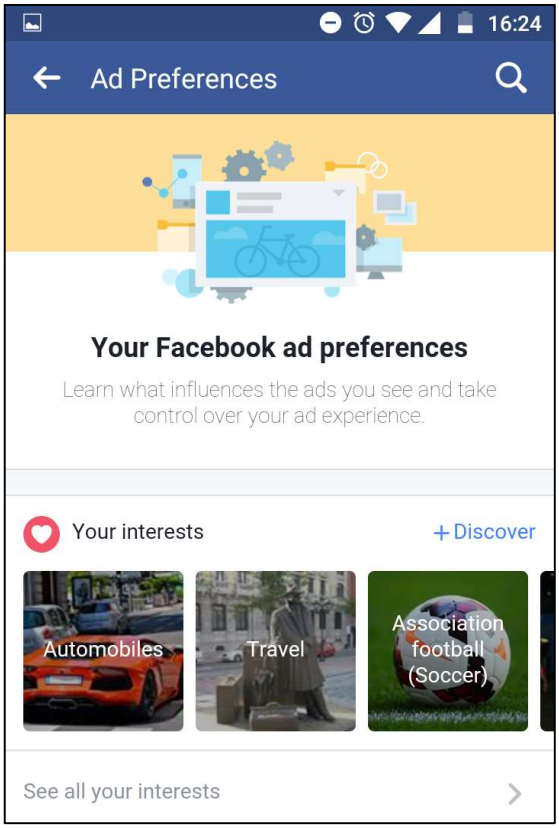

Figure 1. Ad preferences configuration is possible to be found, but only through several tabs.

To conclude, the SIM uncovers a main goal of the news feed interface: to highlight selected posts and promote commenting and sharing, as well as to promote the creation of new posts. Understanding and managing the feed is demoted and only partially possible. For example, there is no way to determine if a post was presented in the news feed through human involvement or due to an algorithmic decision. Furthermore, there is no way to understand the inner workings of the news feed algorithm, or when or how any personalization is being made.

Sensitizing Workshops

The first sequence of workshops focused on collecting user's opinions on the current algorithmic experience of Facebook's news feed. The participants were all active Facebook users, recruited through email and Facebook's messenger (within and outside the recruiter's list of friends), and through various FB groups for students such as student unions and student housing organizations. Participants demonstrated a strong interest in discussing issues related to AX and the algorithmic influence over Facebook. Due to the lack of knowledge that users in general exhibit related to experience-worthy algorithms (as delimited in the background section above), the workshop started with a priming tutorial on how algorithms are used in several common apps with a focus on the Facebook case.

After this priming, the participants were invited to discuss their perception of algorithmic influence. The discussion was guided by a semi-structured set of questions developed from Bucher's and Rader and Gray's categorization for algorithmic experiences in Facebook [7,23] as well as Diakopoulos invitation for algorithmic accountability [8], but gave room for users to volunteer additional perspectives and experiences.

In total, eleven (11) participants attended three sessions for the first sequence of workshops. The first session had five (5) participants; the second four (4) and the third one had two (2) participants.

Results

The sensitizing workshop confirmed most of the experiences reported by Bucher [7]. Almost all the participants had felt that Facebook had on occasion classified them in ways that they were not comfortable with.

Another common experience was that specific contacts were not visible in the news feed, and many of the participant felt that the app was making them lose contact with friends and even family. One participant suggested that the interface could display a low-interaction friend list, to promote awareness and encourage more interaction with such friends.

'Whoa moments' [7:35] were mainly connected to the experience that Facebook was using information from other sources such as browser activity or third party brands. This was reported as surprising, scary and annoying. Participants expressed a desire to know if these suspicions were accurate.

One user expressed strong negative feelings towards the Facebook algorithm due to the way the algorithm bases its recommendations equally on every action. He argued that just because he clicked somewhere, this does not mean that he wants that kind of content in the future.

Faulty predictions had also been noted: for example, participants had been annoyed by faulty friend suggestions and or faulty places predictions where they had not visited. Closely related, they felt annoyed when the system reminded them of deceased friends and would like a function to stop such reminders.

To summarize, the expressed feelings towards Facebook's algorithmic behavior were ambivalent.

Figure 2. The ad preferences could be made available from the profile page. Suggested re-design used in the second workshop.

Some participants considered the algorithmic influence needed as they otherwise would experience information overflow, and they also found it largely successful in providing the expected and desired information. Others felt that they would prefer to receive every post without any kind of filtering. Concerning Facebook's use of profiling for commercial purposes some participants argued that since this is a freely available service, Facebook needs to track and make inferences about its users to be able to make profit. Others rejected this reasoning and feared the results of such tracking.

Redesign workshop

In addition to volunteering their experiences, the workshop participants had also provided suggestions for how the AX of Facebook could potentially be improved. Before the second round of workshops, we designed a set of potential interventions in the Facebook news feed interface as suggestions towards of improving its algorithmic experience. In this step, eight (8) of the participants from the first workshop were individually consulted and asked for their opinions and feedback on the suggested designs. The workshop setup was incremental, so that previous opinions and suggestions from participants were incorporated into the material before consulting the next person for feedback.

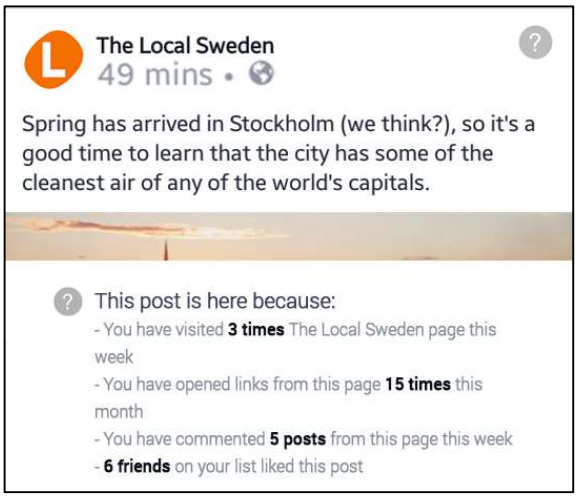

Figure 3. A suggested redesign to improve algorithmic awareness. Suggested re-design used in the second workshop.

This strategy made it possible to evaluate the feedback from participants in relation to previous comments and suggestions. Former participants were treated confidentially and presented just as "…a previous user suggested …" to maintain their privacy.

Figure 3 shows one of the proposed designs related to the news feed structure. This suggested redesign explains why the post appears in the newsfeed, with the purpose of increasing user awareness of selection criteria. Figure 4 presents another suggestion, aiming to address the need to be able to stop specific memories from re-appearing in the news feed. Both suggestions were appreciated by workshop participants.

Figure 4. A suggested redesign to make the system forget previous memories.

The results from the SIM inspection, and the opinions and suggestions from the two workshops were merged into a list of design considerations that subsequently were clustered to form the following framework.

A FRAMEWORK FOR ALGORITHMIC EXPERIENCE

The design opportunities elicited to improve AX in Facebook's news feed can be clustered into five groups of features. Figure 5 presents a graphical representation of the five groups of features and contexts.

Algorithmic profiling transparency

This aspect relates to how the system makes visible what the algorithm knows about a user and explains why the algorithm present results based on that profiling. Making profiling transparent could be considered to improve the algorithmic experience. Ideally it should also be easily accessible, and the transparency related to the filtering, trending or profiling of results that is produced by the algorithm.

Transparency can further be divided into the dimension of internal versus external sources. Internal sources are those mechanisms inside the social media system itself that influence user profiling. External sources may include e.g. Google search information, cookies stored by other services, or adjacent tabs open in the web browser. Facebook's browser tracking [28] is an example of this external profiling.

In both workshops, participants considered algorithmic profiling transparency important. They emphasized the need to show why particular posts appeared in the news feed.

Some filtering effects were discussed in more depth. During the second workshop, participants expressed a wish to understand which friends had little or no influence in the algorithmic results for the news feed, so that they could make a conscious choice about whether to remove them from the friends list or actively increase their interaction with such friends.

Algorithmic profiling management

This aspect relates to how users can corroborate and manage the profiling made by the algorithm. It can improve the algorithmic experience in social media services through making users feel empowered and capable of managing what the system thinks about them and how this affects algorithmic interventions.

Throughout the workshops, it was the user's profile page that was indicated as the best context for profile management. Participants tended to regard profiling not as Facebook's

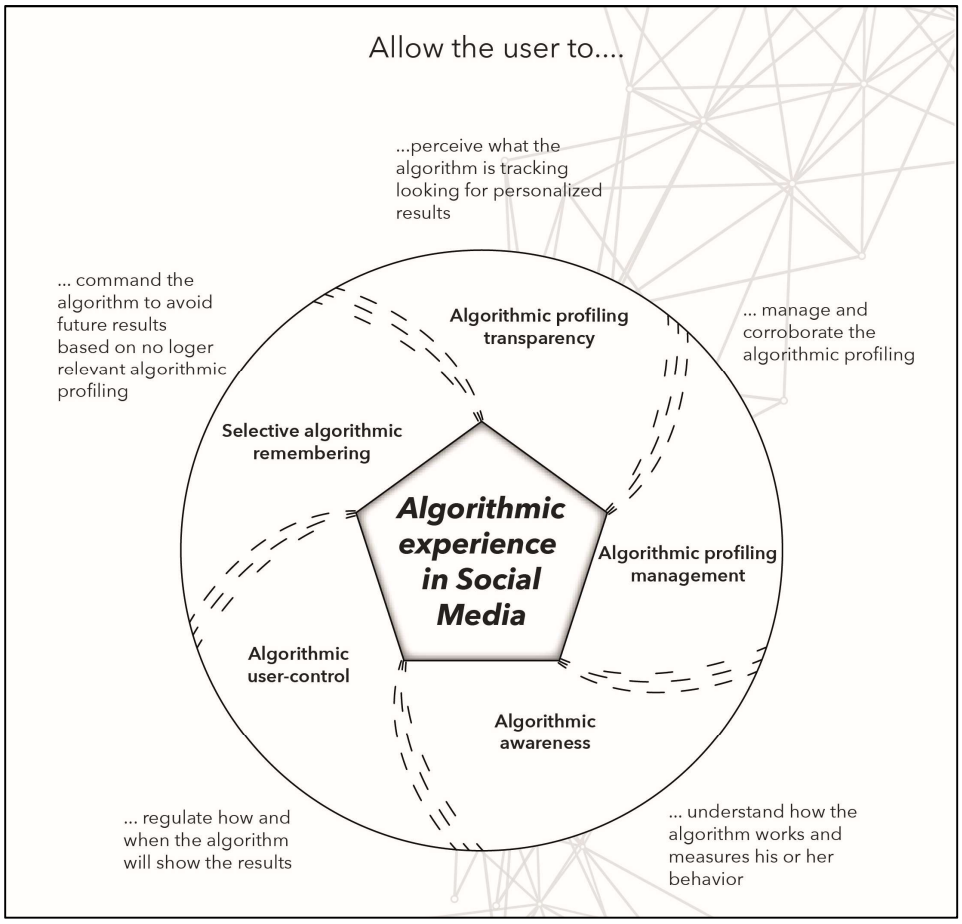

Figure 5. Design areas for Algorithmic Experience in Social Media.

property but as their own. Users considered algorithmic profiling as a representation of them, and desired it to be tuned, modified or adjusted as a "public" aspect of their identity.

Algorithmic user-control

This aspect of AX is related to the capabilities that the user is given towards directly controlling the algorithm. We identified five specific ways in which users found it meaningful to exert control over the algorithm as such.

Firstly, there is an option to sometimes turn off the algorithmic influence, e.g. over the news feed. Facebook offers such an option for handling the news feed through the "Top news" and "Most Recent" options, where "Most Recent" represents a way to turn off the algorithmic influence over the newsfeed.

While participants appreciated this function, they also expressed a need for order and coherence. For example, after reactivating the algorithm the users may expect see some new posts at the top but maintaining the order of posts from the previous presentation further down the news feed list. This can be understood in terms of coherence, as the users expect the algorithm to be selecting and curating posts from the same pool of posts and with very similar criteria before and after the algorithm was turned off and on.

A second option for algorithmic user-control is to let users selectively turn off some or all of the data sources that are influencing the profiling algorithm. Specifically, this includes turning off and on information from sensors, such as position tracking. Some such options currently exist in Facebook, although not for all types of user data.

Finally, participants expressed a desire to be able to present the algorithm with explicit negative feedback when a faulty prediction was made.

Selective algorithmic memory

Relates to the user's influence over which data the algorithm bases its decisions on. Users may wish to exclude specific data from the profiling mechanisms, both when gathered but also in in retrospect, if the user's situation has changed.

In the context of Facebook, workshop participants brought this up as the need to be able to un-follow memories if the system e.g. recommended shared memories with deceased friends or an old relationship after a bad breakup. In this context, selective algorithmic memory would require a way to tell the system to forget specific memories or people.

Algorithmic awareness

Algorithmic awareness relates to the overall awareness that users have of the algorithmic influence, how user profiling is done, and what influence the user can have on its results. While all of the aspects above contribute to a higher level of algorithmic awareness, direct tips and recommendations on how to understand the results of algorithmic influence may also be desirable. Initial posts telling the users how the news feed works, what kind of behavior influence the algorithms, and what information is being tracked could be steps towards encouraging users to acquire a more thorough understanding of the function.

A particular aspect of this general awareness is also desirable to communicate clearly when there is *human* intervention to the functions that users have come to consider as algorithmically controlled. The workshops brought about an interesting discussion of *algorithmic spaces*; graphically delimited spaces of the service interface in which the user expects the algorithm to present its results in terms of filtering, personalizing or trending. For these spaces, there is an implicit contract between the users and the service providers: only algorithms curate results in this space. In such spaces, the workshop participants considered important that human intervention or content moderation [25] would be clearly marked, making it clear if post was eliminated or added due to a human decision. Therefore, we can add the need to signal when an algorithm has been *changed* due to human intervention.

CONCLUSION

This article has proposed the concept of algorithmic experience (AX) as a way to conceptualize the ways in which users experience systems and interfaces that are heavily influenced by algorithmic behavior. Building on Bucher [7] we can note that in current social media, AX is largely negative, as the algorithmic influence is foregrounded only when it behaves erroneously or unpredictably. Hence, we suggest that AX can be deliberately designed to foreground algorithmic behavior and increase user awareness of algorithmic influence.

It is important to realize that AX and the socioeconomic dynamics of Facebook's business are only partly aligned [10,27]. While there may be economic and commercial reasons behind the current algorithmic obscureness towards the user, we have here chosen to frame AX from a user-centered perspective. From a commercial perspective, AX may contribute towards a more joyful and faithful relationship with a service, avoiding the possible bad experiences [7,9]. By placing the user in focus, HCI can serve to support an important debate related to the political and legal issues involved around algorithms, privacy, and users' rights.

During the workshops carried out within this project, users consistently expressed that the explicit awareness of and discussion of AX gave them conceptual tools to analyze the technologies they use and to understand how they work. Participants were not previously aware of how their behavior was tracked, and the ways this influenced the Facebook service. After getting familiar with the concept of algorithmic experience, participants reported that they became more aware of their use of digital platforms and also changed their way of using Facebook in order to improve its service in accordance to their interests. The awareness of AX thus works as a "new lens" for users, for understanding and using digital technologies.

The concept also can become useful in design. In this article, we suggest five particular ways in which the design of social media can cater for increasing algorithmic awareness and improving AX.

Algorithmic profiling transparency provides users ways to understand what the system knows about them and how the offered results are related to that profiling. In this it is important to display both internal profiling, the implicit profiling mechanism based on the user's behavior within the system, and to make transparent what the system is gathering from external sources such as browser tracking or third party/allied companies' services.

Algorithmic profiling management allows users to refine the profile. Explicit profile management helps users correct profiling behavior, and is an important resource also for designers as it allows for implicit and explicit feedback to personalization [5:213].

Algorithmic user-control could empower users to give them a level of control over their social media services. It includes turning off and on algorithmic interventions as well as tracking.

Selective algorithmic memory offers the user a possibility to make the system forget their previous interactions and delimit their influence over the future algorithmic results.

Finally, *Algorithmic awareness* can be directly fostered through informing users about how the algorithms work and how the user's behavior affects its behavior. In this lies a didactical challenge to present the user with sufficient information, but at the same time not expose the social media platform to user behavior that can compromise its function or commercial viability.

FUTURE RESEARCH

The present research opens several questions to be elaborated in future research. It would be valuable to apply similar strategies to analyze other social media platforms, to understand to what extent the same issues apply and how the suggested design strategies would affect their algorithmic experience. Furthermore, it is possible and needed to develop methods to assess AX.

Referring to algorithms, Schou and Farkas invite to think about "*how to make visible that which is invisible by design*"[26:44]. As algorithms become an integral part of most everyday services, we must look for ways to develop AX in areas outside of social media. Some examples of algorithms worthy of experience include map services and services that mix human and algorithmic intervention such as Amazon Mechanical Turk, Über, or Airbnb. It is critical to develop AX perspectives in relation to health and self-care systems, where algorithms may have a direct influence over health and well-being of humans, and in the domain of Human-Robot Interaction where the focus on anthropomorphism may interfere with the algorithmic transparency.

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