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USING e-ANNOTATION TOOLS FOR ELECTRONIC PROOF CORRECTION

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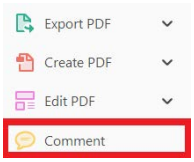

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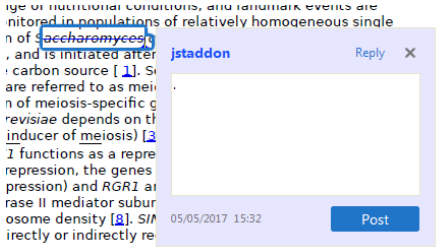

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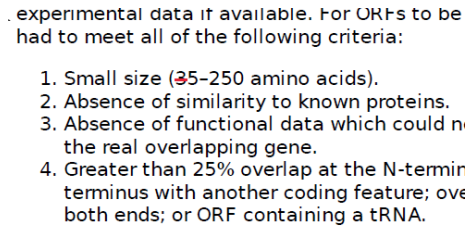

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How to use it:

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How to use it:

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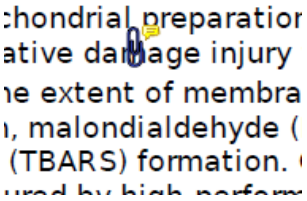

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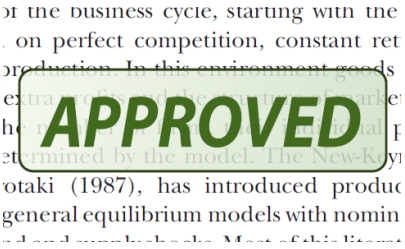

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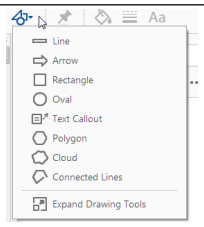

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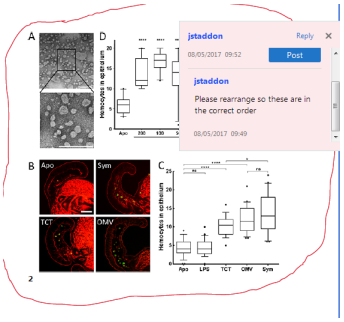

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smart place to work? Big data systems, bour, control and modern retail stores

Leighton Evans and Rob Kitchin

The modern retail store is a complex coded assemblage and data-intensive environment, its operations and management mediated by a number of interlinked big data systems. This paper draws on an ethnography of a retail store in Ireland to examine how these systems modulate the functioning of the store and working practices of employees. It was found that retail work involves a continual movement between a governance regime of control reliant on big data systems which seek to regulate and harnesses formal labour and automation into enterprise planning, and a disciplinary regime that deals with the symbolic, interactive labour that workers perform and act as a reserve mode of governmentality if control fails. This continual movement is caused by new systems of control being open to vertical and horizontal fissures. While retail functions as a coded assemblage of control, systems are too brittle to sustain the governmentality desired.

Keywords: retail, control, discipline, code/space, labour, big data, automation.

Introduction

used to be more chance for contact and more time with customers. Now, do people care n?

(Customer Services Operative).

tail industry has to balance good customer service and soft labour skills with effi- naximising revenue and formal labour. In large retail stores, interaction with cus-

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m of our research was to understand how such computational systems mediate
sform the nature of labour and workplace governmentality and the conse-
with regards to staff work practices and conditions. The paper first outlines
nt to which big data systems have become pervasive in the retail sector. We
rt how new big data systems attempt to shift workplace governmentality from
e of discipline to a regime of control and the horizontal and vertical fissures
ning such a shift. Next we explore the governmentality operating on a daily
hin a large retail store, drawing on observations from an ethnographic study
ed in Ireland. Specifically, the empirical study sought to address three ques-
what are the discernible changes in modes of governance in the modern retail
ment due to big data systems? (2) what factors are responsible for disruptions
nance? (3) what are the effects of these changes on workers?

The modern retail store as a big-data environment

retail is a data intensive business reliant on extensive information manage-
stems such as Enterprise Resource Planning (ERP), Supply Chain Management
nd Customer Relationship Management (CRM) (Chopra and Meindl, 2012;
al., 2006). These systems aim to facilitate greater coordination and control
retail organisation, and with suppliers and customers, using big data – that is,
ntities of fine-grained (at the level of individual products, staff, customers),
ve and quickly transitioning data produced through the everyday, routine in-
s with the various systems used to conduct business (Kitchin, 2014). Such big
tems are seen as vital for producing extended coordination and improved
-making and operational intelligence, creating organisational efficiencies, in-
new services and business models, and improving customer experience, thus
ng additional profit and competitive advantage while reducing risks, costs and
nal losses. In addition, they are marketed as enabling retailers to be nimbler,
ne, flexible, innovative and smart in how they are organised and operate
a *et al.*, 2011). These big data systems are having profound effects on the na-
etail labour.

systems change labour practices in three respects. First, they change the forms of
th tasks mediated by digital devices and practices. Second, they replace some work
h automation or semi-automation (such as self-service checkout tills, or automati-
nputed delivery routes). Third, they change the nature of governmentality and the
which the work of staff is managed, overseen and regulated. With respect to the
nd third points, technological infrastructures will create less human labour, but not
y Keynes (1936) envisaged, wherein a planned form of technological unemploy-
uld exist (Floridi, 2014; Danaher, 2016a). Instead, a fear of idleness, a failure to de-
mployment and income, and the positioning of the Protestant work ethic as the

organisations which overlaps with other algocracies and interacts with them – mple, a 'human-out-of-the-loop' system, such as predictive systems like stock n supermarkets. The effect of such systems and modes of governance in a re- e is to actively divorce labour from the reasons for doing the task, as allocated ue systems (Danaher, 2016b). Morozov (2013a,b) refers to this as a 'web of in- arbed wire', where systems of control constrain and construct work without and without requisite knowledge in labour, or labour organisations able to e these structures (Andrejevic, 2014; Mittelstadt and Floridi, 2016). The result of satisfaction in work as the worker is divorced from the motivation and rea- or work (Danaher, 2016a). The effect of such a working environment is precar- ployment where workers experience degradation with a lack of political tion in such a process as the issues are poorly understood (Smith, 2012).

storical context, the use of data in the workplace is part of the ongoing project of management of work (Gregg, 2016). Like in the disciplinary techniques of Gilbreth reth (1917), Roethlisberger and Dickson (1939), and Taylor (1903) in general, slow apture techniques are reproduced in the big data age, but with a commensurate in speed and a lack of direct intrusion; with an increase in overall intrusion, such as work outside of the workplace in the form of expected use of email and other appli- Technological innovations in the workplace – such as sales-based ordering or inven- nagement prevalent in retail environments – are therefore used to determine the d character of labour (Gregg, 2016). This is materialised in workplace surveillance s the boundary of public and private spheres (Dash, 2014). The use of technology to nisations of 'time theft' (Ehrenreich, 2010: 29) through surveillance has led to a situ- ere 75 per cent of all companies monitor usage of the internet at work (Ball, 2010). o this, the routine use of tracking technologies on employees, such as Amazon's ng of employee movement in warehouses (McClelland, 2012), and the firing of em- or a lack of 'hustle' (Head, 2014) are more severe extensions of the same observa- gic. Following from Deleuze (1992), in a post-Fordist environment, such as the big used retail store, power is mobile and mobilised by technology. The aim of this gically-infused surveillant workplace is efficiency, a situation that Rossiter (2014: s as a nightmare combination of enterprise resource planning (ERP) and key perfor- dicators (KPIs) used to modulate the experience of the work world. The tracking of es becomes an informatised sovereignty (Rossiter, 2014: 68) where 'code is king' are used to maximise the effectiveness of worker bodies. With no delay be- ovement and data collection and processing, code means that there is always, , work.

Discipline and control of labour in a coded assemblage

ct of the presence of big data systems in the workplace that monitor and assess

of any disciplinary mechanism is dependent upon these instruments. Any
n the apparatus (such as through new data techniques or the use of databases)
mplify or change the nature of discipline. As such, in a data society discipline
extended across the lifeworld. For Foucault, this produced power distributes
uals in a permanent and continuous field in which they self-discipline, actively
g their behaviour to comply with expectations for fear of being caught trans-
and experiencing sanctions (Foucault, 1979).

tantly, the shift to big data systems seeks to change the mode of governmentality
l. Here, employees become subject to constant modulation through their capture
as that shape their behaviour explicitly or implicitly nudge it, rather than being (self)
ed (Savat, 2012). For example, the work of checkout operatives was disciplined
the gaze of the supervisor and CCTV monitoring of work rate. Now, the mode of
e scanning of items – becomes the mechanism of capturing and regulating behav-
re, work is modulated by checkout till and the act of scanning becomes a site of ad-
tion (Kitchin and Dodge, 2011). Big data systems change the nature of observation
surveillance) from a model where an observer is needed to one where observation
stant and performed by software; behaviour is no longer adjusted in case a man-
resent as the 'manager' is always present. Here, pattern recognition of the kind de-
n everyday performance management in retail environments is not panoptical, as
pticon requires awareness by the subject that they are being watched, subjects
are of the model towards which they have to adjust their behaviour, subjects that
ut being observed, and a sense of gratification derived from following the disciplin-
ime (Savat, 2012: 23).

lation uses different mechanisms (e.g. recognition of patterns; anticipation of activ-
nisation of antitheses; and programming of code) and instruments (e.g. simulation;
ampling) in its operation as a mode of power. Whereas disciplinary machines oper-
ke the invisible mechanisms of control visible, modulation has no need to do this
ys acts in a non-overt way without the need for an explicit gaze. The effect is that
ct produced by this form of observation is akin to Deleuze's objectile – not a subject
t a construct of patterns of code that emerge from activity in the digitally-infused
herefore, modulation does not 'see' individuals and individuals only fleetingly
rom the flux of code and patterns, if at all (Savat, 2012: 56). This produces a dissipa-
e individual and therefore a destruction of any care for the individual (Stiegler,
is work world, where one is held in a state of continual anticipation, is one where
er is always in a state of angst as the modulatory machine is always aware of the
nother words, governmentality is no longer solely about subjectification (moulding
and restricting action) but about control (modulating affects, desires and opinions,
ucing action within prescribed comportments) (Deleuze, 1995; Braun, 2014).

n the context of retail, workers become continually monitored and modulated across
e range of work through an amalgam of interlinked systems and overlapping calcu-
gimes designed to produce a certain kind of worker and work. While techniques of

al displays (Hochschild, 1985), there is a significant barrier to mobilising these symbolic labour in a big data regime (Sallaz, 2010). Competition demands els of service, but the operational mechanisms and key performance indicators sed in big data environments are not designed to encompass this symbolic la- hile workers engage in interactive and emotional labour continually in their eir performance is only assessed on formal labour in the data infrastructure of l store. As such, disciplinary techniques are still employed in retail environ- govern symbolic labour, in continual oscillation with control techniques that ormal work and monitor performance. These different modes of power in the ce impact upon the experience of work for the labourer and create a work at is paradoxical, contradictory and confusing while still being quantified and egulated. The worker becomes an interface (Lazzarato, 1996) between the different s and levels of hierarchy in the workplace, continually moving between disciplinary rol regimes and embodying these in their labour practices – and therefore always onitored by different techniques, for different (or non-existent) reward and punish- echanisms.

Case study: a retail store in Ireland

changing nature of labour and governmentality in retail industry, the move- tween disciplinary and control regimes, and the vertical and horizontal fis- play that we are centrally concerned with examining through our case study, ting the precarious and provisional state of play due to the rapid adoption of systems. The empirical, on-site fieldwork took place over a nine-week period September and November 2015 at a large retail store operating in Ireland. The part of a large, multi-national chain in the Republic of Ireland, with typically people working in the fieldwork store per shift across all departments, and a crew of 15–25 working at night during the closing hours of the store (varia- ording to seasonal demand). The research was conducted within the parame- ealth, safety, training and University ethics approval and was subject to a losure agreement with the chain.

viduals were interviewed in 15 separate interviews, complemented with a set of 10 of observation of workers at work, and observant participation through workplace- e researcher was placed for one week in each of the following departments, con- nterviews, learning and performing tasks, and observing working practices: online and delivery; customer services; electrical products; stock control; price integrity; nce; and front end (checkouts). The interviews took place with two delivery drivers in the home delivery department; two team leaders, the driver coordinator and the of the home delivery department; three checkout operators; the checkout team he stock control manager and a stock control operative; two customer service oper-

that reoccurred across interviews and observations and significantly ted upon the central research questions.

Vertical and horizontal fissures in control

e management consistently identified the key challenges for the store as grow- and planning the trade deals for the week. Managers primarily use the email work plan, Sales Based Ordering (SBO), and store reports derived from these to provide, compile and communicate data for the running of the store. Major dentified by store workers were 'no clear link between [company] vision and ns in store', 'honest communications' between managers and staff, 'clearer tar- n line managers', and 'health and wellbeing' (including wages and hours). The e and functioning of a variety of data-intensive systems to produce a data in- environment contributes to these issues. In particular, the research found three rtical and horizontal fissures:

- People work 'for the data', where tasks become data-fulfilment and data-satisfying rather than people-, task- or customer-focussed. This is particularly problematic in roles that are distanced from direct customer interaction (horizontal).
- Non-coded activities and symbolic labour (such as strong customer relationships or service), while praised, are not part of formal evaluation or appraisal of staff because they are not easily captured data (horizontal).
- Systemic system failure (where systems do not work properly or are subject to disruption) and equipment issues (old, absent or malfunctioning media) form major operational concerns and are a source of frustration for those working in the store or on particular tasks (vertical).

Working for data

mple of work being directed by data – and therefore the totalisation of formal a regime of control – is the 'picking' operation for home deliveries that are ed through the company's online ordering portal. The picking PDA device (re- a 3G signal rather than store Wi-Fi) directs the activities of the picker and how the route around the store and order of collection of items) is undertaken. The on with coded data is intense; the picker must scan their personal ID barcode PDA to activate themselves on the device; the picker scans each individual p to 6) on their trolley; this generates an order of the pick based on items loca- he store; the picker must then scan the begin/end barcode (located next to the

nt system. The mapping of the store also causes major issues, especially on days when the ends of aisle displays are changed for offers as old items can often napped in the wrong places.

ture of the task and the extent to which the task is dictated by the PDA and data nt aspect means that this role is one which is (more than any other in store) d from the customer. In effect, the use of the PDA to navigate the store creates housing' effect wherein the picking team encounters the store differently to es. While there are some interactions with customers and with colleagues, the interaction in work is the PDA and not with the customer or the store 'as a his formal labour is a clear instance of a regime of control, with worker move- hly modulated – that is, planned, controlled, scheduled and timed – for max- ficiency and minimal (ideally no) symbolic labour (as detailed in the context of vice work by Carter *et al*., 2011: 90). Performance is totally objectified and infor- lised, and performance review is derived from systems rather than direct ob- n by managers. However, staff dissatisfaction with the work derives from the tioning of systems, with little reflection on Morozov (2013a,b) 'web of barbed t exerts control.

Non-coded activities and symbolic labour

e a number of work tasks that are not mediated by coded systems or captured mployee performance metrics. Customer service is one such activity and per- the role can seriously affect the metrics of those tasks that are measured. For , in the picker role, individual run performance is not assessed, rather overall performance is a part of appraisal. However, as there are customers in the he time of the pick, pickers must if asked break off from their duties to assist rs, which in turn affects pick rates (with KPIs of 80–120 items per hour, de- on demand). Customer service would need to be recorded – through pausing or signing off for the time needed to assist the customer (recording the activity way) – if it is to be rewarded, but this is not the case. Any demand for a switch olic labour is, however, considered critical by management, and cannot be ig- Here, the two regimes of power in the store clash most clearly; control requires g the coded system, discipline requires ignoring the system and falling into a r service role where the reward mechanisms are fuzzy, undefined and conven- ther than data-driven.

ont end (checkouts) also includes activity that is not coded, but which is vital to the r service element of the store. The team leader monitors checkout performance re- t give data on sales and customers, time taken by each operator, numbers of inter- , sales totals, and issues with pricing. These are measured against KPIs for efficiency d of scanning and form part of the appraisal of operators. However, interactive la- critical in this role and is not assessed – only formal work is incorporated into the

s red to alert the operator – they then restore the status of the checkout to green issue has been resolved. The real-time monitoring station gives feedback on items price of items and quantity of items, and keeps a running total of customers that sed through the area in a session. While this activity can be recorded and reported d despite this being a customer activity, the operator role is very manual – there are interventions made and assistance given. The operator needs to be constantly for customer care, as well as attending to formal duties. The performance of omer service role is not recorded, nor are the continual interventions to assist ervice. The non-coded activities were seen as being, by far, the most important he role by the operator, yet was the least commented on when it comes to ap- Indeed, the role itself was summarised as a 'thankless task' by staff. Positive ustomer feedback is rare, although negative formal feedback is acted upon by management and such sessions ignore data on task performance which is the PoS system.

clear indication of this tension between systems of control and discipline was ob- the electrical department, specifically in the mobile phone area. Two key functions and troubleshooting, with roughly a one-to-three division in time between these s although the latter has no bearing on the KPIs of the department. The KPIs are y based on new connections to pay-monthly tariffs, with a sales KPI target of 19 new ons per week (the store achieves 20–23 on average, but this is not evenly distrib- ough the year). Troubleshooting takes up most of their time, and during our obser- e observed a worker writing texts for a customer and accessing and resetting an count for another. The excellent customer service was not recorded in any way, de- eing integral to the role at it taking up the most time. Again, the symbolic labour (in explicitly emotional and interactive labour intended to ease customer distress with gy) is disregarded in the regime of control being sought in the store, and only fleet- t all attended to in the regime of discipline. With KPIs tethered so closely to data on, analysis and provision, the regime of control appears to be a barrier to the ap- n of non-coded activity in the way that Sallaz (2010) argues.

Systemic system and equipment failures

c system and equipment failures are a continual issue in the store. These situa- se because although the environment is highly data dependent, it relies in ses on old digital technology that has limited capability and lacks interopera- th other systems. These shortcomings arise because the technology was pur- t different times, with the capabilities available at the time of purchase, with em upgraded or patched or worked around but not replaced. The wholesale ment of a technical system is costly and brings with it certain risks, for example uption of transferring to a new system and embedding it into existing systems k practices. At the same time, there are also clear risks in persisting with sys-

ore being mapped out on an item basis through barcoding, there is no real-time visualising and reporting KPI data.

egards to the online orders fulfilment team, the routing system used to direct o deliveries is a major operational and system issue. While routing systems own that delivery operations can be improved dramatically with the applica- ehicle routing analytics technology (Toth, 2015), in this situation there was no ble improvement in delivery. Currently, in order to monitor KPIs for time of of items, punctuality and route compliance the route order cannot be altered rs, and if the route is not followed (unless alterations are programmed by the owing a report) then the driver is penalised in their metric. This is despite the local knowledge possessed by the experienced drivers who know the loca- customers and the best routing between them would improve service and particular, issues of CO_2 reduction, fuel costs and customer service are raised se of this system (see Wang *et al*., 2015). Routing issues occur because of a ssue, where distances between delivery points in towns or townlands are re- s 0 km distance whereas the distance could be up to 10 km, with only six allocated for delivery (in line with the KPIs for delivery). As one driver com- 'the routing sets you up to be late.' Here, the issue is the use of a system de- or the postcode address system in the UK rather than the Irish addressing leading to routing being haphazard and sub-optimal especially in urban cen- re congestion exacerbates issues (Wygonik *et al*., 2015). Manual routing could but then the tracking of orders and data collection would be out of sync with that does not allow such adjustments. Here, the regime of control has a lack h task demands and the pragmatic aspects of the task, but there is no regime line to replace this system. Another major issue identified was illogical sched- d routing. The order schedule on a run we observed as a passenger went: n deliveries; 11–1 pm deliveries; 10–12 pm deliveries. The non-sequential or- llied to the need to follow routing meant that there were inevitably delivery at were missed. Customers had to be phoned from the van to be informed was apparent the delivery would be late and while this was fine with some, ould not be contacted and messages had to be left, which is far from ideal cus- rvice.

r, the online order system requires drivers to use a reach device that collects data routes and driving performance, and feeds that information into the system to re- ng and collate driver metrics. The reach device is also used to end the run through rn journey' function that syncs the device with the system once docked at the store. esyncing is not always possible due to persistent signal issues. Moreover, the reach re themselves technologically obsolete, with no Global Positioning System (GPS) ies, and their mode of connection to the systems in-store leading to a time lag (con- g to a bullwhip effect). This time lag means that the online order fulfilment system operate in real time; it is always contingent on drivers being in the store to synchro-

of control which results in a reversion to a regime of discipline. A systemic the electrical department occurs when customers are sometimes denied sales ustomer security check on the landing page of the main portal. If a fail is re- a score of more than 10) then the sale is not approved. This is decided by an m, and the team is not given reasons for why the customer has been denied, hey have sufficient understanding of the potential reasons as to why they e denied. The security team that can intervene in these events is not based in d finish each day at 4 pm and are closed at weekends, while the shop is open rly morning until late, Monday to Sunday – so failed orders cannot be pro- t many busy periods. On 1 day, while with the electrical team, the email to the team was down so no 'fail customers' could be passed for processing (delay- potential sales). The automation of decision-making and black boxing of dge on these processes again result in a reversion to soft, symbolic labour that t to an undefined and undervalued focus within the store.

reduction is an important part of the operations of the store, and refers to the pro- eploying new stock on shelves and registering that stock as available to customers re systems. This task is targeted for completion at 8 am every day, and this forms ary KPI for that department. While this time was achieved on the morning the er accompanied stock control (beginning at 5 am), it was commented that it is usu- mpossible task'. This is particularly true at times of high volume. This is largely a of another bullwhip effect, where data errors that inform delivery from the ware- pact on operations in store. In addition, connectivity issues for PDAs – a function of lth and coverage issues in store – create delays in data processing and retrieval also s task. There are over 10,000 lines in store at any time, so this is a data and task in- ole. Prices are downloaded weekly from the central office, and this system provides at must be printed and then verified through the use of the PDA handset. This is reate Shelf Edge Labels (SELs) which are critical for stock check and online order nt. Changeover is the most intensive part of the role; a huge job, involving label pro- for legal sales of both store reductions and increases in price for goods coming off on. This must be done by 7 am on the day of sales. The night crew has two people d to this task, but the main means of communication between the night and day communications book and a weekly meeting at 7 am on a Tuesday. Again, this is an of highly controlled, formal work incorporating loosely disciplined regimes of gov- that are ill suited to the task resulting in data errors that effect formal execution. ment issues are also seen in the front-end operation, where the processes of work- eckout terminals were described as: monotonous, automated, data-driven, repeti- characterised by a rigidity of movement, function and action. The haptic interface is across terminals rather than being optimally configured for each worker. The elec- partment shares the systems overload issue; it has three web-portal based records all accessible through an antiquated desktop PC with no Wi-Fi connection. If there rnet connection available, there is no electrical retail. All systems are web based,

our analysis, it is clear that big data systems are being extensively deployed across orms of retail work and they are having a significant impact on operations. This is hey work to create a condition in which the spaces (e.g. store, warehouse, logistics) tices (e.g. management, sales, deliveries, communications) of retail are pervasively d through computation, and introduce a regime of control that shifts the manage- abour from surveillance and discipline to capture and modulation. This is a signifi- ft, with the management of work increasingly being automated, mediated, ed and regulated by code and data that saturates all tasks and sites of labour. Even anagers are still directly involved, their work is directed by a series of auto-generated d data-reactive work processes.

we have detailed through our empirical study this regime of control is highly pre- nd fallible, open to vertical and horizontal fissures that disrupt the various opera- lt to the functioning of a store. For example, tasks can become data-satisfying rather erations- or customer-focused; symbolic labour vital to customer satisfaction is nored; and systemic system and equipment failures continually disrupt operations. sequence, retail work involves a continual movement between a regime of control s to regulate and harnesses formal labour and automation, and a disciplinary hat deals with the symbolic, interactive labour that workers perform and acts rve mode of governmentality when control fails (see also Newsome *et al.*, 2013: nsequently, rather than the retail environment becoming inherently more nim- ble, innovative and smart in how it is organised and operates, as suggested by ns research and the big data industry (e.g. Manyika *et al.*, 2011), big data sys- oduce a number of effects that hinder effective operation and require staff to karound solutions and management to revert to disciplinary regimes. Indeed, he dependence and ubiquity of big data in the store, the actual equipment that s with the various store systems actively work to prevent formal labour being icient. One manager remarked that the effect of this is that 'the environment been created by the data flows also makes it too fast to think… there is no time t on what works and what might work, as the KPIs always have to be met and s and planning are data, rather than knowledge, based.' In other words, while is a big data environment, the tools for working in the store do not match the ensive functioning of the store,

over, the use of these systems mean that customer satisfaction is also being dele- big data and algorithmic processing in order to understand 'customer behaviour' sales and improve customer experience. The implication of such measures is that o know customers is no longer about face-to-face interactions and symbolic labour e about efficiency in formal work (Sallaz, 2010). Moreover, the reliance on big data to manage customers means workers experiencing less chance to develop or exer- skills (or emotional labour) with customers (Barocas and Levy, 2016). Yet, face-to- ractions do not disappear; they are still critical in the presentation of the service a retail store but without mechanisms to capture and reward this labour, this work

esearch thus highlights that the retail industry has some way to go to effectively
ig data systems into their operations that maximise operational efficiency
hancing worker management and experience and customer satisfaction. In
horizontal and vertical fissures we identified suggest that such an alignment
xtremely difficult to achieve due to the inherent contradictions of seeking to
e productivity and profit at the same time as maximising worker and cus-
tisfaction. Rather than trying to square this circle through another round of
gical solutionism (Morozov, 2013b), our sense is that it requires an organisa-
proach that considers the use of technology in context, maps outs unantici-
nsequences, and considers novel solutions that take advantage of the benefits
utation and big data, but does not lose sight of the fact that retail is a high
le activity. Retail relies on large numbers of customer-facing workers, and
ger numbers of customers, and brand image and reputation are extremely im-
not simply efficiency and price.

research is needed, we believe, to map out the uses and consequences of big data
ess operations and labour. This should take at least four forms. First, there needs to
ension of our work within the retail sector and to chart in detail the ways in which
systems are being deployed and the horizontal and vertical fissures that disrupt
nded disruptive innovation. Second, this research needs to become comparative
ards to type of retail sector, scale of operations, and location. For example, in retail
redominately conducted online, the parameters of customer satisfaction are
atdifferent, withonlythecustomer-relationsdepartmentbeingpredominatelycus-
cing. Further, the scales of economy for deployment will vary across businesses and
ct workplaces differentially. Moreover, there are likely to be variation in how sys-
configured and used across jurisdictions depending on local workplace culture,
e of unions, labour laws, and other regulations. Third, how big data systems are re-
ing the management and practices of labour in other sectors requires analysis and
son. It is likely that horizontal and vertical fissures will have emerged in these con-
t may have different forms and consequences. Fourth, more attention needs to be
he formulation of normative interventions that consider the ethics, politics and
f big data systems with respect to workplace governmentality and labour and to
ing alternative ethos, ethics of care, and instrumental arrangements that have posi-
ker and customer effects while still benefitting from the use of computation and big
aser and Bolton, 2017). In each case, understanding the workplace changes
y will benefit from ethnographic insights built on first-hand observation and
tion in the functioning of work as it unfolds in practice rather than as in-
Without such research and re-envisioning it seems that many workplaces will
om smart places to work.

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