The social construction of algorithms and the limits of algorithmic transparency

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Algorithms increasingly govern social and economic processes, yet their mechanisms often remain opaque to the public. This paper explores the limits of algorithmic transparency by combining theoretical considerations with empirical findings from a study on platform-mediated food delivery work. While transparency is commonly proposed as a solution to mitigate algorithmic opacity and promote fairness, we argue that transparency alone is insufficient because it often fails to translate into practical understanding or meaningful agency for users. Technical transparency may be obstructed by trade secrecy, technical complexity, and the dynamic nature of machine learning systems. Moreover, even when transparency is achieved, users may continue to act on alternative theories about algorithmic functioning, as demonstrated in our study. This highlights that algorithmic governance is co-constructed through social processes, user interpretations, and technological affordances. We conclude that efforts to improve algorithmic accountability must move beyond technical transparency and address the social dynamics that shape algorithmic systems in practice.

Keywords: algorithmic transparency, social construction of technology, algorithmic management, platform work

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1 Introduction

Algorithms are key technologies of the present and part of what Borgmann [1, p. 14] called the technological furniture of our age. These complex systems have become a cornerstone of nearly all facets of modern life, play a pivotal role in professional domains, and orchestrate and regulate their processes. As technologies that automatically make decisions either on the basis of a predefined framework or self-developed criteria, they reproduce existing structures and are thus rule objectified in technical procedures [6; 14]. They achieve a significant part of their effectiveness through the aura of objectivity, efficiency and effectiveness that surrounds them.

In the context of algorithmic systems, the opacity of the mechanisms by which automated decisions are made is of particular significance. With regard to the concept of algorithmic fairness, the transparency of algorithms assumes a pivotal role. The limitations of this approach are delineated below. The fundamental premise is a socio-material understanding of algorithms, according to which their effects are only actualised in practice.

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2 Algorithms as black boxes and transparency as a solution

A key characteristic of algorithms is their opacity, in contrast to the documented and transparent nature of bureaucratic processes, for example. Algorithms are 'black boxes' of which only the outcomes are visible, and their mechanisms are kept 'behind veils of trade secrecy' [18, p. 2], so that their opacity is legally protected. This obfuscated nature of algorithms undermines the identification of biases in their decision-making and thus also undermines their accountability.

The consequence of this is agency laundering, whereby the individuals, structures and interests behind and within the algorithms become obscured [22]. Furthermore, the lack of transparency of the algorithms leads users to speculate about their criteria for making decisions. For instance, studies of YouTube vloggers [1] and platform workers [9; 13] demonstrate that the mechanisms of algorithms are a central subject of discussion and action planning among users. Opacity can be accompanied by a so-called 'black box power' [10] in the course of which users behave according to the presumed mechanisms of the algorithms without proof that these are necessarily correct, so that self-policing, for example, can be the result [11; 20; 23].

In order to counteract these consequences, the concept of 'algorithmic transparency' is often proposed [5; see for example 18; 24; 26]. The aim of this transparency is firstly to create accountability for the algorithms so that the parameters on the basis of which an algorithm has made a decision are visible. Secondly, this should create a levelling of the playing field for users, as transparency gives them agency, allowing them to make informed decisions in their interactions with the algorithms.

However, as Burrell [3] points out, there are several potential causes of algorithmic opacity: intentional secrecy, required technical literacy, and machine-learning opacity. Firstly, algorithms may be proprietary, and so it is not possible to ascertain their mechanisms. In order to establish transparency in this respect, regulation via laws is needed that allow insight into the algorithms in general, or at least for ombudsmen. Secondly, the comprehension of the algorithms' internal processes and their implications necessitates specialized knowledge. The absence of interpretability, even with code visibility, renders transparency meaningless. This underscores the requirement for experts capable of interpreting and verifying software code. Thirdly, the inherent complexity and dynamic nature of machine-learning algorithms, with their continuously evolving functionalities, often defies human comprehension [12]. In such cases, the black box remains open, and the code cannot be meaningfully interpreted or its mechanisms reconstructed. This issue is further compounded by the immense size of algorithmic systems, which can encompass several billion lines of code, making it almost impossible to comprehend the specific decision-making processes and their criteria (4, p. 899].

It is also important to consider when and how transparency is established, since the fact that advocacy groups, experts and others demand transparency and, at best, implement it, does not necessarily mean that this also has an effect on users. It is not uncommon for algorithmic structures to become part of the 'technological unconsciousness' [21] of contemporary societies. A body of research suggests that algorithm awareness, defined as the recognition that routine digital interactions are governed by algorithms, is frequently limited [6]. This underscores the necessity for cultivating algorithm awareness as a pivotal digital competence, albeit one that is disproportionately distributed across the population [8]. In instances where awareness is deficient, the transparency of algorithms in the users' daily practices may have negligible consequences or even serve to perpetuate existing social disparities. In addition, and as will be explained below, the social construction of algorithms is also relevant.

3 The social construction of algorithms

Oudshoorn and Pinch [17, pp. 1–2] emphasise that technology comes with interpretative flexibility: “[T]here may be one dominant use of a technology, or a prescribed use, or a use that confirms the manufacturer's warranty, but there is no one essential use that can be deduced from the artifact itself”. Technology develops its effects in practice and can to some degree be ‘redesigned’ by the users.

Subsequently, algorithms are to be understood as socially ontogenetic and performative. They only take effect in practice and thus in contact with other actors and in specific contexts. Because of their influence on these same actors and contexts, the result of an algorithmic decision is never identical with a previous one. Contrary to their ontogenetic character algorithms are usually reificated and treated as objective entities and the fact that they are socially constructed is neglected. They are analysed only as such and without the social relations connected with them and behind these artefacts, which is tantamount to fetishisation [14].

Based on a multi-method study with interviews and an ethnographic investigation of platform-mediated food courier work, we were able to show that workers under algorithmic management develop theories about the functioning of opaque algorithms in the context of sensemaking [9]. These theories are framed by technological frames as precursory ‘sense-making’ propositions [16]. These frames are mental macrostructures in which experiences with technologies can be integrated. The theories are based on the individual experiences of the subjects and on users’ discussions. Only in practice the effects of algorithms become manifest and are realised through the subjects' actions. Workers' everyday practices and interactions with algorithmic management are guided by their theories about algorithms.

It became evident that the workers develop theories about the algorithms based on their own experiences and exchanges with colleagues, and subsequently apply these in their everyday lives. These theories and practices are often contradictory, highlighting the limitations of transparency and the emergence of what has been termed 'black box power'. For instance, the platforms communicated that physical proximity was a decisive factor in distribution, which was in alignment with the algorithms' actual operational processes. However, due to the workers' mistrust of the platforms and a "hermeneutics of suspicion" [19], they frequently adopted alternative theories and behaved as if other criteria were pivotal for job allocation, such as speed.

In the pursuit of algorithmic fairness and the concomitant transparency of algorithmic mechanisms, it is important to recognise the limitations of this approach in practice. The sociotechnical nature of algorithms, shaped by social construction and utilisation, must be acknowledged. Algorithms, being both ontogenetic and socially constructed, are influenced by social processes in addition to physical laws. Consequently, while transparency may be achieved, it can be constrained by the specific social context, as evidenced by the presence of so-called 'myth information' [25]. This phenomenon underscores the complexity of achieving desired outcomes through transparency initiatives, highlighting the need for a nuanced understanding of social dynamics in algorithmic governance.

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