media/rep/

Repositorium für die Medienwissenschaft

Armin Beverungen

The Invisualities of Capture in Amazon's Logistical Operations

2021

https://doi.org/10.25969/mediarep/21876

Veröffentlichungsversion / published version
Zeitschriftenartikel / journal article

Empfohlene Zitierung / Suggested Citation:
Beverungen, Armin: The Invisualities of Capture in Amazon's Logistical Operations. In: *Digital Culture & Society*. Networked Images in Surveillance Capitalism, Jg. 7 (2021), Nr. 2, S. 185–202. DOI: https://doi.org/10.25969/mediarep/21876.

Nutzungsbedingungen:
Dieser Text wird unter einer Creative Commons - Namensnennung - Nicht kommerziell - Keine Bearbeitungen 4.0/ Lizenz zur Verfügung gestellt. Nähere Auskünfte zu dieser Lizenz finden Sie hier:
https://creativecommons.org/licenses/by-nc-nd/4.0/

Terms of use:
This document is made available under a creative commons - Attribution - Non Commercial - No Derivatives 4.0/ License. For more information see:
https://creativecommons.org/licenses/by-nc-nd/4.0/

DFG Deutsche Forschungsgemeinschaft

Philipps Universität Marburg

The Invisualities of Capture in Amazon's Logistical Operations

Armin Beverungen

Abstract

This paper explores the status of visuality in surveillance capitalism by considering its role in the management of Amazon's logistical operations. Whereas Amazon is often portrayed as being at the forefront of developments in surveillance associated with face recognition technologies, a focus on its logistical operations highlights the more mundane role of the barcode scan. The barcode is considered a calm image, central to the operation of capture in the warehouse and beyond. Logistics is here marked by invisualities, wherein visuality is operationalised to optimise logistical flows of data, things and people, rather than geared towards visual forms of surveillance. These invisualities mean that power is exercised primarily through the scan as capture, with power characterised as operational and environmental. Recent developments in logistics towards augmented video surveillance and its associated networked images must also be assessed in the context of this mode of power and its economy.

Keywords

Logistics, Barcode, Amazon, Operational Images, Environmentality

Amazon Between Barcode and Face Scan

In a paper published in the *Whole Earth Review* a few months after the 9/11 attacks, entitled "Your face is not a bar code", the computer scientist and humanities scholar Phil Agre (2001) put forward a strong plea for the prohibition of face recognition technologies. A key part of his argument was that it is false to assume that faces are already barcodes: whereas barcodes are machine readable and unique identifiers, faces are much harder to read and to remember for people, and are often mistaken for one another. Effectively, however, what face recognition technologies may achieve is that faces could be treated much like barcodes. As they become machine-readable, images of faces become networked and computable, and thus "easily communicated, compared, stored, and associated with other information" (Agre 2001: 76). Agre's comparison of barcodes and faces highlights the impor-

DOI 10.14361/dcs-2021-0209

tance of focusing on the specificity of media technologies of capture and surveillance. Whereas barcodes are logistical media for capture widely in use today, face recognition technologies constitute the current high-water mark of surveillance. Are we moving towards the future warned against by Agre, where the face is effectively becoming a barcode, and the barcode scan is being replaced by face recognition? This paper will explore this question in relation to Amazon's logistics, which operate between the barcode and face scan.

Amazon is often portrayed as a surveillance capitalist, one that makes surveillance convenient, intimate and embracing. West considers Amazon to be providing "surveillance-as-a-service", both through "selling products and services consumers can use to conduct surveillance on their own domestic spaces", and by offering surveillance "as a key ingredient for providing personalised goods and services" (2019: 29). The twin technologies at the centre of Amazon's consumer technologies for surveillance are Ring and Alexa. The Ring Always Home Cam, the latest iteration of Amazon's smart home security devices, is a flying indoor security camera that can be directed to fly around and deliver images of indoor space to one's mobile phone. In the promotional video it is used to chase a burglar out of the house.[1] Alexa is Amazon's voice assistant, which can be accessed through many of its devices, most notably the different Echo smart devices Amazon sells for smart homes. What makes Amazon's offers special, according to West, is that "Amazon's tools and techniques of surveillance create tremendous intimacy between consumer and brand – achieved through the sensations of being seen, heard, and known" (ibid.: 31). Munn similarly notes that the Echo can be conceived as an "'architecture of embrace' – a computational zone running in an intimate domestic space" focused on gathering as much information as possible (2018: 94).[2]

In addition to voice recognition, object and face recognition technologies have gained importance in these offers for Amazon's consumers. Rekognition, a product that is part of its Web Services division, is Amazon's deep learning tool that allows its user to "identify objects, people, text, scenes, and activities in images and videos" and "provides highly accurate facial analysis and facial search capabilities" – or so Amazon claims.[3] Rekognition is at work in recent Echo Show devices equipped with Visual ID, which recognises faces both to unlock

1 See https://youtu.be/i2jFN_QEcS4.

2 For the sake of clarity of argument in relation to Amazon's logistics, I am leaving out discussions of how Amazon's surveillance technologies also trade in architectures of fear, for example in the way Rekognition has been deployed by U.S. Immigration and Customs Enforcement (Weise 2021), or in the way its Ring technologies "produce fear and paranoia of the racialized Other" (Bridges 2021: 830) when used by police accused of racial profiling. Needless to say, this blurring between state and corporate surveillance (Bridges 2021: 838) also complicates the characterisation of Amazon as a surveillance capitalist (Zuboff 2019: 268).

3 See https://aws.amazon.com/rekognition (accessed 12.08.2021).

devices and to rotate screens to orient towards users' faces. Amazon Astro, the "household robot for home monitoring" introduced in late 2021 and available to select consumers only, similarly relies on object and face recognition to orient itself in space and to address its users.[4] Rekognition is also deployed in Amazon Go stores, and has recently been put in place in other stores such as Starbucks (Lyons 2021). Huberman suggests that Amazon Go stores, equipped with "high ceilings to accommodate the cameras and sensors that are used to meticulously track the movements of merchandise and shoppers", promise convenience in that they make checkouts and their accompanying queues redundant, since tracked goods can be billed automatically (2021: 339). This convenience for Huberman operates "as an ideology that is central to Amazon's abilities to exploit the behavioral surplus of its customers and legitimate new forms of capital accumulation and extraction" (ibid.: 337).

A shift from a focus on the consumers of Amazon's surveillance products to the labour involved in delivering these products (and the convenience associated with them) highlights how surveillance for workers is less embracing and intimate, and more insidious and unpleasant. Whether in the warehouse or in last mile delivery, workers are usually understood to be "subject to a system of total surveillance" (Delfanti 2021b: 68). In the following, by exploring the role of visuality in the management of Amazon's logistical operations in the fulfilment centre in particular, I want to partially contest these accounts. What I will demonstrate is that the kinds of advanced face recognition technologies and their associated networked images have not been established in these warehouses. Rather, what comes to the fore is a more mundane technology: that of the barcode scan. While also implicated in surveillance, I suggest that the barcode scan can be understood more productively as partaking in capture and in a mode of power characterised by environmentality and operationalism, rather than panopticism. Furthermore, Amazon's logistical operations are marked by invisualities produced by calm images such as the barcode, with visuality operationalised for optimising the flows of data, things and people, rather than for visual forms of surveillance. The economy of this mode of power and its invisualities must also be considered when accounting for the ways in which face recognition technologies and augmented video surveillance more broadly are being put to work in logistical operations. Finally, the contrast between how consumers and workers are subjected to these technologies highlights the shifting politics of technology and their distribution between these spheres.

In proceeding, and taking a cue from Agre that the specificity of media technologies of surveillance must be accounted for, I draw on logistical media theory (Hockenberry et al. 2021) to highlight the role of logistical media such as barcode scanners, but also of architecture, in the operations of power in Amazon's

4 See https://youtu.be/sj1t3msy8dc.

fulfilment centres. LeCavalier, in his account of Walmart's architecture of fulfilment, notes that there, "architecture's role as a tool has expanded significantly as it operates at different scales to orchestrate desire fulfillment, control territories, discipline bodies, and catalyse cultural growth" (2016: 25; on architecture as media, cf. Kamleithner et al. 2015). We can also expect to find other media of organisation (cf. Beverungen et al. 2019) in Amazon's fulfilment centres, media which, optical or not, serve logistics. Peters has suggested that digital media in particular "traffic [...] in organization, power, and calculation", "serve [...] as logistical devices of tracking and orientation", and their innovations are to be found in "the structures of everyday life and the organization of power" (Peters 2015: 7; on logistical media, cf. Rossiter 2016). What logistical media are to be found in the "continuously computed environments" (Thrift 2008: 95) of logistics at Amazon?

Architecture of Flows and Logistical Media of Capture[5]

The architecture of Amazon's fulfilment centres, whether these were purpose built or not, is extremely reductive – standardised, pre-engineered and prefabricated (Lyster 2016: 156). Not much more than a big shell, the large warehouses contain different areas for the storage of different sized goods in different shelving systems (for stowing and picking by humans, forklifts, or robots), areas for the reception of goods as well as their packing and delivery, plenty of conveyor belts connecting these areas, and of course amenities for labour. There are only few levels, with shelving for robots or human pickers and stowers, usually across three levels, and for bulk items on one level with high ceilings, with conveyor belts higher up and sometimes half levels or balconies stretching across the sides. There are only as many walls as necessary, with many open spaces occupied by machines (e.g., for packing or labelling), conveyor belts, shelves and work stations. The architectural shell of the building is pierced with docking stations for trucks, for delivery and reception of goods, emphasising the way these fulfilment centres are part of wider logistical networks. Architecture becomes infrastructural here, with the building's shell "merely a necessary provision to keep the vast material handling system protected from the elements", which "only obscures the more active process of connecting one interior to another" (LeCavalier 2016: 26, 96). "It's not that architecture has disappeared", Lyster notes: "rather, it has been synthesised into a flow field, such that conduit (flow) and node (space) merge into a single seamless artifact" (2016: 158).

Several hundred people work in fulfilment centres at any one time, and the architecture and material arrangement of the space are geared towards them

5 Observations and analysis in this and subsequent sections is informed by two site visits to Amazon fulfilment centres in Germany, interviews with trade union representatives at Amazon, and the newspaper reports and academic literature cited.

fulfilling their role in logistical operations. There are turnstiles at the entrance that can be opened using chip cards, stairs, body scanners at the entrance (to prevent theft), many marked paths, a canteen, toilets, stairs and doors. On the work floor of the fulfilment centre itself, there are a wide variety of stations for receivers, who receive goods, for packers, who pack shipments, and, in the case of fulfilment centres with robots, also stations near the robot zones for stowers, who put goods on shelves, and pickers, who take them off again. The work stations are integrated into the logistical flows via conveyor belts, which move the ubiquitous totes in which goods travel before they are finally packaged for delivery. Stations are equipped with screens, buttons and scanners, in order to both give directions to workers and to track the movement of goods. Those not working at stations, such as stowers and pickers who walk around to store and retrieve goods from shelving, are equipped with handheld scanners which, via screens and sounds, give directions and equally enable goods to be scanned in order to be tracked.

The fulfilment centre as an environment, then, is teeming with logistical media, both fixed and mobile. As Lyster notes with regards to logistical operations more broadly: "Mechanical devices and their digital prosthetics – trackers, codes, responders, and scanners – are collapsed into a synthesised systemic interface" (2016: 156). Here in Amazon's fulfilment centres, it is the logistical media – the scanners, the buttons and the totes – which constitute an interface for the algorithmic system that manages logistical flows and logistical labour. And there is one operation that is central: barcode scanning. All goods, and all containers for goods – the totes, the shelves and the packages – are marked with individual barcodes. And as soon as goods change their place of storage – that is, are put into the tote by a receiver, put onto a shelf by a stower, put back into a tote by a picker, packed by a packer – both the goods and the containers are scanned. Since Amazon wants to track individual goods, all of them are equipped with an individual barcode, rather than the more standard Universal Product Code (UPC) more widely in use (cf. LeCavalier 2016: 63-75 for a history of the barcode). Here, the barcode as a logistical medium acts as a translator, "to translate physical objects into information to be managed", and as one of many "coupling technologies that facilitate the internal compatibility within logistical systems" (LeCavalier 2018: 105).

It is Agre's concept of capture (1994) that explicates this operation of the scan. For Agre, capture originally stems from "the elaborate representational schemes of industrial time and motion studies" (ibid.: 108) such as those of Frederick W. Taylor and Lilian and Frank Gilbreth. Key to the computational operation of capture are two aspects: the capture of data by computer systems and their sensors, and the representational schemes that allow certain processes or semantics to be mapped in the computer system (ibid.: 106). Capture points to a particular operation of power: it is not only a matter of monitoring or recording activity, but equally a matter of imposing the representational schemes as grammars of action (ibid.: 109-110). This is also the case when, in Amazon's fulfilment centres, the handheld scanners or workstations not only record activity by a scan or the push of a button,

but give directions to workers. The scanning of individual barcodes generates all the data essential for tracking goods in the warehouse that the algorithmic control system relies on. The data also suffices to manage and assess labour, to prompt team leaders to check on workers, e.g., when their scanning is interrupted or their breaks are taking too long – recorded as "time-off-task". It also allows for all sorts of amalgamated statistics and calculations on performance and productivity. This evaluation and assessment of work on the basis of data generated by scans is the central way in which labour is managed in the warehouse (Delfanti 2021a).

As Kanngieser notes with reference to the use of RFID technologies in logistics, what "is at stake here is an equivocation of agency between workers and the objects they are required to move along the supply chain" (2013: 599). It is through the scanning of objects that the activities of workers are tracked, and this equivocation is far from accidental. Rather, it demonstrates how the scan integrates the management of labour into Amazon's logistical operations. It also points to the economy of this power. As Elmer has reminded us, Foucault insists on the way that "disciplinary mechanisms lie at the heart of the political economy" (Elmer 2012: 25), so that forms of power must coincide with political economic logics, as discipline did for a long time with industrial capitalism. Referring to Deleuze's reading of Foucault and his notion of "control societies" as well (Deleuze 1992), Elmer notes that what comes into view is a "self-governing machine that not only subtly coerces subjects into docile states, but also integrates such subjects into the machinations of wider economies, including the circulation of information and objects" (2012: 27). It is the economy of the scan with its dual function of tracking objects and people which makes it so economical: it becomes key to the circulation of goods in logistics while it enables power to be exercised over workers. What role does visuality play in this economy of power?

Invisualities and Operational Images

The architecture of Amazon's fulfilment centres, then, as well as the spatial arrangement of the different areas for receiving, storing, retrieving, packing and sending goods, is designed so as to optimise logistical flows, rather than surveillance. Consider the layout and arrangement of spaces within the fulfilment centre. Amazon has carried out many zoning studies to optimise "the tricky relationship between time and space in the warehouse" (Lyster 2016: 95). The results of these studies are visible today, for example, in "fast picking zones", where very popular products are stored *en masse* on pallets near stations, or in "batches", where popular products are available for picking at multiple points in the warehouse (ibid.). The movement of bodies around these spaces is part of these studies, with the aim to optimise the movements of bodies rather than make them visible, that is, to reduce the length of the tracks pickers have to follow to pick goods for delivery, speeding up delivery times. Amazon's zoning studies may be reminiscent of the time and motion studies of Taylor and the Gilbreths, which sought to optimise

work design and ergonomics for productivity. Yet while their focus, as well as the media of the stopwatch and the camera they deployed, were primarily directed at the human body and its sequential movements (cf. Pias 2017: 32-49; Gregg 2018: 34-40), Amazon's studies on space utilisation are concerned with optimised sequences and arrangements between people and logistical media in space.

Even if the spatial arrangements of architecture and logistical media in the fulfilment centre are not specifically designed for visual surveillance, they are nonetheless amenable to it. There are still a lot of open spaces on the shop floor; the work stations are equipped functionally but not, for example, to reduce visual or acoustic interference; and in particular, team leaders moving around the shop floor can easily visually supervise their team members, and when prompted by the algorithmic system, intervene in their work. Union organisers also report that in some fulfilment centres, there are balconies which do not seem to serve a purpose other than granting managers a bird's eye view of the shop floor. There are also accounts of operations managers who, during busy times such as Prime Day or the busy period prior to Christmas, walk up and down alleys under the roof usually reserved for maintenance – very visibly, in order to let workers know that they are being watched.[6] Yet, contrary to what US-based reports suggest (e.g., Hanley/Hubbard 2020), in fulfilment centres in Germany there is no CCTV surveillance except at the perimeters of the site, and no other ways in which augmented video technologies such as face recognition come into play.[7] In this sense, it would seem the operation of capture executed with the barcode scan is complemented by rather anachronistic forms of human visual surveillance reminiscent of the panopticon (Foucault 1977: 195-228).

Yet where the primary role of visuality in the fulfilment centre comes to the fore lies in the barcode scan itself. Barcodes can be considered what Farocki calls "operational images", that is, "images made by machines for other machines" (Paglen 2014: 1). The advent of operational images, as Paglen recounts, means that "human eyes were becoming anachronistic", with "machines and images starting to 'do' things in the world" and thereby inaugurating a "new visual regime" (ibid.). Veel (2012) suggests that operational images or what she refers to as "calm imaging" is a key feature of ubiquitous computing, and is associated with broader media technological reconfigurations of sensing and attention (cf. Hansen 2012). The barcode is a rather simple example of these calm, operational images, insofar as its informational content is rather limited and fixed, in contrast to examples such as images from drone surveillance or retail motion trackers (Paglen 2014:

6 These two aspects were reported to me during interviews with union representatives at fulfillment centres in Germany in 2017.

7 There is, however, the accusation of illegal, automated surveillance also said to include cameras, brought up by a coalition of Amazon employees, trade unionists, lawyers, and civil rights activists as part of the Amazon Workers Against Surveillance coalition. See https://organizeawas.de/en/ (accessed 12.08.2021).

1), where image data potentially yields more patterns than can be algorithmically extracted (Rothöhler 2018: 38). In that way barcodes offer little propensity for further surveillance beyond the immediate recording of the scan itself as it reflects how labour moves things – its economy is exhausted yet effective.

We are thus dealing with the invisualities of Amazon's logistical operations in the fulfilment centre. Invisualities, for MacKenzie and Munster, refers to the operationalisation of images, wherein "observation operates in and through the image but is not *of* the order of the visual" (2019: 6; cf. Azar et al. 2021). As Rothöhler observes with regards to the operationalisation of images in automation: "We are thus surrounded not only by computing machines that can do without human input, but also by image machines that do not value images" (2018: 37). Yet Amazon's fufilment centres are not fully automated (Delfanti/Frey 2021), and the invisualities are complemented by focused kinds of visualities, namely visualisations of the data generated through capture. As Wright notes, visualisations "imply that not all computational processes can be fully automated and left to run themselves", and that human decisions or actions are still called for (2008: 79). So, the screens of handheld scanners or those installed at workstations order workers to complete certain tasks prescribed by the grammars of action inscribed in the warehouse management system. Supervisors sit at mobile workstations staring at screens with various visualisations of performance data for humans and machines, calling for optimisation. In the reception area of the fulfilment centre, screens attached to walls inform workers of their centre's key performance indicators in competition with others, calling for more competition. These visualisations, based on practices of depicting and modelling data, produce particular forms of attention (cf. Halpern 2014: 21-7).

Where automation is more advanced, namely in those fulfilment centres with robots carrying shelves, which effectively make storage mobile, and where "instead of machine buildings populated with robot-like humans" we see a "machine landscape of building-like robots" (LeCavalier 2019: 53), the invisualities of Amazon's logistical operations come to the fore yet more sharply. Several hundred of the robots would be moving around thousands of shelves in flat-surfaced and fenced "human exclusion zones" (LeCavalier 2019), receiving orders through an auction system, and only meeting human workers at the work stations set up at the edges of the fenced area, which humans enter only for repair and maintenance tasks. LeCavalier describes how inhumane (and invisual) these zones are: "the bots only need a small light to scan the codes on the floor. As a result, the human exclusion zone is dark. Dark and quiet. It is large enough that the rows of racks receding in the distance, when viewed from the outside, disappear into the blackness beyond" (ibid.: 54). Since robots orient themselves in space by scanning QR-codes on the floors via infrared scanners, and include other sensors to detect other robots, human operators or other obstacles such as goods that have fallen off shelves (Wurman et al. 2007), little lighting is required. These human exclusion zones are equally zones of invisuality.

Surveillance between Panopticism and Operationalism

The invisualities of Amazon's logistical operations in the fulfilment centre point to a very specific way in which surveillance operates there. It is far less embracing and intimate than Amazon's surveillance technologies for consumers, with logistical media in the fulfilment centre attached less to workers' bodies, being less intimate with them, interacting through quite simple, standard logistical interfaces of buttons and screens. This insight runs somewhat contrary to accounts of Amazon as a leading example of a "despotic", "digital Taylorism" (Staab/Nachtwey 2016; Altenried 2019). According to these accounts, one might have expected more insidious logistical media at work, allowing labour processes to be monitored and evaluated even more meticulously. For example, Moore and Robinson suggest that Amazon monitors workers via "wearable" and "arm-mounted terminals" (2016: 2779). Yet the scanners do not attach to the body in the way quantified self technologies such as Amazon's fitness and health band Amazon Halo do: the handheld scanners merely scan barcodes; they do not collect bodily information or track specific body movements. In that sense they are less invasive than quantified self technologies.

What is striking, nonetheless, in accounts of control in Amazon's fulfilment centres, is how control is experienced as practically total (cf. Beverungen 2021: 12). This is often understood to be an effect of surveillance. Delfanti, for examples, notes that "in the warehouse, workers are subject to a system of total surveillance" (2021b: 68), and Ajunwa et al. cite Amazon as an example of "limitless worker surveillance" (2017: 744). The account here corroborates these positions insofar as the operation of capture through the barcode scan can be considered the technical basis for such surveillance. For a long time, scholars of surveillance have associated these kinds of computation with surveillance, at least since Clarke's coining of the term "dataveillance" (1988). The sense of total control afforded by surveillance and capture is exacerbated by the one-sided opacities actively operationalised in performance management. The performance of individual workers is evaluated on the basis of a single performance indicator, which in itself is opaque and hardly comprehensible, and cannot even be reconstructed by trade unions from various productivity indicators.[8] Delfanti characterises this as "augmented despotism" (2021a: 48-51), effectively a technologically mediated form of arbitrary authority, where managerial decisions that could be transparent are hidden behind opaque machinery.

At the same time, the account here contradicts other accounts on surveillance at Amazon, with regards to both the logistical media at work and the forms of power associated with surveillance. In particular, this is the case for accounts which conceive of power as panoptic. Despite longstanding critiques in scholar-

8 This was reported to me by a trade unionist during an interview in 2019.

ship on surveillance of the panoptic frame of analysis and attempts to characterise post-panoptic forms of power (e.g., Boyne 2000; Elmer 2012), the frame of the "electronic panopticon" (Chen 2017) or more recently the "algorithmic panopticon" (Woodcock 2020) is applied in particular to an analysis of power in platform labour. With regards to Amazon, Manokha has forcefully claimed that a move "towards absolute panopticism" can be discerned for workers under digital surveillance, in that "the three main assumptions behind the panopticon" – the omnipresence of the manager, universal visibility, and the presumption of constant surveillance – "are now increasingly fulfilled" (2020: 547). In a similar vein, Delfanti argues, with reference to Foucault, that "Amazon is developing and deploying digital technology that extends and deepens Bentham's panopticon further: [...] workers are constantly watched, recorded, their labour measured, and their activities monitored" (2021b: 69).

It may be a moot point to note that the scan, as an operation of capture on which the algorithmic management of labour in Amazon's fulfilment centres relies, is not "constant" but rather discontinuous. While Delfanti refers to the report by Hanley and Hubbard (2020) mentioned above and mentions a set of other examples of (visual) surveillance, the suggestion that these add up to 'total surveillance' does not account for the US-centricity of the report, nor does it fully explain how visual surveillance relates to the barcode scan. Where Manokha does note that "if workplace surveillance was previously [...] limited to supervisors' eyes, it is now continuous" (2020: 541), he opens an opportunity to reflect on the logistical media of surveillance replacing the line of sight. However, this opportunity is thwarted by insisting on the metaphor of the gaze, when he writes that "with modern means of surveillance, the supervisor is always 'looking', even when not physically present" (ibid.). The argument here is that these nuances matter, insofar as an account of surveillance requires a careful consideration of its economy and its limits. For example, it might be easy to get rid of CCTV cameras, but much harder to get rid of the barcode scan that is so entangled with logistical operations. A political response would thus need to focus less on privacy, as e.g., Zuboff (2019) does, and more on what Rossiter calls the "politics of parameters" (2016: 71-72), which challenges the kinds of parameters through which computational systems record, represent and govern human behaviour.

A focus on the invisualities of logistical operations here highlights two things in particular. On the one hand, it demonstrates the limited way in which the barcode as a rather simple kind of calm image can be repurposed for more elaborate forms of augmented surveillance, particularly in contrast to other calm images operative in augmented video surveillance, which provide such opportunities. On the other hand, attention to the specific ways in which calm imaging works complicates the story of transparent surveillance. The longstanding association of computing with the transparency required for surveillance is remarkable in itself, since it relies on a forgetting of the processes of capture and the generative aspects of computing in constructing representations of the world (Chun

2005; Agre 1997). This is exacerbated with the invisualities described above, since when machines "see", seeing "is no longer centred, singular or indexical of truth or reality, as it was mistakenly thought to be [...], but takes on new distributed and contradictory forms" (Azar et al. 2021: 1095). In particular, "seeing" is neither primarily about humans, nor for humans, so knowing is decoupled from seeing (ibid.: 1098); the coincidence of machine seeing and managerial knowing cannot be assumed. This insight also puts into question the three central premises of the panoptic analysis: the omnipresence of the manager, universal visibility and the presumption of constant surveillance.

The analysis above also – on the other hand – suggests a different analytic of power in contrast to the panoptic. Power here appears as environmental and operational: the invisualities of logistical operations point to the ways in which fulfilment centres become "continuously computed environments" (Thrift 2008: 95). Power here is environmental in the sense that the fulfilment centre as environment becomes programmable, via a paraphernalia of logistical media. Andrejevic points out how sensory monitoring and data-driven control rely on the modulation of environments: "to treat [them] as a flexible, programmable context, analogous to that of virtual reality" (2020: 18). Power here is operational in the way it is coincident with the logistical operations as described above, with capture at the centre of these operations, and in the way this "operationalism" relies on automated responses (ibid.). With reference to Foucault's notion of environmental power (see also Massumi 2009; Gabrys 2016), Hörl notes: "here it is not 'surveillance' but 'capture' that serves as the fundamental concept of Environmentality, whose basic problem consists in capturing and controlling, in managing and modulating behavior, affects, relationships, intensities, and forces." (Hörl 2018: 162). Power moves further away from panoptic and disciplinary logics in modulating human behaviour, beyond the prompts that scanners and screens provide. This power "does not need to tame the wilderness of facts and behaviours; neither does it aim at producing docile subjects"; instead, the subject of this power is a "statistical body", which allows for the establishment of "statistically meaningful correlations" (Rouvroy 2013: 157) to predict and modulate behaviour.

That is not to say that there are no other forms of power at play in Amazon's fulfilment centres, or that the panoptic frame of analysis is wholly exhausted. Amazon complements capture with what remains of the disciplinary effects of surveillance, as sketched above; a lot of competition between precarious workers, teams and different fulfilment centres, to induce more self-discipline; elements of cultural management such as its ubiquitous leadership principles; and even aspects of gamification (cf. Beverungen 2022). As the sociologist Ulrich Bröckling has noted, "making humans governable always uses more than one register" (2017: 194). Yet the focus on economy suggests that these other forms of power are less essential for Amazon's logistical operations, more supplementary to the key operation of capture and its associated invisualities and forms of environmental power. It also explains why face recognition or quantified self technologies are

currently seldom in use in the fulfilment centre: it is the economy of the barcode scan that explains why it has persisted despite the way these newer technologies have been hyped and have been ascribed a promise of yet more total surveillance and control.

Beyond the Barcode

How to make sense, then, of the discrepancies between the accounts of Amazon as a surveillance capitalist and a supplier of surveillance-as-a-service, and the account of the rather mundane centrality of the barcode scan for Amazon's logistical operations in the fulfilment centre? One way is to consider the situation a reversal of Winner's discussions of the politics of artefacts, where he noted: "That 'democracy stops at the factory gates' was taken as a fact of life that had nothing to do with the practice of political freedom" (1980: 133). The assumption was that if there was a way to make technology democratic, it would have to be outside places such as Amazon fulfilment centres. The point that Zuboff's work on surveillance capitalism (2019) makes so forcefully is that the kind of instrumentarian power that Amazon and other surveillance capitalists deploy deprives us of our freedom as consumers – Zuboff's attention is on consumers, not workers. So, the counter-intuitive argument here is that at least there seem to be constraints in place in the workplace – even at Amazon, more so outside the US, in Europe – which constrain the use of some of the more invasive, total forms of control such as those associated with face recognition technologies, which can be made use of more fully in relation to consumers.

The constraints on the use of these technologies in the workplace – imposed for example by strong trade unions and by regulations on technologies at work – condition the economy of power, thereby contributing to the economy of the barcode scan, and constraining the use of more advanced technologies of capture. However, the COVID-19 pandemic has lefts its mark here as well, at least in the US, and there are suggestions, partly taken up by Delfanti (2021b: 70) and others, that augmented video surveillance is making inroads into fulfilment centres. During the summer of 2020, Amazon introduced "distance assistants" in its fulfilment centres in the US, which were meant to ensure social distancing during the Covid-19 pandemic (Vincent 2020). These were based on augmented video surveillance, which would track workers and measure the distance between bodies. While focused on bodily movements, much like more traditional forms of panoptic surveillance, they also operated and intervened automatically, and thus reproduced the operational, environmental mode of power explored above. They could potentially, if they remain, be repurposed for more elaborate forms of visual surveillance and more minute tracking of bodily movements.

Beyond the fulfilment centre, Amazon experiments more freely with more advanced surveillance technologies – and perhaps sees more of a need to do so, considering the environments in which last mile delivery workers in particular

operate, which must be modulated in ways different from the fulfilment centre. Hockenberry suggest that the cultural concept of "cellularity" (2022: 265) is central to programming labour on the last mile through mobile phones. These devices, which are also cameras and image processing machines, bring with them their own operational images, including the barcodes found in the fulfilment centre, but also satellite images or the pictures workers need to take of delivered parcels where "the system does not intend for the consumer to see the worker, the worker need not see the consumer. It is the camera – the system – that sees" (Hockenberry 2022: 273). In early 2021, it was also reported that, in the US, Amazon was deploying AI-powered cameras called Driveri to monitor delivery van drivers (Di Stefano 2021; Delfanti 2021b: 71), which – supposedly for safety – track activities both on the road and around the van as well as the drivers themselves. The instructional video explains in detail the kinds of analytics the system promises, for example, with regards to attention and distraction, road rage and theft. Insofar as the system – developed by a company called Netradyne – connects these calm images to various platforms for machine learning and adds them to operational databases, the system would contribute to kinds of "platform seeing" (MacKenzie/Munster 2019) way beyond what occurs with barcodes in fulfilment centres, and therefore also opens up avenues for quite different modes of surveillance.

Consumers are equally at the behest of Amazon's experiments in modulating environments through logistical media such as the Echo and Ring devices explored in the introduction. Hill suggests that the ubiquity of Amazon's platform creates an unconscious consumption, as we virtually inhabit an omnipresent marketplace: Amazon's platform, as a "central nervous system", hides behind a wide variety of interfaces (2020: 525). Hill describes how the various Alexa voice-controlled devices, such as the Echo devices or Fire tablets, exemplify the disappearance of habitual media and "a process of withholding from awareness what ought to be at the centre of our attention" (ibid.: 524). Bridges similarly suggests that Amazon's devices constitute a kind of "urban camouflage" of its infrastructure and thus an "infrastructural obfuscation" (2021). These effects concern not just those consumers buying the gadgets who consequently become subject to Amazon's behaviour modulation, but also those who may pass the Ring devices pointing towards public spaces, making passers-by subject to "racialized algorithmic sorting" and "data violence" (Bridges 2021: 832). This concern is certainly not alleviated by Amazon Sidewalk, a kind of mesh established between Amazon devices, further networking both these devices and their invisualities.

These cases from the last mile and the home suggest that, beyond the fulfilment centre, a different economy of power reigns, one where the operations of capture are not associated only with the comparatively simple calm images of the barcode, but where Amazon experiments rather freely with object and face recognition technologies that extend and exacerbate the environmental and operational power at play. These technologies produce more elaborate invisualities and forms of "platform seeing" (MacKenzie/Munster 2019), which offer potential for

surveillance. The spectre of control certainly looms large here, considering Veel's warning, with reference to the kinds of calm images circulating in technologies of face recognition and neuromarketing, that these technologies "highlight how difficult it is to determine when calmness capsizes in control" (2012: 126). Yet, considering the account offered here of the economy and mode of power associated with the invisualities of Amazon's logistical operations, suggestions that these kinds of arrangements of devices constitute a kind of "surveillant assemblage" (Haggerty/Ericson 2000), which potentially provide total surveillance, may be premature when the limited experimental status of many of these technologies is also considered.

A more fundamental shift in the invisualities of Amazon's logistical operations materialises, however, in the Amazon Go stores mentioned above. While they are currently only operating experimentally in the UK and USA, they are spaces that eliminate the requirement for last mile delivery, as customers come to Amazon to pick up their goods. In Amazon Go stores, customers check-in with their NFC-enabled smartphones, and there is no need for a check-out, as picked-up goods are traced not via scanning or RFID chips but via augmented video cameras, and are automatically charged to the customers' Amazon accounts. Here, the barcode is potentially replaced by other logistical media: "deep learning algorithms, sensors and cameras in the ceiling control the selection, placement and replacement of all the goods, rendering obsolete the iconic barcode" (Lyster 2019: 102). In this way, the central operation of the scan is potentially replaced by augmented video surveillance and object recognition technologies. Here, the continuity of logistical operations become apparent, as Amazon moves further into the heart of cities and as customers are reimagined as picking agents: "Amazon makes little distinction between a customer in a shop or picking agent working at their fulfillment centers. In fact, it stresses the similarities between the two: both locate items from an inventory" (Stewart 2018). Being caught, never mind whether as workers or consumers, in these modulated environments, perhaps augmented video surveillance and its associated networked images may slowly precipitate a further shift in the economies of power and the invisualities of Amazon's logistical operations.

The author would like to thank Ilia Antenucci, Maja-Lee Voigt and Daniela Wentz for comments on earlier versions of this paper.

References

Agre, Philip (2001): "Your Face Is Not a Bar Code." In: Whole Earth Review 106/ Winter, pp. 74-7.

Agre, Philip (1994): "Surveillance and Capture: Two Models of Privacy." In: The Information Society 10/2, pp. 101-27.

Agre, Philip (1997): "Beyond the Mirror World: Privacy and the Representational Practices of Computing." In: Philip Agre/Marc Rotenberg (eds.), Technology and Privacy: The New Landscape, Cambridge, MA: MIT Press, pp. 29-61.

Ajunwa, Ifeoma/Crawford, Kate/Schultz, Jason (2017): "Limitless Worker Surveillance." In: California Law Review 105/3, pp. 735-76.

Altenried, Moritz (2019): "On the Last Mile: Logistical Urbanism and the Transformation of Labour." In: Work Organisation, Labour & Globalisation 13/1, pp. 114-29.

Andrejevic, Mark (2020): Automated Media, New York, NY: Routledge.

Azar, Mitra/Cox, Geoff /Impett, Leonardo (2021): "Introduction: Ways of Machine Seeing." In: AI & SOCIETY 36/4, pp. 1093-1104.

Beverungen, Armin (2021): "Remote Control: Algorithmic Management of Circulation at Amazon." In: Marcus Burkhardt/Mary Shnayien/Katja Grashöfer (eds.), Explorations in Digital Cultures, Lüneburg: meson press, online first.

Beverungen, Armin (2022): „Automatisiertes Verhalten: Regierungskünste Bei Amazon." In: Georg Toepfer/Sophie Gräfe (eds.), Wissensgeschichte des Verhaltens. Interdisziplinäre Perspektiven, Berlin: DeGruyter, forthcoming.

Beverungen, Armin/Beyes, Timon/Conrad, Lisa (2019): "The Organizational Powers of (Digital) Media." In: Organization 26/5, pp. 621-35.

Boyne, Roy (2000): "Post-Panopticism." In: Economy and Society 29/2, pp. 285-307.

Bridges, Lauren (2021): "Infrastructural Obfuscation: Unpacking the Carceral Logics of the Ring Surveillant Assemblage." In: Information, Communication & Society 24/6, pp. 830-849.

Bröckling, Ulrich (2017): Gute Hirten Führen Sanft: Über Menschenregierungskünste, Berlin: Suhrkamp.

Chen, Julie Yujie (2017): "Technologies of Control, Communication, and Calculation: Taxi Drivers' Labour in the Platform Economy." In: Phoebe V. Moore/ Martin Upchurch/Xanthe Whittaker (eds.), Humans and Machines at Work: Monitoring, Surveillance and Automation in Contemporary Capitalism, New York, NY: Springer, pp. 231-252.

Chun, Wendy H.K. (2005): "On Software, or the Persistence of Visual Knowledge." In: Grey Room 18, pp. 26-51.

Clarke, Roger (1988): "Information Technology and Dataveillance." In: Communications of the ACM 31/5, pp. 498-512.

Deleuze, Gilles (1992): "Postscript on the Societies of Control." In: October 5, pp. 3-7.

Delfanti, Alessandro (2021a): "Machinic Dispossession and Augmented Despotism: Digital Work in an Amazon Warehouse." In: New Media & Society 23/1, pp. 39-55.

Delfanti, Alessandro (2021b): The Warehouse: Workers and Robots at Amazon, London: Pluto Press.

Delfanti, Alessandro/Frey, Bronwyn (2021): "Humanly Extended Automation or the Future of Work Seen through Amazon Patents." In: Science, Technology, & Human Values 46/3, pp. 655-82.

Elmer, Greg (2012): "Panopticon – Discipline – Control." In: Kirstie Ball/Kevin D. Haggerty/David Lyon (eds.), Routledge Handbook of Surveillance Studies, Abingdon and New York, NY: Routledge, pp. 21-9.

Foucault, Michel (1977): Discipline and Punish: The Birth of the Prison, trans. A. Sheridan, New York: Vintage.

Gabrys, Jennifer (2016): Program Earth: Environmental Sensing Technology and the Making of a Computational Planet, Minneapolis: University of Minnesota Press.

Gregg, Melissa (2018): Counterproductive: Time Management in the Knowledge Economy, Durham: Duke University Press.

Haggerty, Kevin D./Ericson, Richard V. (2000): "The Surveillant Assemblage." In: The British Journal of Sociology 51/4, pp. 605-22.

Halpern, Orit (2014): Beautiful Data: A History of Vision and Reason since 1945, Durham: Duke University Press.

Hanley, Daniel A./Hubbard, Sally (2020): Eyes Everywhere: Amazon's Surveillance Infrastructure and Revitalizing Worker Power, Washington D.C.: Open Market Institute.

Hansen, Mark B. N. (2012): "Ubiquitous Sensation: Toward an Atmospheric, Collective, and Microtemporal Model of Media." In: Ulrik Ekman (ed.), Throughout: Art and Culture Emerging with Ubiquitous Computing, Cambridge: MIT Press, pp. 63-88.

Hill, David W. (2020): "The Injuries of Platform Logistics." In: Media, Culture & Society 42/4, pp. 521-36.

Hockenberry, Matthew (2022): "Cellular Capitalism: Life and Labor at the End of the Digital Supply Chain." In: Mark Graham/Fabian Ferrari (eds.), Digital Work in the Planetary Market, Cambridge: The MIT Press, pp. 263-80.

Hockenberry, Matthew/Starosielski, Nicole/Zieger, Susan (eds.) (2021): Assembly Codes: The Logistics of Media, Durham: Duke University Press.

Hörl, Erich (2018): "The Environmentalitarian Situation." Trans. N. F. Schott. In: Cultural Politics 14/2, pp. 153-73.

Huberman, Jenny (2021): "Amazon Go, Surveillance Capitalism, and the Ideology of Convenience." In: Economic Anthropology 8/2, pp. 337-49.

Kamleithner, Christa/Meyer, Roland/Weber, Julia (2015): „Medien / Architekturen. Einleitung in den Schwerpunkt." In: Zeitschrift für Medienwissenschaft 12/1, pp. 10-18.

Kanngieser, Anja (2013): „Tracking and Tracing: Geographies of Logistical Governance and Labouring Bodies." In: Environment and Planning D 31/4, pp. 594-610.

LeCavalier, Jesse (2016): The Rule of Logistics: Walmart and the Architecture of Fulfillment, Minneapolis and London: University of Minnesota Press.

LeCavalier, Jesse (2018): "New Interfaces in the Automated Landscapes of Logistics." In: FOOTPRINT 23, pp. 105-14.

LeCavalier, Jesse (2019): "Human Exclusion Zones: Logistics and New Machine Landscapes." In: Architectural Design 89/1, pp. 48-55.

Lyons, Kim (2021): "New Starbucks Pickup Store in NYC Uses Amazon Go Cashierless Technology." In: The Verge, November 18 (https://www.theverge.com/2021/11/18/22789116/starbucks-pickup-store-amazon-go-cashierless-technology).

Lyster, Clare (2016): Learning from Logistics: How Networks Change Our Cities, Basel: Birkhäuser.

Lyster, Clare (2019): "Disciplinary Hybrids: Retail Landscapes of the Post-Human City." In: Architectural Design 89/1, pp. 100-5.

MacKenzie, Adrian/Munster, Anna (2019): "Platform Seeing: Image Ensembles and Their Invisualities." In: Theory, Culture & Society 36/5, pp. 3-22.

Manokha, Ivan (2020): "The Implications of Digital Employee Monitoring and People Analytics for Power Relations in the Workplace." In: Surveillance & Society 18/4, pp. 540-54.

Massumi, Brian (2009): "National Enterprise Emergency: Steps Toward an Ecology of Powers." In: Theory, Culture & Society 26/6, pp. 153-85.

Moore, Phoebe V./Robinson, Andrew (2016): "The Quantified Self: What Counts in the Neoliberal Workplace." In: New Media & Society 18/11, pp. 2774-2792.

Munn, Luke (2018): Ferocious Logics: Unmaking the Algorithm, Lüneburg: meson press.

Paglen, Trevor (2014): "Operational Images." In: E-Flux 59/November, pp. 1-3.

Peters, John D. (2015): The Marvelous Clouds: Toward a Philosophy of Elemental Media, Chicago: University of Chicago Press.

Pias, Claus (2017): Computer Game Worlds, Zurich: Diaphanes.

Rossiter, Ned (2016): Software, Infrastructure, Labor: A Media Theory of Logistical Nightmares, New York: Routledge Taylor & Francis Group.

Rothöhler, Simon (2018): "Calm Images." In: MERKUR 72/833, pp. 32-42.

Rothöhler, Simon (2021): "Calm Images: The Invisible Visual Culture of Digital Image Distribution." In: Olga Moskatova (ed.), Images on the Move: Materiality – Networks – Formats, Bielefeld: transcript, pp. 73-86.

Rouvroy, Antoinette (2013): "The End(s) of Critique: Data Behaviourism versus Due Process." In: Mirellie Hildebrandt/Katja de Vries (eds.), Privacy, Due Process and the Computational Turn: The Philosophy of Law Meets the Philosophy of Technology, London: Routledge, pp. 143-67.

Staab, Philip/Nachtwey, Oliver (2016): "Market and Labour Control in Digital Capitalism." In: TripleC: Communication, Capitalism & Critique 14/2, pp. 457-474.

Stewart, Matthew (2018): "Amazon Urbanism: Patents and The Totalizing World of Big Tech Futures." In: Failed Architecture, May 23 (https://failedarchitecture.com/amazon-urbanism-patents-and-the-totalizing-world-of-big-tech-futures/).

Thrift, Nigel (2008): Non-Representational Theory: Space, Politics, Affect, Abingdon: Routledge.

Veel, Kristin (2012): "Calm Imaging: The Conquest of Overload and the Conditions of Attention." In: Ulrik Ekman (ed.), Throughout: Art and Culture Emerging with Ubiquitous Computing, Cambridge, MA: MIT Press, pp. 119-32.

Vincent, James (2020, October 1): "Amazon's Palm Reading Starts at the Grocery Store, but It Could Be so Much Bigger." In: The Verge, October 1 (https://www.theverge.com/2020/10/1/21496673/amazon-one-palm-reading-vein-recognition-payments-identity-verification).

Weise, Karen (2021): "Amazon Indefinitely Extends a Moratorium on the Police Use of Its Facial Recognition Software." In: The New York Times, May 18 (https://www.nytimes.com/2021/05/18/business/amazon-police-facial-recognition.html).

West, Emily (2019): "Amazon: Surveillance as a Service." In: Surveillance & Society 17/1/2, pp. 27-33.

Winner, Langdon (1980): "Do Artifacts Have Politics?" In: Daedalus 109/1, pp. 121-36.

Woodcock, Jamie (2020): "The Algorithmic Panopticon at Deliveroo: Measurement, Precarity, and the Illusion of Control." In: ephemera: Theory & Politics in Organization 20/3, pp. 67-95.

Wurman, Peter R. et al. (2007): "System and Method for Maneuvering a Mobile Drive Unit." December 20 (https://patents.google.com/patent/US20070290040A1/en?oq=US20070290040A1).

Zuboff, Shoshana (2019): The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power, New York: PublicAffairs.