The Politics of Algorithmic Management

Class Composition and Everyday Struggle in Distribution Work

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Declaration of authorship

I declare sole authorship of this thesis, which has not been published elsewhere prior to examination. I confirm the work has not been submitted for a degree at another university.

Abstract

This research enquires into the politics of organization, control and resistance in distribution workplaces. Situated within an autonomist Marxist conceptual framework, I make a case for the restoration of the spirit of the workers inquiry to class composition analyses of contemporary workplaces, particularly regarding the strategic need to understand the politics of *algorithmic management*. Although largely lost since the 'post-autonomist' turn, I argue the 'interested' methodological approach of the workers inquiry as developed within operaismo is especially pertinent to understanding contemporary class struggle within algorithmically-mediated workplaces.

I highlight the political deficit in initial studies of the emergence of algorithmic management through engagement with a genealogy of scientific, cybernetic and humanistic management approaches. In doing so, I excavate the class politics of knowledge and communication, which remain prevalent in softwarized managerial forms. Combining an interdisciplinary theoretical basis with original empirical engagement, the inquiry builds an understanding of the technical composition of a number of distribution workplaces, detailing the managerial and working processes and highlighting the role of tracking, metrics and communication.

Devices such as handheld radio data terminals provide the research with a space for thinking about the politics of algorithmic management because they mediate informational asymmetry between workers and managers, which I examine through consideration of such effects as 'managerial distantiation' and the uncertain place of supervisors within the algorithmic management infrastructure.

I argue that workers are politically active in distribution workplaces, often aside from trade union involvement, and that there exists an infrapolitical realm where workers take advantage of the technologically reshaped terrain of struggle. These subversive actions, I argue, are characterised by metis (cunning intelligence), which challenges the forms of political action typically found in the workplace organizing repertoire by providing an alternative basis of commonality and collectivity based on the use of guile despite initially adverse conditions.

Abbreviations and acronyms

BAME	Black, Asian and minority ethnic
BBC	British Broadcasting Corporation
BEIS	Department of Business, Energy and Industrial Strategy
BMA	British Medical Association
CGIL	Confederazione Generale Italiana del Lavoro (Italian General Confederation of Labour)
CLMS	closed-loop management system
CPM	cases per minute
GMB	General, Municipal, Boilermakers and Allied Trade Union
HGV	heavy goods vehicle
ICT	information communication technology
IPH	items per hour
IWGB	Independent Workers Union of Great Britain
IWW	Industrial Workers of the World union
MTurk	Amazon Mechanical Turk
QC	quality control
QR	quick response (code)
SAP	Systeme, Anwendungen und Produkte in der Datenverarbeitung (Systems, Applications and Products in Data Processing)
SLAM	scan label, apply manifest (machine)
SMS	short message service
TQC	total quality control
TSS	Transnational Social Strike platform
TUC	Trades Union Congress
Usdaw	Union of Shop, Distributive and Allied Workers
Ver.di	Vereinte Dienstleistungsgewerkschaft (German United Services Trade Union)
VSM	viable systems model

Introduction

> …emancipatory politics must always destroy the appearance of a ‘natural order’, must reveal what is presented as necessary and inevitable to be a mere contingency, just as it must make what was previously deemed to be impossible seem attainable.
>
> Mark Fisher (2009: 17)

Laboratories of resistance

On a chilly morning in April 2013, over a thousand trade unionists donning high-vis vests and armed with whistles formed a picket line outside the Bad Hersfeld fulfilment centre in central Germany, beginning a campaign of strike action which by 2016 had cost over a hundred work days, and marking the first ever strike against the e-commerce, entertainment and digital services giant Amazon (Boewe and Schulten, 2017: 9). Facilitated by the Ver.di general union, the launch of the campaign was notable not only for being the first of its kind, but also for its specifically industrial, proactive character — Amazon having crushed trade union ambitions for a decade in the UK by that point (ibid.: 27-9; see Gall, 2004).

Foremost among the campaign's aims is a collective agreement between the union and employer; a demand echoed by unions across the sector internationally, with a clear rationale which links union recognition and representation with protections for workers in terms of wages and conditions. However, such demands have been met by anti-union tactics either overt or implicit. In Spain and Italy, union campaigns have met with police violence. In the UK, unions have had to deal with a lack of access, a workforce divided between employment agencies, employers signing 'sweetheart deals' with partnership unions, and ambivalence from the political wing of the labour movement, which has expressed concern over working conditions in the sector while subsidizing companies like Amazon on the promise of bringing jobs to deindustrialized areas.

Boewe and Schulten (2017) refer to Amazon as a "laboratory of resistance". In many senses the metaphor encapsulates the trials of labour movement actors and thinkers over the past decade in engaging with a broad but entangled knot of emerging working practices and conditions symbolized by Amazon on one hand, and the so-called 'gig economy' on the other. Against the backdrop of

expanding global logistics networks (Moody, 2017), the rise of 'platform capitalism' (Srnicek, 2016) and suggestions of the 'uberization' of work (Warhurst et al, 2017), the position of labour in relation to the combined force of capital and unprecedented technological capabilities appears precarious both economically and politically. The precise forms of work emerging from this nexus are diverse, but they are united by the highly computerized forms of organization and management which have come to be referred to as 'algorithmic management', and are frequently accompanied by contractual insecurity, such as some variation on 'self-employed' status (as in the gig economy) or fixed-term or 'zero-hour'[1] contracts, as well as sectoral norms of adaptivity, flexibility and just-in-time provision.[2]

Labour and social movements have responded to this situation in different ways. Industrial action against Amazon has spread to fulfilment centres in Spain, Italy and Poland (Reuters, 2017; Al Jazeera, 2018). Meanwhile, the gig economy has seen its first 'strikes' by food platform workers against Deliveroo, Foodora and Uber Eats (Cant, 2018; Bloomberg News, 2016), as well as 'ride-sharers' against Uber (Mabuza, 2018; McGinn, 2018), subverting the companies' insistence that its service providers are independent workers (rather than employees) by staging organized 'wildcat' actions whereby workers agree not to log into their work apps. In response to the increasingly logistical character of the organization of global capitalism (Moody, 2017; Dyer-Witheford, 2015: 81-101, LeCavalier, 2016), social movement actors have focused their energies on 'blocking' supply chains through occupations or blockades (…ums Ganze!: 2017; MSNBC, 2011). Meanwhile, trade unions in the UK have launched media campaigns and legal challenges over working

[1] 'Zero-hour' contracts are a controversial provision of British employment law, whereby workers are retained by a company as employees without the guarantee of shifts but without the right to decline shifts when they are offered.

[2] A lesser used but more descriptive and arguably more inclusive term which has emerged is the 'on-demand economy'.

conditions in the 'digital economy' (GMB @ Asos, 2016; Butler and Osborne, 2017). Combined with the work of investigative journalists, many of the issues arising from this moment in labour relations have seeped into popular consciousness in the UK. Following undercover documentaries and some high-profile news stories (Panorama, 2013; Dispatches, 2015; Unite the Union, 2015), issues such as zero-hour contracts and Draconian surveillance practices became talking points in the 2015 general election and have remained prominent national political and media issues (Goodley and Ashby, 2015; Grierson, 2015), leading to separate parliamentary inquiries into the digital economy and working conditions at Sports Direct's Shirebrook distribution centre, a company whose name has become synonymous with poor working conditions in popular discourse (Chakrabortty and Weale, 2016).

The future world of work

On 26th October 2016, the UK parliament's Business, Energy and Industrial Strategy (BEIS) Committee responded to the spectrum of concerns raised by the emerging situation by launching an inquiry into the "future world of work and the rights of workers". Following the digital economy and Sports Direct inquiries, the 'future world of work' inquiry sought to address concerns arising from news stories regarding the working conditions of distribution warehouses, courier delivery services and high-profile 'gig economy' companies (Business, Energy and Industrial Strategy Committee, 2016; see also Business, Innovation and Skills Committee, 2016a, 2016b).[3] Although the 'future world of work' inquiry, like its predecessors, ultimately framed its concerns for working conditions in terms of employment security, its rationale was directly

[3] A note on the use of inverted commas (') and quotation marks ("): Single inverted commas are used throughout to denote phrases, concepts, terms which may be considered 'so-called', and paraphrasing, as well as quotations within quotations. Double quotation marks are used to denote direct quotations.

linked to concerns about the effects of technological change on work. Launching the inquiry, Iain Wright MP said:

> The nature of work is undoubtedly changing. It will change further with growing use of technology and a spreading of automation across the economy. This might provide flexibility and choice for some people, but unleash insecurity and squeezed working conditions for others. With these economic and technological changes shaking up the world of work, it's vitally important that workers are protected. (Business, Energy and Industrial Strategy Committee, 2016)

The confluence of technological changes and employment insecurity pointed to by Wright is widely observed across the labour movement, both in the UK and beyond (Blakely and Davies, 2018; Runge, 2017). Yet the response to this challenge has tended to focus on resolving employment insecurity, with considerably less attention paid to the technological organization of work, despite grievances against it. So far, proposed solutions towards mitigating what are perceived as encroachments on workers' interests have generally taken two related forms: legislation and unionization.

The legislative approach entails parliamentary lobbying or participation (such as in an inquiry) or advancing test cases through employment courts. In these ways trade unions seek changes either in legislation or case law with a view to strengthening workers' rights at work with respect to the terms and conditions of employment. Recent examples include two test cases successfully brought against Uber by the GMB union and then the Independent Workers Union of Great Britain (IWGB) (GMB, 2016; BBC News, 2017), and a third brought against CitySprint by IWGB (Butler and Osborne, 2017). Although related, unionization refers more specifically to recruiting workers to a trade union, most often with the explicit aim of forcing either a voluntary or statutory recognition agreement with the employer. This has taken different forms. IWGB, a

grassroots campaigning union, recruited Deliveroo riders, demanded recognition, and facilitated coordinated action using the fact that workers were not technically Deliveroo employees to bypass some constraints of trade union law, such as balloting procedures (Osborne, 2016a).[4] GMB conducted a strong recruitment campaign at the global distribution centre of online retailer Asos, alongside a media campaign, with the primary goal of achieving a recognition agreement (GMB @ Asos, 2016). In contrast with IWGB at Deliveroo, GMB's focus on achieving a statutory recognition agreement meant focusing primarily on contracted workers rather than incorporating the agency workers who make up half the workforce at Asos,[5] and backing away from the site when the company signed a sweetheart deal with the Community union, both because of resources and longstanding trade union agreements.[6] While joining a union is generally accepted as a good principle by those concerned with labour rights, it is nonetheless important to remember unionization is not a panacea for strategic strength at work and is accompanied by other factors which themselves have implications for workers' interests.

Technology and the 'deeper unrest'

Although the unions mentioned so far are all cognisant of the technological dimension, they all campaign on a broadly contractual angle. In other words,

[4] In UK employment law, 'employee' is a specific category of worker with statutory entitlements and protections. Trade union law in the UK places stringent conditions on unions' ability to call industrial action, but companies are less protected by legislation if they use workers who are not employees of the company proper.

[5] Trade unions in the UK are able to force statutory recognition if they recruit 10% of a company's employees.

[6] What is known as the 'Bridlington agreement' is a convention among TUC member unions by which they agree not to recruit or campaign at workplaces where another union has, or is campaigning for, a recognition agreement with the employer. Community broke the Bridlington agreement to sign a voluntary recognition agreement with Asos.

their campaigns (beyond recognition) are primarily concerned with workers' employment rights, rather than asserting claims on companies' labour processes. While employment security is certainly important to workers' interests and, arguably, their ability to act collectively, it is curious that technological innovation does not register higher in the labour movement's priorities, despite widespread awareness of the technological character of the 'future world of work', and particularly given its significance to grievances about working conditions across companies such as Deliveroo, Uber and Amazon. Such grievances generally pertain to what is becoming known as 'algorithmic management' (O'Connor, 2016); a situation whereby the ubiquity of algorithmic tracking and decision-making is augmenting or replacing the traditional managerial or supervisory function and creating a situation whereby workers can be directed in their work by software based on real-time data processing. Initially applied in a work context to managerial forms arising in the gig economy (Lee et al, 2015), this dissertation extends the use of the term to arguably more 'cyborg' managerial forms such as those found in distribution warehouses, where digital tracking technologies which manage the work process are used in conjunction with human managers. Under algorithmic management, typical areas of concern span worker surveillance, the development and use of performance metrics which intensify work, and the curtailing of worker autonomy or influence within the labour process. This dissertation hones these concerns to show that algorithmic management represents a substantial rearrangement of social and power relations which warrants specific focus beyond attributing it to a general "use of technology and spreading of automation" (Business, Energy and Industrial Strategy Committee, 2016).

This dissertation focuses on the politics of algorithmic management technologies in the new world of work. It addresses oversights in contemporary analyses by arguing that the governance of work in the guise of 'algorithmic management' warrants a *class composition* analysis which can help us to understand the workplace politics emerging in computationally-organized

logistics workplaces, specifically in the fast-moving consumer goods sector (Baker, 2008). The research therefore extends interventions such as Woodcock (2017a, 2017b), Waters and Woodcock (2017), Moore (2018), and Rosenblat and Stark (2016), which have combined technological realities with political concerns regarding the situation of workers in heavily mediated workplaces. With a particular focus on customer goods distribution — the sector at the heart of contemporary concerns — I use a methodology inspired by the 'workers inquiry' of 1960s operaismo to ask *how algorithmic management affects 'algorithmic workers'*, and *how they might apply their own political agency* within the algorithmically-managed workplace.[7] In doing so, I excavate the politics of workplaces which are generally hard to access, and managerial forms which are often considered to be 'black boxed', advancing an alternative politics of resistance and working-class struggle.[8]

This politics starts from what in the past has been considered a 'deeper unrest' within the workplace. At the beginning of his 1921 thesis *The Frontier of*

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[7] Throughout the dissertation I use the attributive 'workers inquiry' rather than the possessive 'workers' inquiry', although I note both appear in the literature. The discussion is staged at length by Wellbrook (2014) and touched on in Chapter 1. The Italian 'operaismo' is often inaccurately translated into English as 'workerism'. In contrast with 'lavatore' (literally 'worker'), the alternative term 'operaio' carries political connotations which are not captured by 'lavatore'. 'Working class', for example, is 'la classe operaia'. Operaismo presupposes class struggle, in that it suggests alignment with a political entity rather than the blinkered preoccupation with a particular sociological strata implied by 'workerism'. Operaismo is also the collective term for the political movements from which the 'operaisti' in this thesis emerged.

[8] The dissertation does so in the UK context. While there is certainly a case for analysing the specificities of the politics of algorithmic management in different national jurisdictions, as well as between them and across global supply chains, it is beyond the scope of this dissertation. Nonetheless, as Blakely and Davies (2018: 7) note, the UK is useful as a starting point at least insofar as it has long been regarded a particularly challenging environment for workers and working-class institutions, having become something of a laboratory of anti-trade union strategy.

Control, Carter L. Goodrich quotes William Straker, the general secretary of the Northumberland Miners' Association, in an address to a Coal Commission meeting at the House of Lords:

> 'In the past workmen have thought that if they could secure higher wages and better conditions they would be content. Employers have thought that if they granted these things the workers ought to be contented. Wages and conditions have been improved; but the discontent and the unrest have not disappeared.' … Mr Straker went on:—'Many good people have come to the conclusion that working people are so unreasonable that it is useless trying to satisfy them. The fact is that the unrest is deeper than pounds, shillings and pence, necessary as they are. The root of the matter is the straining of the spirit of man to be free.' (Goodrich, 1975: 3)

Straker's choice of words is purposefully evocative, but Goodrich finds it useful for distinguishing "the unrest which is concerned more with discipline and management than with wages" (ibid.). For Goodrich, the crux of this form of unrest is *control*, a malleable term he sees used as both a slogan and a convenient term in various (sometimes conflicting) corners of the labour movement, and by no means "the unified expression of some single impulse" (ibid.: 18-9). Nonetheless

> …in actual reference to the facts of industry it breaks up into a bewildering variety of rights and claims… Control is no 'simple central objective,' no one clear-cut thing which people either know they want or know they don't want. The demand cannot be put glibly into a single phrase or a single resolution — too many diverse motives are blended and crossed in the strivings of many workers for the complicated set of things called control. (ibid.: 18)

It should be made clear that in raising the issue of workers' control, Goodrich is not straightforwardly raising the prospect of workers' political governance over industry, so much as identifying a contested threshold running through workplace relations — the *frontier of control*, or the point at which the employer aims to say "beyond this there shall be no discussion, the rest is my business alone" (ibid.: 56) and workers might test the limits of their ability to control or shape their work environment.

Glimmers in the algorithmic curtain

Goodrich's focus on "the complicated set of things called control" (ibid.: 18) as a concern aside the more conventional issues of wages and conditions is apposite for an inquiry into the politics of algorithmic management, given initial concerns about the technologically-enhanced tracking, monitoring and intensification of work and the correlative lack of control and transparency faced by workers according to studies so far (Lee, 2016; Moore, 2018; Moore et al, 2018a; Rosenblat and Stark, 2016; Woodcock, 2017a, 2017b) — in other words, issues of discipline and management. These grievances and concerns recur across the labour movement (Business, Energy and Industrial Strategy Committee, 2017a; Blakely and Davies, 2018; UNI Global Union, n.d.), but critical engagement with the specificities of algorithmic management technologies is, so far, beyond the scope of union engagement. One might be tempted to draw the simple conclusion that without trade union engagement on the issue, the technological frontier of control is simply left to the determinations of management. However, Jamie Woodcock's initial study of Deliveroo suggests the extent of managerial control may not be so straightforward, and algorithmic technologies may even represent a rather precarious form of control on the part of management (Woodcock, 2017a).[9] To understand this aspect of algorithmic management I engage with the idea of control not only in

[9] Woodcock's investigations into Deliveroo are ongoing at the time of submission.

conventional political terms but also in relation to the cybernetic principles of the algorithmic management system. As I show in Chapter 5, workers are already contesting the frontier of algorithmic control quite apart from the involvement of trade unions.

Irrespective of the formal balance of power between companies and trade unions, this dissertation dives into the 'deeper' contest occurring between workers and management within ordinary algorithmically-managed workplaces. It contributes to an understanding of what Mark Fisher (2009: 64) calls a "political phenomenology" of work by developing a class composition analysis of both the technical and political formations which emerge under algorithmic management, in which the 'algorithmic worker' is presented with both obstructions and opportunities to acting politically within the workplace. Operating within an autonomist Marxist framework, the dissertation analyses technological innovation in terms of the rearrangement of workers and management as social forces. Nonetheless, it also argues for a reorientation of the contemporary autonomist perspective towards its earlier methodological approach of workers inquiry.

Overall, this dissertation argues that answers to questions of workers' resistance to algorithmic management require further empirical engagement with ordinary algorithmically-managed workplaces and the workers in them. It shows that a class composition analysis is the appropriate framework for understanding workplace politics in a way that is attentive to the effects of technological innovation on the work process and the potential and character of workers' political agency.[10] As Scholz (2017: 2-4) notes, beyond a 'future

[10] Although it is not covered in this research, it is hoped that in arguing for the appropriateness of a class composition analysis, this dissertation strengthens calls for further inquiry into the 'social' dimension of class, particularly in terms of migrant and gendered labour, in relation to questions of technical and political composition (Notes From Below, 2018).

world of work', the technological reorganization of work we are currently witnessing may be indicative of the future of capitalism itself. If that is the case, it is imperative that critical scholarship on the topic of digital technology and work turns itself towards the changing class composition of algorithmically-managed workplaces and a closer assessment of the forms of resistance which may be available to algorithmic workers.

In 1949, the cybernetician Norbert Wiener tried to persuade Walter Reuther, the head of United Auto Workers, to either make cybernetic technologies the union's business or else campaign for their suppression (Dyer-Witheford, 2015: 39). In 1964, the co-founder of operaismo, Raniero Panzieri, warned against the 'objectivist' attitude of unions and workers parties which essentially accepted capitalist rationality with respect to the development of workplace technologies in favour of struggles over wages (Panzieri, 1980). By now digital technologies have become part of the fabric of everyday life, and in many ways the introduction of algorithmic techniques to workplaces seems somewhat unremarkable, or even inevitable (O'Connor, 2016). As Barr (2018) observes from his own experience of the supermarket distribution sector, working alongside a technology which seems opaque and pervasive can seem to give the impression of the suppression of politics altogether, let alone political possibility. In his polemic *Capitalist Realism: Is There No Alternative?*, Mark Fisher (2009: 80-1) writes:

> The very oppressive pervasiveness of capitalist realism means that even glimmers of alternative political and economic possibilities can have a disproportionately great effect. The tiniest event can tear a hole in the grey curtain of reaction which has marked the horizons of possibility under capitalist realism. From a situation in which nothing can happen, suddenly anything is possible again.

This dissertation begins a project of identifying such glimmers; events which might tear small holes in the curtain of algorithmic management, indicating new avenues for workers to advance upon the workplace claims of their own, and expanding the horizons of possibility beyond that which was previously presumed to be its frontier.

Chapter outline

The thesis does not follow the traditional structure observed by many sociological or political dissertations, i.e. discrete chapters which respectively contain a literature review, methodology, findings, analysis and so on. Instead, the thesis is organised more thematically into chapters on technology, management, algorithmically-managed distribution work, the effects of algorithmic management, and resistance to algorithmic management. The first two chapters are literature-focused, each providing something of a political history of the core ideas underpinning the thesis, but new literature is introduced in later chapters as appropriate. Empirical findings are presented and discussed across Chapters 3 to 5. This section of the thesis contains my original class composition analysis, moving from an exploration of the 'technical' composition of algorithmic management through to its 'political' terrain and composition.

Following this introductory chapter, Chapter 1 begins by explaining how different Marxisms understand the role of workplace technology in capitalist society, before introducing why autonomist Marxism offers a useful perspective for assessing the politics of algorithmic management. Specifically, I draw out its understanding of technology as struggle, the continual aim of locating the potential for autonomy or resistance within the working class, the importance of 'class composition analysis', and the methodological approach of the workers inquiry. A key research tool of operaisti in the 1960s Italian new left, the workers inquiry is a worker-centric 'interested' methodology which aims to

develop empirically-grounded theory from a working-class standpoint in order to strengthen workers' political struggles. While I make the case for an autonomist Marxist perspective in broad terms, and a class composition analysis in particular, I also acknowledge the more recent 'post-operaismo' tradition which derives a thesis of immaterial labour from the intellectual progenitor of the 'socialized worker'. Contrary to much of this tradition, I argue that contemporary attempts at class composition analysis actually need to reconnect with the historical tradition of the workers inquiry in order to be strategically useful, and that living through the so-called 'digital age' increases, rather than lessens, the need for empirical engagement with specific workplaces.

In Chapter 2 I adopt a more genealogical approach to management techniques and technologies. Following a discussion of the problems arising from algorithmic management and the limitations of adopting a 'human-centred' design or transparency-oriented approach to the issues faced by workers, I discuss the politics of management within capitalist relations. Tracing developments in the history of twentieth century management theory, I discuss the foundational principles of ensuring the cooperation of workers, maintaining effective control of the labour process, and enacting strategies which can mitigate workplace antagonism. I examine how these principles operate within a system of continuous improvement and put concepts such as kaizen into conversation with the ideas behind cybernetic management systems which privilege the measurement of performance. I conclude by considering Woodcock's (2017a) problematization of the idea of ubiquitous management, which is an important reminder that management theories need to be assessed against their observable incarnations.

In Chapter 3 I turn to the technical composition of distribution work as understood through eight cases. Following a discussion of my approach to the workers inquiry methodology and the practical challenges of researching this

sector, I describe the labour processes of the cases in some detail. I then analyse the technical class composition of the cases with particular attention to the processes of tracking and transmission, crucial as they are to algorithmic management practices. I conclude the chapter by discussing technical composition through the idea of what I call the 'management interface' as represented by real-time spatial tracking, both as a relation or calibration of processes, and as a point of juncture between asymmetric forces, such as found within screenic devices.

Chapter 4 politicizes the technical composition presented by algorithmic management by analysing what algorithmic management means for the organization of work and authority. On the organization of work, I analyse the role of algorithmic management technologies in facilitating labour demand; structuring the work flow, with consequences for workers' experience of work; producing norms of workplace communication, both through devices and between workers; and altering workers' relationship to space and movement. I then consider the rearrangement of authority within the algorithmically-managed workplace, in particular the production of power through algorithms and the elevation of the authority of algorithms. These aspects of algorithmic management create opportunities for what I call managerial distantiation, but also result in the epistemological emptying of the supervisory role. I subsequently consider the nature of the political terrain produced by algorithmic management: one that resembles an advanced form of Taylorism and which has at its core a fundamental informational asymmetry that appears to undermine the possibility of workers enacting political agency.

Following Chapter 4's analysis of the political form of algorithmic management, in Chapter 5 I enquire into the actions taken by workers to mitigate managerial claims or otherwise maximize their interests. The chapter contributes an understanding of class struggle in algorithmically-managed workplaces by developing an account of the political composition of 'algorithmic workers'. In

contrast with more union-oriented approaches, I show that the technological organization of work creates opportunities for workers to engage in acts of resistance, presenting four examples of resistance enabled by algorithmic management: a slow-down, taking advantage of devices, intentional mistakes and snooping. Introducing an alternative way of thinking about worker organization, I argue these forms of resistance are rooted in workers' guile, and make use of both 'metis' ('cunning intelligence') and an infrapolitical commons, which presents the possibility of an alternative mode of resistance I call 'metic commonality'.

In the concluding chapter I summarize my analysis and show how I have responded to the research objectives. I show that this dissertation advances a new 'spirit of approach' to thinking about the politics of algorithmic management, particularly regarding the potential for workers to establish 'defensive cordons' from which to advance their own claims within the work process. Arriving at such a position, I conclude, cannot be deduced from what managers (or management theorists) tell us about algorithmic management, and is the result of methodological choices which belong to a tradition — the workers inquiry — largely lost and much missed within autonomist Marxism.

1. Reading Technology Politically

> It would be possible to write a whole history of the inventions made since 1830 for the sole purpose of providing capital with weapons against working-class revolt.
>
> Karl Marx (1976: 563)

Introduction

Introducing the dissertation's autonomist approach, this chapter argues for the necessity of pursuing a class composition analysis of contemporary technological innovations and workplace realities. Beginning with a discussion of different Marxist approaches to questions of work and technology, I argue autonomist Marxism — particularly operaismo — offers a unique combination of historical tradition, conceptual tools, strategic orientation and methodological perspective that is distinctly suited to the interests of this study. In particular, I draw out the tradition of the workers inquiry as developed by Romano Alquati, and its practical relation to conceptual and strategic development. The later part of the chapter focuses on the question of a class composition analysis, which is fundamental to the autonomist framework. As there is no commonly agreed form or method to a class composition analysis except for the recurring notions of *technical* and *political* composition, I discuss some of ways autonomists have gone about uncovering new political configurations before turning to the ideas generated by post-operaismo in light of the perceived crisis of the mass worker figure and the onset of the digital age. Ultimately, I argue these perspectives lack strategic applicability due to their largely logical or theoretical basis, echoing Comitati Autonomi Operai's perspective that the political significance of changing class circumstance demands more, not less, empirical engagement (Rivolta di classe, 1976: 136 in Wright, 2002: 171), or alternatively, as Ed Emery (1995) argues: "no politics without inquiry".

Technology and class struggle

Class society

This dissertation is grounded in a Marxist political ontology, by which I denote a commitment to the historical persistence of class society and the centrality of

a class-based analysis for understanding the socio-political-economic phenomenon of capitalism. To the question 'why Marxism?', Nick Dyer-Witheford offers a compact response: "The short answer is: because of capitalism" (Dyer-Witheford, 1999: 9). In other words, Marxism is the one sustained intellectual and political project solely committed to understanding, criticizing and overcoming class society. Most pertinent to the interests of this dissertation, it is also a project which has throughout most of its traditions sustained specific analyses of both work and technology as crucial to understanding the social totality (ibid.). As I will argue in Chapter 2, fundamental conflicts of class interest are at the heart of workplace relations between management and the workforce, and the development of management technologies can be understood through the framework of class politics as a site of struggle and contestation.

The language of class struggle will doubtless evoke for some readers the worst excesses of a rigid, brittle and deterministic Marxism. I share Harry Cleaver's frustration that wide-reaching texts such as *Capital* have "often been interpreted in an objectivist and determinist fashion to justify reactionary politics" (Cleaver in Negri, 1991: xix), but likewise I feel compelled to mount a defence of both the unique usefulness of Marx's analyses and at least part of the nomenclature which has followed from his writings. In this dissertation, class struggle is the basic frame I use to make sense of how digital management technologies indicate, enable and curtail a range of political tactics on the part of managers and workers. It is the lens through which I will articulate the politics of the implementation of algorithmically-mediated management techniques, and the persistence of workers' resistance to it. Similarly, Dyer-Witheford (2015: 7-8) articulates the importance of retaining the concept of class struggle:

> A Marxist concept of class designates the division of members of society according to their place in a system of production: today, as capitalists,

> various fluid intermediate strata or 'middle classes', and proletarians. But this is not a mere observation that societies are divided into economically in-equal strata, a bland sociological truism. *The point is that a dominant stratum exploits all the others*. Since the concept of class identifies a process of predation, it is unsurprising that no message is more frequently transmitted through the intellectual organs of society than that class does not exist. Or that it once existed, but has now passed away. …that because working-class communities no longer have the close knit solidarity they did in the industrial city, class is no longer important … that, if class is to be mentioned at all, it should only be to affirm that we are all, every last one of us, 'middle class'. To name class in an any more critical sense is to be condemned as, at best, reductionist, inhumanely insensitive to the rich textures of everyday life, committed to unearthly clinical abstraction, and, at worst, actively hostile towards social harmony, if not inciting civil war…[11]
>
> Yes, class does not today present itself in the same way as it did in Marx's era. But there is a difference…between saying that something has ceased to exist, and saying that it has mutated, become more complex… Class has become ontologically not less, but more real, more extended, entangled, ramified and differentiated…and yet preserves its simple, brutal algorithm.

I will address the matter of how to account for changes in internal class formations in a later section introducing the concept of class composition. First, I want to discern between the Marxist approaches which have most closely

[11] Dyer-Witheford (2015: 8) argues 'civil war' is precisely the spirit in which to insist on class analysis, for its denial, "the insistence that the world be understood only as a set of individual projects, is one of the most powerful and destructive weapons in that war."

sought to theorize the role of technology in the “brutal algorithm” of class society within the organization of work.

Marxisms on technology

In his reflection on the actions of the Luddites and their successors, Marx (1976: 554-5) states: “it took both time and experience before the workers learnt to distinguish between machinery and its employment by capital, and therefore to transfer their attacks from the material instruments of production to the form of society which utilizes those instruments”. This comment evokes what Langdon Winner (1980: 122) calls a social determination theory of technology — the idea that the politics of technology are determined by the society in which they exist rather than owing to any properties inherent in the technology. Within Marxism, this position is most commonly seen in Leninism, particularly with regard to the historical experience of Lenin’s support for Fordist production techniques being used to accelerate the early USSR’s industrialization. The argument goes that although Fordist techniques may have undermined workers when implemented under the capitalist social relations of the USA, Fordist techniques would have a different political character within the context of the socialist ambitions of the early Soviet Union. As Marxists of different stripes have noted, if the aim was to transcend exploitative labour relations, the move to Fordism was miscalculated, with the result instead being “a new discipline of work and maximised production” (Cleaver, 1979: 16; see also Harvey, 2010: 218).

Winner’s theory of technological politics goes some way to explaining why the suggestion of technology’s political neutrality is inadequate and why technologies can appear to produce effects different to those which may have been socially intended. The theory of technological politics, Winner (1980: 123) argues, “draws attention to the momentum of large-scale sociotechnical systems, to the response of modern societies to certain technological

imperatives, and to the all too common signs of the adaptation of human ends to technical means." He continues: "Rather than insist that we immediately reduce everything to the interplay of social forces, it suggests that we pay attention to the characteristics of technical objects and the meaning of those characteristics. A necessary complement to, rather than a replacement of, theories of the social determination of technology, this perspective identifies certain technologies as political phenomena in their own right" (ibid.). For Winner this position amounts to "[taking] technical artifacts seriously" (ibid.) by focusing on the relationship between technological objects and society, observing how the scale of certain technical arrangements (either as object or organization) can engender technological imperatives which command particular social responses.

For readers of science and technology studies, Winner's argument may initially evoke something approaching an actor-network theory position, but for Winner the pertinence of the theory of technological politics is expressly political-normative: "In our times people are often willing to make drastic changes in the way they live to accord with technological innovation at the same time they would resist similar kinds of changes justified on political grounds" (ibid.: 135). It is not that Winner wishes to replace a social determination theory with a technological determination theory, rather he points to the way some technological objects can have a dual character which makes them more or less flexible depending on both social and technological factors. David Harvey similarly argues it is necessary to capture something of the flexibility of technology while ensuring due focus is given to its capitalist context. For Harvey this means understanding what he calls the open and dialectical relation between technologies and a number of terrains which are crucial to capitalist development (2010: 196).

Reflecting on Chapter 15 of Marx's *Capital*, 'Machinery and Large-Scale Industry', Harvey describes the technologies discussed by Marx as being

"suited" to capitalist production (Harvey, 2010: 218).[12] Harvey leaves his meaning ambiguous, only indicating these are the "technologies through which capitalism has found its own basis" and they are therefore "the technologies *of* a capitalist mode of production" (ibid., emphasis added). It is important to understand that technologies here are understood within a historical-materialist framework, requiring attention to the historical conjuncture in any analysis of technological politics. In an idiosyncratic reading of Marx's chapter, Harvey identifies six elements 'revealed' by technology, which form the general framework, he says, of dialectical and historical materialism: the relation to nature, social relations, mental conceptions, the reproduction of social life, and the actual process of production. The six elements (technology being the sixth)

> coevolve and are subject to perpetual renewal and transformation as dynamic moments within the totality. But it is not a Hegelian totality in which each moment tightly internalizes all the others. It is more like an *ecological totality*, what Lefebvre refers to as an 'ensemble' or Deleuze as an 'assemblage', of moments coevolving in an open, dialectical manner. Uneven development between and among the elements produces contingency in human evolution. (Harvey, 2010: 196, emphasis added)[13]

For Harvey, it is crucial to examine technological forms through the prism of this ecological totality. "Technologies and organizational forms do not descend from the sky," he argues. "They get produced out of mental conceptions. They also arise out of our social relations and concretely arise in response to the

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[12] As Harvey (2010: 218) notes, this raises the question of what the "technologies appropriate to a socialist or communist mode of production" are.

[13] Here Harvey is attempting to move a dialectical-materialist framework beyond a narrow Hegelian dialectic between contradicting forces. Whether or not it is possible for such an amended framework to still be considered 'dialectical' is contestable. Personally, I am not invested in the structuralism implied by 'dialectical' Marxisms.

practical needs of our daily life or of labor processes" (ibid.: 195). Although Harvey acknowledges the space that exists for political engagement to occur across these elements, his analysis generally remains at the structural level of the relations between them. Notably, he asserts that "no one moment [element] prevails over the others" (ibid.: 196), and particularly argues against what he calls 'class-struggle determinism'. This is a problematic position for a Marxist analysis which fundamentally understands capital as a class relation (Cleaver, 1979: 53), and I would caution that Harvey is conflating the view that one element can 'prevail' over the others (insofar as it can be a dominant condition) with a deterministic position. As I will argue, a Marxist analysis which maintains a commitment to the principle that the working class is a unique and recurring problem for capital (i.e. an autonomist Marxist analysis) is able to maintain that the class relation is the 'motor' of capitalist development whilst remaining mindful of the wealth of contingencies involved in such a process.

Labour process theory

Before explicating the autonomist position on technology in class society, it is important to acknowledge another Marxian field which has made attempts to foreground class relations in its understanding of technologies and organizational forms. Lamenting that there is "no continuing body of work in the Marxist tradition dealing with the capitalist mode of production in the manner in which Marx treated it in the first volume of *Capital*", Harry Braverman (1974: 9) attempts to reorient Marxist analysis towards a "critical analysis of capitalist production" (ibid.: 8). In doing so, Braverman marks the generally agreed beginning of the diverse tradition of labour process theory (Smith, n.d.: 2-3; Thompson, n.d.: 2; Thompson, 1983: xi).

While Braverman often uses the language of social determination, his position is closer to Harvey's, arguing that although "technology…*is produced by* the

social relation represented by capital" (Braverman, 1974: 20), social determinacy

> does not have the fixity of a chemical reaction, but is a *historic process*. The concrete and determinate forms of society are indeed 'determined' rather than accidental, but this is the determinacy of the thread-by-thread weaving of the fabric of history, not the imposition of external formulas (ibid: 21).

Nonetheless Braverman does bestow upon technology — particularly machinery, i.e. industrial production technology — a special role within the functioning of capitalist social relations, arguing, "The ideal toward which capitalism strives is the domination of dead labor over living labor" (ibid: 227). He continues:

> [Capitalism] brings into being this system of the domination of living by dead labor not just as an allegorical expression, not just as the domination of wealth over poverty, of employer over employed, or of capital over labor in the sense of financial or power relationships, but *as a physical fact* (ibid: 228).

There are aspects of labour process theory which coincide with the analysis in this dissertation, most centrally the notion that capitalists must struggle to overcome the indeterminacy of labour power, making the productive process a contested terrain. This idea informs Chapter 2, which discusses a range of forms this struggle takes. Likewise, labour process theory attempts to understand the changing realities of work and trajectories in forms of control because they are important for understanding the direction of capitalist development more broadly. A key caveat within labour process theory is the principle of the *relative autonomy* of the labour process from wider political economy (Jaros, 2005: 6-7). In my own work my interest in this idea has less

to do with the degrees of separation between working life and macroeconomic factors, and more to do with asserting the ongoing contingency of class struggle within paid work aside from any structural principles or tendencies one may wish to claim. Indeed, this point has been recognized by later proponents of labour process theory; while Braverman famously neglected to discuss the agency of workers against machinic regimes in the workplace, tending to assume managerial ideals tend to play out more or less as intended, others have incorporated worker resistance as an important factor of the capitalist employment relation (Thompson, n.d.: 5-7).

Nonetheless, it remains the case that labour process theory's understanding of this tension tends to remain predicated on conflicting economic interests between classes. As Burnes, Knights and Willmott (1988: 6) summarize:

> Occupying a dominant position, the agents of capital are able to impose a technological transformation of the workplace in pursuit of the extraction of surplus value from a workforce that has little or no power and knowledge to resist the unquestioned demand for 'technological progress'.

Instead, this dissertation looks at managerial innovation through the political lens of circumventing antagonism rather than the economic lens of maximizing surplus value. This is a difficult issue to navigate in the labour process theory literature, and I do not want to suggest labour process theorists do not see these economic 'imperatives' as political, but there appears to exist a shared commitment to tying workplace politics to the rationality of productivity and profit. As Burnes et al (ibid.) go on to argue: "In so far as the new technology extends the division of labour and specialisation, it becomes apparent that improved productivity will increasingly depend upon the strength and quality of labour's co-operation and interdependence." In coupling improvements in productivity with labour's cooperation, Burnes et al (ibid.: 7) take the apparent

lack of “the kind of resistance usually associated with threats of standard (restrictive) practices in the workplace” e.g. overt workplace organizing, or active trade unions, as a sign of “labour’s compliance” or “shopfloor acceptance”. As I explore throughout this dissertation, I take a different view, drawing on a ‘continuing body of work’ Braverman initially failed to locate, namely the autonomist tradition of operaismo. Nonetheless, I recognize the role of labour process theory and particularly Braverman in affirming the political value of researching workplaces and changes to work (Braverman, 1974: 30).[14]

Operaismo and autonomist Marxism (autonomism)

Like labour process theory, autonomist Marxism has historically sought to understand changes in working processes and conditions. But, autonomism is primarily interested in the ability of the working class to struggle. Although within autonomism struggle is understood and located on various terrains, in various forms and at various scales, this preoccupation is explicitly political, stemming from Marx’s idea that the working class is the class that will abolish itself and class society (Marx and Engels, 1967: 105). For autonomists it is therefore necessary to understand the ways that class can struggle against its exploitation and the conditions within which it struggles. Two crucial elements arise: the centrality of the working class to an understanding of work, and the need for what autonomists refer to as a class composition analysis. As I will discuss later in this chapter, the latter is the theoretical and practical insurance against the ossified and dehistoricized romanticization of the former.

Central to autonomism in all its forms is the notion that the working class is not merely “a spectator to the global waltz of capital’s autonomous self-activating

[14] And, indeed, its influence on initial critical studies of algorithmically-mediated work (see Moore, 2018; Whittaker, 2018; Woodcock, 2017b)

development" (Cleaver, 1979: 26). Rather, autonomism upholds the principle that the working class has political agency regardless of the conditions imposed upon it by either capital, the state, or traditional political 'vehicles' such as trade unions or workers parties. Although in coining the term Cleaver is drawing on diverse movements such as the Johnson-Forest Tendency in the USA and the operaismo and autonomia tendencies of the Italian new left, both of whom will be discussed later in this chapter, a central point of reference for understanding a specifically *autonomist* Marxism is Mario Tronti's 'Lenin in England', in which he argues:

> We too have worked with a concept that puts capitalist development first, and workers second. This is a mistake. And now we have to turn the problem on its head, reverse the polarity, and start again from the beginning: and the beginning is the class struggle of the working class. At the level of socially developed capital, capitalist development becomes subordinated to working class struggles; it follows behind them, and they set the pace to which the political mechanisms of capital's own reproduction must be tuned. (Tronti, 1964)

Commonly referred to as Tronti's 'Copernican inversion' (or the 'Trontian inversion'), the insistence on the primacy of working-class struggle within the development of capitalism is the fundamental basis of autonomism. For Cleaver, the starting point is therefore that capital is a fundamentally political relationship, hence political relations should be at the centre of an analysis of capitalism. Cleaver separates the notion of a 'political analysis' from what he refers to as economistic or philosophical Marxist accounts of capitalism, arguing that "Capitalist power over labor is the ability to force people into the labor market, to force people to work for capital in production, and to coerce

surplus labor in the labor process" (Cleaver in Negri, 1991: xxiii).[15] This raises the issue of the conflict of the labour-capital relationship, in particular the problem of actualizing labour power, which I will discuss in depth in Chapter 2. But crucially for Cleaver, "it serves little purpose to study the structures of capitalist domination unless they are recognized as strategies that capital must struggle to impose" (Cleaver, 1979: 42-3) — i.e. against an active working class. Implicit within this position is an understanding of Marx's (1976: 508) observation that machinery generally "operates only by means of associated labour, or labour in common" which is to say workplace technology represents an ongoing intervention of sorts into the "cooperative character of the labour process". In other words, whereas Braverman tends to understand machinic regimes as largely enacting managers' will, Cleaver argues we should understand this process not as a fait accompli but as the enactment of strategic objectives with varying degrees of success.

It is not a novel point to say technology is used against workers for political ends. As Marx (1976: 562) notes:

> …machinery does not just act as a superior competitor to the worker, always on the point of making him superfluous. It is a power inimical to him, and capital proclaims this fact loudly and deliberately, as well as making use of it. It is the most powerful weapon for suppressing strikes, those periodic revolts of the working class against the autocracy of capital.

However, Cleaver argues Marxist political economy has too often "analyzed capitalist growth and accumulation independently of working-class initiative"

[15] For Cleaver, 'economic' readings include those of Bolshevism and structuralist Marxists such as Louis Althusser, while 'philosophical' readings include critical theory and in particular the Frankfurt School.

(1979: 15). This is to say the capitalist use of technology is not merely about the domination of living labour by dead labour, but rather a struggle and moreover a response to working-class power.[16] As Cleaver (1979: 28) states: "We are presented with elaborately detailed critical interpretations of this self-activating monster in a way that completely ignores the way actual working-class power forces and checks capitalist development." What is instead demanded by means of an autonomist analysis is an account of the political dynamics (i.e. class relations) that are immanent to technology (Mancini, 1977 in Wright, 2002: 44).

The prime theorist of this position within autonomism is Raniero Panzieri. For Panzieri, organizational progress is about power rather than rationality, with arguments to the contrary making it too easy to depoliticize technology (Wright, 2002: 42). As such, Panzieri complements Tronti's key insight that all relations of production are first and foremost relations of power (ibid.: 40) — meaning

[16] This is how Marx frames the period of technological recomposition following the working-class struggle for the shortening of the working day: "[It] gives an immense impetus to the development of productivity and the more economical use of the conditions of production. It imposes on the worker an increased expenditure of labour within a time which remains constant, a heightened tension of labour-power, and a closer filling-up of the pores of the working day, i.e. a condensation of labour, to a degree which can only be attained within the limits of the shortened working day" (Marx, 1976: 534). In other words, the struggle forces capital to shift its focus from absolute surplus (the length of labour time) to relative surplus (the 'condensation' of labour within a given time, i.e. productivity), which it does through technological development to the detriment of workers' conditions: "As soon as that shortening [of the working day] becomes compulsory, machinery becomes in the hands of capital the objective means, systematically employed, for squeezing out more labour in a given time" (Marx, 1976: 536). This is an algorithm (to use Dyer-Witheford's metaphor) we also see in the surge in manufacturing innovations in West Germany in the 1970s; the eventual result of "trade-union power…on sustained high wage rates, which produced a strong incentive for technological innovation" (Harvey, 2010: 213-4). In particular it would be interesting to relate the 'new production techniques' analysis by Kern and Schumann (1987) to this point (see Tomaney, 1994).

capital does not develop because of any self-contained logic but rather in relation to the ongoing struggle between classes (Dyer-Witheford, 1999: 66-7). Panzieri is of particular importance to a political conception of technology[17] because he develops a specific account of the "revolutions of capitalist technology and workers' organization within the dynamic of class struggle" (Cleaver, 1979: 53). Within this account, Panzieri argues technological progress does not stand apart from class relations (Wright, 2002: 41), and there is a responsive element to changes in the use of technology and workers' modes of resistance within the work process.

For autonomists, the purpose of developing a specifically political account is not only to better understand the dominative power of capital, but — as Dyer-Witheford (1999: 62) argues — to emphasize people's capacity to contest it. Further still, the autonomist research agenda aims at equipping workers with the weapons to do so. For Cleaver (1979: 4), for example, the use of returning to Marx and continually re-evaluating Marxist concepts is to develop a simultaneously *political* and *strategic* account in light of the material circumstances of the present, insofar as doing so can put a "political tool in the hands of workers". Political, in that the analysis is able to integrate technology, capitalist strategy and working-class autonomy into an account of class struggle (ibid.: 56); strategic, in that an account should be developed as if intervening in a war and trying to work out allegiances, as opposed to an ideological assessment or "critical interpretation" (ibid.: 10). The autonomist perspective, then, has alternative commitments than merely understanding the changing organization of work (i.e. the self-organization of capital). In order to understand this impetus and the potential for autonomism's application today, it is important to understand the history and frameworks developed within its heterodox tradition.

[17] I am using Cleaver's definition of 'political' here.

The offer of autonomy

A political tradition

I now consider the theoretical and practical benefits of situating this dissertation within an autonomist political-philosophical framework. First, I will consider the particular tools developed by autonomist thinking historically, before considering the perspectives of autonomist accounts which have attempted to reorient Marxist analysis towards the digital age, through which I will argue what form an autonomist analysis should take today.

The combined project of autonomism — intellectually and practically — is and always has been oriented towards developing a new Marxian praxis appropriate to the latest technological innovations shaping work and the actual material conditions of the present. Dyer-Witheford (1999: 69) sums up the basic autonomist outlook on technology succinctly:

> Its perspective on technology…has two aspects. The first is an analysis of technoscience as an instrument of capitalist domination — a rereading aimed at shattering scientific socialism's myth of automatic scientific progress. The second, however, looks at the situation from the other side and analyzes the ways in which struggles against class can overcome capital's technological control.

However, the thinkers and ideas Cleaver groups under the banner of autonomist Marxism are brought together not just by a theoretical perspective but rather an actually existing political tradition with a traceable, definite and traumatic history. It is against this history that autonomists have tested their ideas and sharpened their intellectual 'weapons'.

The writings of the early operaisti in Italy in the early 1960s were generally responding to a dual frustration with the capitalist reorganization of factories (particularly the introduction of Taylorist methods) on one hand, and the impotency (and collaboration) of the official trade unions which were dominated by the Communist and Socialist parties.[18] Prompted by the political problem of trade union officials often being in cahoots with factory managers, operaisti developed a theoretical toolkit which could both challenge the dominant orthodox Marxist accounts of technology and work, and empower workers directly outside the apparatuses of the unions and parties by recognizing the breadth of political action and agency within the working class at the time. As well as being an intellectual movement to reinvigorate the Marxist project, operaismo (and particularly autonomia, which followed) was an actually existing social movement. It should be noted here that although operaismo (growing out of the Quaderni Rossi and Classe Operaia publications and centred around the political group Potero Operaia) and autonomia (the subsequent flourishing – especially in the 1970s – of groups such as Autonomia Operaia, Lotta Continua, Lotta Femminista and the Radio Alice pirate station) were distinct movements with notable internal bifurcations,[19] here I find their commonalities strong enough to continue to group them together, as Cleaver does, under the term 'autonomist Marxism'. In a different context this move might appear inappropriate, but given the open political pluralism and shared theoretical framework of both operaismo and autonomia, I find their grouping together unproblematic here, although I will clarify differences with post-operaismo's conceptual developments in the last section of this chapter. Most crucially, autonomism offers a political framework that contends technology is always subject to ongoing class struggle, and furthermore provides a set of well-defined conceptual 'weapons' that may help

[18] In the English language the most attentive history of this movement is Wright (2002).

[19] See, for example, Bologna (2005a).

us develop an account of technology at work: a strategic framework, an ontological framework, and a methodological toolbox.

Political framework: technology as struggle

Historically, Panzieri's main contribution was to challenge the dominant view among Marxists that technological development could be separated from class relations (Wright, 2002: 41). On the contrary, in Panzieri's view "machinery was determined by capital, which utilised it to further the subordination of living labour" (ibid.). In his attempt to weave technology and class domination, Panzieri's intervention involved a reappraisal of the growth of Fordism in Italy, alongside a rereading of Marx's account of technological domination. Starting from the idea that the organization of work is, at some level, about the control of the working class, Panzieri formulated an account of the technological evolution of capital in terms of such innovation representing a response to working-class struggle (Cleaver, 1979: 52), complementing Tronti's idea of capitalist development being driven by the double helix of working-class resistance and capitalist planning.

The notion of planning is central to Panzieri's conceptualization of the active role of capital on its side of the class struggle, as the means by which capitalists can ensure "certainty of result" and ensure control over the productive process over time (Panzieri, 1976: 8). Notably, for Panzieri the only 'unplannable' element of capital is the working class itself (Cleaver, 1979: 53), which by virtue of its autonomy is never fully captured by capitalist strategy, forcing capitalists to similarly engage in struggle by continually developing alternative ideas and mechanisms to better ensure productivity on their terms. This takes the form of conscious decisions to ensure the capitalist class gains the upper hand through the construction of new technologies (Harvey, 2010: 219). As Marx (1976: 563) reflects on the technological developments just within his own lifetime: "It would be possible to write a whole history of the inventions made

since 1830 for the sole purpose of providing capital with weapons against working-class revolt." Yet crucially within the autonomist analysis, the working class struggles back against the capitalist use of technology (Cleaver, 1979: 53).

The understanding of technology as a key site of class struggle stands as an important challenge to the fallacy that technological development can be explained solely in terms of efficiency savings. While efficiency can be a legitimate capitalist target, particularly in the pursuit of maximizing relative surplus against the workforce, as Winner (1980: 124) notes, technological change can also be motivated by the desire to have dominion over others, for which efficiency can sometimes be sacrificed.[20] He goes on to outline the case of the McCormick factory in 1880s Chicago, where hugely expensive pneumatic moulding machines were introduced despite their inferiority to skilled labourers. They were abandoned three years later, but by then had successfully destroyed the skilled workers' union. It is important to note that such a success in capitalist planning is never absolute or final in the autonomist analysis. Even though the union was undermined by the moulding machines, the workers are still present and remain a political problem for the production calculation. As Jamie Woodcock (2014: 498) observes, "behind observable institutional phenomena are the actions of an actually existing working class" which retains the capacity to act on its own initiative against the desired consequences of capitalist planning. This puts the working class in an active position with a productive role in the life of technology:

> Unlike scientific socialists, autonomists find no inherently progressive logic in technological development. But unlike neo-Luddites they do not perceive only a monolithic capitalist control over scientific innovation.

[20] Cf. Simon's discussion of the factors considered by managers when introducing new technologies (Simon, 1977: 18).

> Rather, their insistence on the perpetually contested nature of the labor-capital relation and the basic independence of human creativity tends away from attribution of fixed political valencies to machinery and toward a focus on possibilities for counterappropriation, refunctioning, and 'detournement'. If machinery is a 'weapon' then it can, as Cleaver says, be stolen and captured, 'used against us or by us'. Or — to use Panzieri's perhaps richer and less instrumental metaphor — if capital 'interweaves' technology and power, then this weaving can be undone, and the threads used to make a different pattern. (Dyer-Witheford, 1999: 71)

Strategic framework: locating the potential for autonomy

The indeterminacy of technology — or at least the recognition that political will does not always translate into the satisfaction of that desire in terms of the social effects of a technology enacted (Noble, 1979: 38) — leaves open the possibility of workers' ability to contest managerial techniques as implemented through specific technologies. Winner (1980: 127) observes two stages of choice in the introduction of new technologies: first, the decision of whether or not to introduce a technology; second, the set of design choices made in the implementation, invoking consideration of the logical and temporal consequences of those choices. Antonio Negri outlines two modes of working-class contestation (Dyer-Witheford, 1999: 70-1) which broadly map onto Winner's stages: sheer refusal, as in sabotage or non-compliance; and 'invention power', or what Dyer-Witheford frames above as the creative ability to explore the possibilities for the subversion of a technology's design.

This is not to deny the situation Winner (1980: 125-6) warns of, whereby "the technological deck has been stacked long in advance to favor certain interests", but rather to indicate the strategic opportunism of the autonomist project. Such a framework aims at an assessment of the potential for the activation of

working-class power which sees “technology as a particular division of working-class power produced through struggle” (Cleaver, 1979: 63), an in-depth discussion of which will take place in Chapter 5. For Cleaver (ibid.: 25), a strategic orientation draws a distinction between what he calls “an exercise in necromancy in which one or another long-dead spirit is summoned from the grave to direct the battles of the present” and a strategic approach, which he describes as “something like an exercise in archeology designed to uncover the nature of the political weapons developed in the history of class conflict with an eye to their possible usefulness today.” It should be said here that there remain differences of perspective on the application of the idea of ‘invention power’ in relation to working-class strategy against the capitalist use of technology. The advent of digital communication technologies in particular led many autonomists to explore the idea of ‘reappropriating’ technologies[21] (Dyer-Witheford, 1999: 71) through a reinterpretation of their technical capacities, but others questioned the extent of their flexibility and therefore the extent to which such a focus really offers a viable strategy (Wright, 2002: 43). The idea is still keenly explored within the contemporary left accelerationist tradition, which shares some commonality with autonomist discourse (see Gent, 2014), but this thesis proposes an alternative assessment of the potential for workers to wield autonomy (see Chapter 5).

Beyond a sustained intellectual focus on sociotechnical class relations, we can begin to see autonomist research has a firmly normative edge in that it is interested in the political advancement of a particular set of social actors, which is in many ways the overarching aim of the research.[22] In this sense, autonomist research sees itself as playing a role in workers’ struggles, as contributing to the creation of space which a strategic orientation relies upon;

[21] The reappropriation of technology in this instance should not be confused with the ‘reuse’ of a technology within a different socio-economic setting, as with the USSR’s adoption of Taylorism.

[22] To change rather than interpret, as Marx’s famous epitaph puts it.

the making-possible of knowledge by providing a *place* from which to think strategically (de Certeau, 1984: 36). Indeed, this was the aim of the premier autonomist journal Quaderni Rossi, which was established to create a political space with a view to helping workers in struggle acquire new intellectual weapons where the official trade unions and mass workers parties were becoming inadequate. In particular, Quaderni Rossi's prominent focus on the reorganization of workplaces came about in part because Italian factories were being so thoroughly restructured by bosses and the parties were unable to develop an instructive account for how workers should relate to the introduction of new technologies or the changing character and shape of the workforce. As we will see, this sense of 'interestedness' imbues both the core conceptual and methodological innovations of the autonomist tradition.

Ontological framework: class composition

The implementation of machine technology at the McCormick factory had two effects: it deskilled a previously skilled workforce, and it destroyed the moulders' union. In autonomist terms there was a shift (*recomposition*) in the *technical composition*, which created a crisis for the incumbent *political composition*. Similar courses of action were instituted in factories across Chicago in the wake of the Haymarket riot,[23] whereby new technical arrangements of industrial working processes challenged the modes of political articulation through which the working class could express itself. Craft unions, generally comprised by skilled workers and organized by specific trade, were no longer appropriate to a new technical composition characterized by deskilling. This does not mean the political articulations of the working class were stopped dead; in the following years, Chicago became the engine room

[23] The Haymarket riot (1st May 1886) was a pivotal moment in the struggle for the eight-hour day. It led to five innocent anarchist labour organizers being sentenced to death, and is commemorated by International Workers' Day (Libcom, 2006).

of a political recomposition: the development of 'industrial unionism'[24] — an expression of the need for the working class to organize across skill levels and types, i.e. to respond to the technical recomposition of the class with a political recomposition.[25]

'Class composition' is a fundamental concept in autonomism. As a body of thought that shares a sense of the 'open-endedness' of social relations and class struggle in particular, the value of 'class composition' for autonomism lies in its ability to take into account the changing constitution, behaviours, experiences, courses of action and material conditions of the working class over time. In particular, it allows for — indeed, strives for — a description of the working class which takes into account both subtle and major changes in the forms and organization of work, as well as political expressions of what some Marxists understand as the 'class for itself' (see Andrew, 1983). As indicated by the prior example, generally a 'class composition analysis' will aim to understand two vectors — technical composition and political composition — and the relationship between them. Here the technical composition refers broadly to the organization of the working class on capital's terrain, especially the workplace as a site of accumulation, while the political composition refers to the contours of class antagonism, often understood as shaped or determined by the technical composition (Battaggia, 1981).[26]

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[24] The most well-known industrial union from this time is the Industrial Workers of the World (IWW), but the principles underlying the model can be found in the amalgamation of many trade unions into general unions in the UK in the 1970s, and more recently in the 'Unite Community' initiative which aims to organize the precarious and unemployed.

[25] The example above is historically-specific, and it should not be inferred that a self-activated political recomposition will automatically follow any shift in the technical composition of the working class, but the point is that when the composition of the class changes, it does not mean the potential for the class to act has been taken away, even if the specific means to act are no longer present, adequate or appropriate.

[26] I take issue with overdetermined formulations of this relationship, as I will discuss later in this chapter.

The key intellectual originator of class composition analysis is the Johnson-Forest Tendency. A US-based heterodox Trotskyist grouping taking its name from the pseudonyms of its key members, C.L.R. James (Johnson) and Raya Dunayevskaya (Forest), the Johnson-Forest Tendency was a political forerunner to projects like Quaderni Rossi, one of the key journals of operaismo. The group's primary concern was the proliferation of Taylorist and Fordist organizational arrangements in the post-war period, which James argued "heralded a new phase in the class struggle" (Cleaver, 1979: 46). In particular, James was concerned with the totalitarian tendencies of Taylorism, yet in contrast to the Frankfurt School, he "also saw workers' power and he was well aware of the fundamental importance of this recognition" (ibid.). The focus on Taylorism had a particular resonance for operaisti in Italy, as demands for increased wages had resulted in the widespread introduction of productivity targets and the subsequent individualization of wages — a settlement actually concocted with the input of the official trade unions (Cleaver, 1979: 55).[27] This was a visible attempt by Italian capitalists (and the trade unions) to 'answer' working-class demands in such a way as to undermine them (see Virno, 2004: 110-1).[28] In particular, Romano Alquati's contributions to Quaderni Rossi included the observation of the relationship between the introduction of new technologies into the workplace and the changing class composition of the workforce (Wright, 2002: 46-7).[29]

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[27] This process and its political tensions are the subject of Elio Petri's 1965 film 'La classe operaia va in paradiso' ('The working class goes to heaven').

[28] Virno explores the idea that the epochal shift he marks out (not unproblematically) as the transition to 'post-Fordism' is capital's answer to the 'defeated revolution' of the 1970s, whereby capital delivered – in a *deformed* way – many of the demands typical of communism.

[29] Similarly, Lotta Femminista observed the effect of changes to the formal work process upon sections of the working class outside of 'the factory', particularly working-class women (Cleaver, 1979: 59). Dyer-Witheford (1999: 58) makes the useful point that workplace-oriented focuses of technology in general tend to ignore the effect of technological development on the wider class. These notions are most recently being reintroduced into

Set against the 'monolithic' conceptualization of class upheld to ever-limited effect by orthodox Marxists, the idea of 'class composition' has been developed to provide an appropriate account of the way classes (and class politics) mutate and develop internal complexities through history. As a conceptual tool, class composition allows us to recognize the differences and continuities between the working-class 'figure(s)' — *figura operaia* (Battaggia, 1981) — of the 1800s, the 1900s and the 2000s, throughout the various technological revolutions in that space of time. In the 1800s, Marx (1976: 545, emphasis added) observed the way the machine deskilled and reorganized the workforce, with implications for the gendering of the division of labour:

> Along with the tool, the *skill* of the worker in handling it passes over to the machine… This destroys the technical foundation on which the division of labour in manufacture was based. Hence, in place of the hierarchy of specialized workers that characterizes manufacture, there appears, in the automatic factory, a tendency to equalize and reduce to an identical level every work that has to be done by the minders of the machines; in place of the artificially produced distinctions between the specialized workers, it is natural differences of age and sex that predominate.

Since the declaration in the 1970s of the 'social worker' (operaio sociale), autonomists have continued attempts to understand changes in class composition in the (debated) 'post-Fordist' era, particularly since the 'computerization' of work. Berardi (2009: 74-5) notes that digital technology is still "opening new perspectives" on what it is to work, creating an arguably more tech-savvy, 'intellectual' workforce (Dyer-Witheford, 1999: 71). By adopting the

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class composition analyses by the UK project Notes From Below, which is attempting to add a third vector of 'social composition' to contemporary perspectives (Notes From Below, 2018).

framework of class composition, we are able to take the accounts of two thinkers, who provide political accounts of the relationship between technological innovation and workforce organization over a century apart, in such a way that we can consider their accounts of the changing form of the working class as both related and divergent. Instead of resorting to dogmatic orthodoxy about 'authentic' working-class experience, we can say that Marx and Berardi are both discussing a common referent across time, while also accounting for the historical internal mutations of that referent.

However, there remain competing ideas within autonomism about how to use the framework of class composition and what it means to do class composition analysis. These issues and their methodological implications are best explored in relation to a clearer set of research objectives, and as such I will discuss them at greater length later. First, I turn to autonomism's contribution of the *workers inquiry*: a politically-interested methodology which aims to both gather primary findings and forge those findings into new 'weapons' for working-class struggle. Inspired by the Johnson-Forest Tendency's publication of Paul Romano and Ria Stone's 'The American Worker', which detailed and reflected on the state of the technical class composition in US auto factories, workers inquiries conducted by Romano Alquati at the Fiat and Olivetti factories were fundamental to the conceptual development and refinement of operaismo, and the para-factory workers inquiries conducted by Lotta Femminista were crucial to the development of the concept of the 'social factory' which became so fundamental to autonomism in the 1970s.

Methodological history: the workers inquiry

In his essay 'The Capitalist Use of Machinery', Panzieri (1980) details his exasperation at the 'objectivist' position being taken by left-wing trade unions in relation to the proliferation of Taylorist organizational methods, which have "a direct impact on how the working-class struggle is conceived; on the way in

which the actual protagonists of this struggle see it" (ibid.: 7).[30] Although he notes the attention being paid to the technological changes by the unions, he despairs at the way such changes are being framed as "the 'new realities' of contemporary capitalism" (ibid.: 5). In essence, he is arguing for a what Cleaver will later term a 'political reading' of the technological development of Italian workplaces. Against the fatalism of the trade unions, whose "'objectivism' accepts capitalist 'rationality' at enterprise level and downplays the struggle within structures and development points" (ibid.: 10), Panzieri points to Alquati's workers inquiry at Fiat, published in Quaderni Rossi, and argues for the need to excavate the role of "working-class autonomy in forcing the transformation of capitalist technology and planning" (Cleaver, 1979: 63).

Panzieri's frustration with the inadequacies of the 'official' political vehicles of the working class — both in accounting for the politics of technological development and the agency of the working class where new technologies are concerned — is fairly representative of the historical motivations of workers inquiries, and indeed the project of autonomism in general, from Alquati's second inquiry at Olivetti, published in Classe Operaia, to the more recent 'Hotlines' inquiry into call centres in Germany. In Italy in particular, and pertinent to the interests of Chapter 2, the development of workers inquiries was "an attempt to understand the use of Taylorism and the new forms of supervision and control in the factories" (Woodcock, 2014: 503). As I will now discuss, the methodological character of the workers inquiry has been a matter of ongoing contestation since Alquati's *Sulla Fiat* was first published, particularly in terms of its relationship to sociology. That said, while there is no 'one way' to pursue a workers inquiry — reflecting the internal pluralism of

[30] These internal conflicts were to come to a head in Italy's 'hot autumn' of 1969, which "brought out the growing separation between the struggles [of industrial and immigrant workers, students and women] and the Communist party/trade union hierarchies" (Cleaver, 1979: 18). As we know, similar divisions were apparent in the sewing machinists' struggle at Ford in Dagenham, UK, and the struggles in Paris in May 1968.

autonomism — throughout its operational history as a methodological approach it has been defined by "its emphasis upon building a *composite picture* of the technical and political dynamics of the workplace" (Wright, 2002: 25, emphasis added)[31] with an acknowledgement that capital and the working class are specific but relational, and therefore must be studied together (Mancini 1977: 107 in Fasulo, 2014: 318).

Class composition analysis

Uncovering the political

Marx argues the technological development and reorganization of work is a political process whereby capital asserts its power over the workforce by means of control. He notes:

> Owing to its conversion into an automaton, the instrument of labour confronts the labourer during the labour process in the shape of capital, dead labour, which dominates and soaks up living labour-power. The separation of the intellectual faculties of the production process from the manual labour, and the transformation of those faculties into powers exercised by capital over labour, is, as we have already shown finally completed by large-scale industry erected on the foundation of machinery. The special skill of each individual machine-operator, who has now been deprived of all significance, vanishes as an infinitesimal quantity in the face of the science, the gigantic natural forces, and the mass of social labour embodied in the system of machinery, which,

[31] As Wright (2002: 25) notes, this 'composite' approach was probably first thought through in Marx's 'Enquête ouvrière' idea, which would probably have constituted the earliest attempt at a workers inquiry had it gone ahead.

> together with those three forces, constitutes the power of the 'master'. (Marx, 1976: 548-9)

This political power is naturalized as being inherent within capital, as recognized by Panzieri (1980: 3): "the worker is brought face to face with the intellectual potentialities of the material processes of production as the production as the property of another and as a power which rules over him [sic]."[32]

Crucially, *the obfuscation of these processes of control is as much a factor of capitalist strategy as the development of new technical arrangements*. The purpose of the workers inquiry is therefore to uncover the conflictual political interests that have been concealed, circumvented or naturalized by capital through what Marx (1976: 549) has called the "technical subordination of the worker". Importantly within both autonomist theory and the praxis of the workers inquiry, this kind of knowledge of the working class cannot just be derived negatively from the activity of capital; it has to be generated through specific engagement with workers (Fasulo, 2014: 232). In a workers inquiry, "workers are not considered simply as passive subjects to be researched; instead they are positioned as the only people who can describe their own conditions, and more importantly as the only ones who can transform them" (Woodcock, 2014: 496).

A workers inquiry therefore requires empirical engagement, and although there is no one way of carrying out a workers inquiry, Alquati's inquiries demonstrate two differing approaches.[33] In his inquiry at Fiat, Alquati focused on interviews with workers (Cleaver, 1979: 54) in order to understand the political nature of

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[32] This is despite the productive knowledge embodied by the machine having first been expropriated from the working class, as I will discuss at length in Chapter 2.

[33] In addition to Rieser (2001) these approaches are discussed in depth by Wellbrook (2014) and Notes From Below (2018).

their daily problems[34] (Wright, 2002: 50) and develop an account which could cut through the rational account of workplace reorganization being upheld by bosses. By contrast, the inquiry at Olivetti was focused on 'co-research' (conricerca) — a participative method concerned with drawing out the political character of workers' experiences through alternative knowledge production (Fasulo, 2014: 323). As Vittorio Rieser notes, although co-research is one of the key methodological approaches in autonomism, it "requires being in a condition where you are pursuing enquiry with workers that you are organizing or workers that are already organized and therefore in either case [it is] strictly related to political work" (Rieser, 2001). In the absence of an already-existing common project between researcher and worker, it is more common to rely on a combination of more traditional research methods (ibid.), such as in Alquati's study of Fiat.

On this basis alone, it would be fair to ask whether the kind of research generated by sub-disciplines such as labour process theory or the sociology of work also constitute workers inquiries. But workers inquiries are not solely marked out by their object of research; were that the case we might also include a range of investigations from those of government agencies to those of muckraker journalists, of indeed the sort of social inquiry advocated by Elton Mayo, whereby workers' experiences are developed in management strategy to be turned back against workers through intervention in the 'human relations' of the workplace (see Mayo, 1975). Rather, the attribute which marks the workers inquiry out is a primary concern with trying to draw out the shape of power relations within an organization through mapping out points of conflict and antagonism (in each direction), not only to understand them (as in much

[34] Wright (2002: 50) acknowledges the methodological risk that collections of subjective perceptions will just reflect capitalist social relations. The point is discussed in Form's (1976) *Blue-Collar Stratification*.

labour process theory), but for the eventual purpose of empowering workers in struggle (Emery, 1995).

Proletarian sociology?

Woodcock (2014: 505) notes: “Marxism contains within it a political suspicion of certain forms of sociology, whereas sociology contains a suspicion of politics — especially in terms of a political conception of the working class.” While the larger question of sociology’s suspicion of the political conception of the working class can be bracketed, the Marxist political suspicion of sociology is of interest. This suspicion ran through the operaisti, with key figures on each side of the debate over whether sociological methods had anything to offer the political project of generating new ‘weapons’ for working-class struggle. In some ways the terms of the debate reflected the historical debate over technology within Marxism more broadly: the foundation of the suspicion among operaisti was the fact that sociology, particularly industrial sociology, received so much investment from firms such as Olivetti, which was leading the way in Taylorist innovation in northern Italy (Wright, 2002: 54-6).[35] I should make it clear that the suspicion did not arise so much from the ‘contamination’ of sociological methods, but that the operaisti were cautious of reproducing what they saw as knowledge theft being exercised by the bourgeois sociology of the time, which “aimed at integrating the working class into the planning of capital” (Fasulo, 2014: 319).

Whereas Danilo Montaldi favoured engagement with sociological techniques, having been impressed by Romano and Stone’s ‘The American Worker’, Alquati was perhaps the biggest opponent of that approach (Wright, 2002: 24).

[35] Indeed, it was precisely the resulting quiescence of the workforce at Olivetti (highly unusual for such a prominent factory at the time) that made Alquati so adamant about conducting an inquiry there.

Despite his professional training in the field, he “had come to see the use of sociology as at best a stopgap” (ibid.) on the way to the self-research demanded by the autonomous organization of the working class which Tronti (1971: 37 in ibid.: 29) labelled “the *real* process of demystification, because it is the *material* basis of revolution.” This goes some way to explaining Alquati’s own dramatic shift in method from an interview-based study at Fiat to the co-research model used in the Olivetti inquiry.[36] Notwithstanding, workers inquiries have tended to adopt many sociological methods, particularly in combination with a political ‘interestedness’ that is sometimes posed as an ideological counterbalance to a perceived sociological discourse averse to the political situation of living labour (Panzieri 1976: 91 in Fasulo, 2014: 320). Indeed, subsequent developments in the sociology of work — most notably labour process theory — included a strong engagement with the precisely the issues indicated in the early debates within operaismo (in particular see Burawoy, 1979: 3-13).

Using inquiry to develop strategy

Following Cleaver, developing a strategic understanding of technology, organization and the state of workplace politics means directing research and analysing findings with a view to assessing the potential of the working class to exercise power. In other words, a workers inquiry approach aims to understand the class composition in a given context with a view to better understanding the shape and character of political struggle. The benefit afforded by this approach is that it allows us to see how the land lies through direct engagement with workers involved in an actually-existing workplace rather than deriving theories of action from presumptions about the shape of power relations or the flexibility of technologies. Indeed, Panzieri has been criticized (as has Braverman) for

[36] In which, incidentally, workers at Olivetti discuss their disdain for sociologists for “experimenting on us” (Alquati, 1975).

relying too heavily on the Taylorist 'ideal' without enough consideration of the messier (existing) reality resulting from the struggle to impose techniques (Cacciari, 1975: 190-1 in Wright, 2002: 43). Although Panzieri drew heavily from Alquati's empirical study of Fiat in his theorization of technological developments, Alquati actually had little to say on the specific topic of technology in that inquiry (ibid.: 52). Cacciari's criticisms are valid, especially given Panzieri's stated aims, but particularly because they build the case for the need to conduct empirical inquiries. Indeed, although initially formed without the benefit of empirical engagement, Panzieri's ideas about technological arrangements and class recomposition were later vindicated by Alquati's findings in his Olivetti inquiry — a rich study which Wright argues shows the potential of the workers inquiry as a methodological approach (ibid.: 54-8).

At its most insightful, the workers inquiry "sheds light on the never completely realised real subsumption of labour to capital" (Ferrero et al, 2006: 42 in Fasulo, 2014: 327); that is, the reach and limitations of capitalist planning and attempts at the "wholesale reorganization of work" (Dyer-Witheford, 1999: 39), and the degree and character of working-class contestation against that imposition. Inspired by the workers inquiry approach, in Chapters 3, 4 and 5 I use my own 'interested' methodology to analyse the technical and political class composition of a set of contemporary workplaces. First, I outline some of the parameters of my engagement by means of an overview of how autonomist analyses have already engaged with the contemporary (re)organization of work.

Class composition today: immaterial inquiry?

Labour in cognitive capitalism

The workplaces I analyse in this dissertation are notable for the degree to which they depend on computationally-mediated management practices, but computation is by no means a new phenomenon to workplaces and the issues arising from computation, and especially digital media, have been a preoccupation of autonomist analyses in recent decades. Autonomist engagement with the idea of 'cognitive capitalism' (related to and sometimes conflated with the notion of 'semiocapitalism') has been accompanied by an acceptance of the argument that the present mode of capitalist production can be considered 'post-Fordist' (Vercellone, 2005), with the implication that different analytical tools are required to understand the present than those which were sufficient in an earlier 'Fordist' era. The framework of cognitive capitalism groups together a range of phenomena from labour flexibilization, precariousness, and the rise of the service sector and creative industries, and understands them through the lens of new communications technologies — particularly mobile phones and the internet (Moulier Boutang, 2011; Standing, 2011; Lazzarato, 2014).[37] It is the object of inquiry of what is often referred to as 'post-operaismo' or post-autonomism.[38]

Understood through a more theoretical approach to class composition analysis, particularly upheld by Negri, Lazzarato, Virno and Vercellone (see Pasquinelli:

[37] I am not dismissive of many of the phenomena grouped under the banner of cognitive capitalism, such as the centrality of knowledge to capitalist production, but I do find myself in agreement with Tomaney (1994) in objecting to the historical periodization and idea of 'industrial divides' associated with 'post-Fordist' discourses.

[38] I use these terms interchangeably to refer to the dominant strands of contemporary autonomist thought, particularly as upheld by Negri, Lazzarato, Virno and Terranova.

2015a: 58-61), two concepts become central to the post-operaista diagnosis. *Immaterial labour* is understood as the essential character of work arising from the technical class composition of post-Fordism. Perhaps most notably developed by Maurizio Lazzarato (1996), 'immaterial labour' refers to two aspects of labour: labour which produces the "'informational content' of the commodity" "where the skills involved in direct labor are increasingly skills involving cybernetics and computer control", and "activity that produces the 'cultural content' of the commodity", i.e. pertaining to "cultural and artistic standards, fashions, tastes, consumer norms…public opinion" (ibid.: 133). While there are strands in Lazzarato's thesis I will return to later in the dissertation, particularly regarding the codification of informational communication (ibid.: 135), he combines the rise of immaterial labour with a trajectory of work which is becoming more intellectual, self-directed, independent and entrepreneurial (ibid.: 134, 138-9), "defined as the capacity to activate and manage productive cooperation" (ibid.: 135). Far-reaching in its purview, it is possible to ascribe the qualities of immaterial labour to an extraordinarily wide range of labour roles (Nunes, 2007: 186). Nonetheless, more recent uses have tended to focus on the forms of labour involved in the production and reproduction of and on digital networks, especially the internet (see Terranova, 2004).

The immaterial labour thesis extends from the figure of the *socialized worker* (Dyer-Witheford 2005: 151 in Nunes, 2007: 193). In contrast to the industrial worker, the socialized worker is "the new social subject" (Negri, 1971: 137) produced when "work has become diffused throughout the entire society" (Negri, 1989: 77). Predicated on the "very high degree of cooperation" that characterizes post-Fordist work (ibid.: 79), Negri says that contrary to Taylorism, the "*socialized worker is now recombining conception and execution within a universal horizon*" (ibid: 78). I discuss the relationship between the separation of conception and execution in Taylorism at length in the next chapter, but for the moment it will suffice to indicate that I instead find myself

in agreement with Tomaney (1994: 157) that we are in fact witnessing an "intensification of existing tendencies".

The socialized worker — "said to be the fruit of the colossal project of restructuring undertaken by capital to resume the process of accumulation" (Battaggia, 1981) — is defined by its spatial decomposition and lack of internal homogeneity compared with the figure of the mass worker, understood as "a section of the labour force made materially homogenous by a particular relationship to capitalist technology (the assembly line) and a consequent political behaviour: the demand for wages as income, the refusal of work and sabotage" (ibid.). Initially thought to contain "a plurality of class segments often very distant from each other: decentralised factory workers, young unemployed proletarians, inhabitants of marginalised neighbourhoods, housewives, women, homeless students, underemployed intellectuals…", the theory of the socialized worker "is unable, precisely because of its tendentially *totalising* character, to bind together the contradictory and centrifugal class situations we see today" (ibid.). For Battaggia, this tension ought to have warranted a new wave of scientific (empirical) class composition research rather than extrapolating a "univocal theorisation of class conflict" (ibid.). However, in the age of the increased digitization of work, the theory of immaterial labour arguably provides a coagulant for understanding this new class subject.

As Nunes notes, Hardt and Negri (2001: 293) group under the common name of 'immaterial labour' three forms of labour: informatized, cognitive-symbolic, and affective.

> We are thus speaking of a category that encompasses the different realities of the software programmer and the production engineer, the call centre worker and the nurse, the loan manager and the waitress, the shop assistant and the 'IT guy', the teacher and the filmmaker, even

> (pushing the boundaries between production and reproduction) the student and the parent. (Nunes, 2007: 186)

However, the use of the concept of immaterial labour in practice, particularly in terms of its supposedly emancipatory potential, appears to draw generalized conclusions from "very specific and clearly delimited cases such as that of software production" (ibid.: 190). Although post-autonomists have made efforts to emphasize the immaterial labourer need not be highly skilled in the conventional sense (Lazzarato, 1996: 136) or employed in the knowledge industry (or even employed at all) (Terranova, 2004: 88), use of the concept seems to keep returning to the archetypal labouring figure of a modern, mobile, creative worker. As Nunes (2007: 190) notes, this account "seems to fail to grasp the productive realities of most workers apart from a few, unevenly distributed across the globe and circuits of production". Even Bologna, who is hardly a 'Negrian' (Bologna, 2005b), falls into this trap, imagining the 'knowledge worker' — "the person in front of the personal computer" — as one "of many self-employed laborers who provide their services, even if they have only one client, working at home or in 'coworking' spaces or in Starbucks" (Bologna, 2014).

While this particular imagined type of worker may possess "an increased capacity to determine the form and content of their productive activity" (Nunes, 2007: 186), this capacity cannot be said to be shared by the workers who actually staff any given Starbucks — "the fact that production is more and more organised in networks does not make Starbucks workers any more capable of communicating with each other across different shops" (ibid.: 187). And yet it is a fact Starbucks workers interact with ICTs regularly and many coffee chains are now introducing elements of performance tracking to their shops. Nunes (ibid.) argues that if "Starbucks *baristi* are involved in the production and reproduction of social networks, it is not because this is the way in which their

work is organised" but because social networks are a bigger part of social life than ever before in general. In other words:

> In less autonomous, less computer-dependent work, speaking of an increasing becoming-network is a conflation of two different factors: the present state of technological development; and how much this intensifies and reconfigures the being-network that has always been part of social life. In this case, it seems one could only speak of a hegemony if one were ascribing these two factors to the reshaping of power of (some forms) of immaterial labour over the rest of social life — which seems like a rather exaggerated claim to make. (ibid.)

I would argue this is also the case in less autonomous, more computer-dependent work, but the point remains that if Starbucks workers are now more able to find each other via social networks, this is not a result of the degree to which their work is networked, and is generally independent of the degree to which their work is networked by information systems at the level of company logistics.

Political organization in the digital age

It is not my intention to engage with the socialized worker/immaterial labour theses much further in this dissertation; I largely concur with the arguments and diagnoses of Nunes (2007) who has already interrogated these ideas on their own terms at great length and with great care. In referencing them here my point is not to invalidate the arguments, but to raise a more political and strategic question of their applicability (ibid.: 184), particularly taking into account Bologna's (2014) testimony that "workerism has never been indulgent to simplifications" and 'workerist' research has "*the duty* of improving these tools of knowledge to the maximum extent, of reaching the highest levels of scientific production, and of putting their knowledge at the disposal of all, and

in particular the workers" as "cells of a *service infrastructure*" on a "collective journey of liberation". In that sense it is important to understand the organizational systems which provide the "real leaven" to workplace struggles (Bologna, 2005b). As Nunes (2007: 200) states: "The problem with these abstract points of recomposition is that conceptual development and logical rigour can at best give indications as to where to move. They do not solve, or even pose, problems of organisation." The aim of this dissertation, in short, is to explicate those organizational forms and problems.

Of course, digital technologies are not unconnected from questions of political organization, and a cursory examination of social movements over the last twenty years suggests new communication technologies in particular are, if not a determinant, then at least a prominent feature of contemporary political action. Indeed, it could be argued Negri's later focus on social movements (in his writings with Michael Hardt) demonstrates an outgrowth of his turn towards the socialized worker, and that the mediatized modes of political action which have characterized the former have been filtered, as if by reverse osmosis, back into Negri's understanding of the latter. To Negri, networked technologies mean labour has "gained a powerful transversality" (Negri, 2017a), and the emergence or unearthing of immaterial labour "made it possible to take Marx's 'general intellect' as the object of inquiry [inchiesta]" (ibid.), the general intellect's "reappropriation by the collective worker" being the orientation of struggle today, given it has become the raw material of capital's value creation (Negri, 2017b).[39]

[39] Negri's use of Marx's concept of the 'general intellect' is typical here. First appearing in the 'Fragment on Machines' in Marx's *Grundrisse* (1973: 690-712) — a text with near-prophetic value to a subset of contemporary autonomists — the general intellect is understood as the culmination of inherited social knowledge (Marx, 1973: 706). A problematic concept variously interchanged with "'culture', 'socialisation' or 'society'" (Hanlon, 2016: x) and "science" (Wark, 2014), its use within later autonomism broadly correlates with the experience of the period of technological development characterized by the proliferation of personal telecommunications

While Virno (2004: 100) cautions the "realization of the tendency described by Marx" has failed to deliver "any emancipating consequences", Hardt and Negri's (2001) *Empire* is more optimistic about the direction of digital travel, proclaiming an era in which the multitude — taking the place of the working class — "immersed in immaterial labour" might engage in "digital subversion and supersession" through a newly networked global society (Dyer-Witheford, 2015: 10). As Dyer-Witheford (ibid.: 11) notes, initial optimism about the internet age has now largely subsided, particularly since the 2008 global financial crisis.[40] While the idea that network society has displaced industrial society may fit more easily with Negri's socialized worker hypothesis, the issue remains that computer-dependent work does not necessarily entail more mobile or self-determined work, and, as we will see, the idea of 'computerized' work is just as easily applied to those who work in warehouses and delivery vans.

Moreover, the idea that the widely observed mediatization of popular protest (ibid.: 4-6, 10) indicates any turn towards 'connective action' (Bennett and Segerberg, 2013) within workplaces is misplaced.[41] As this dissertation will show, the ubiquitous fluidity of social media is seldom reflected in distribution workplaces, which, while they may occupy a place within a logistical network, are typically characterized by local, proprietary media systems only accessible within the workplace through controlled means and unable to connect to the internet at large.

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technologies and in particular the internet. Negri (2008: 103) describes it as "an immaterial, intellectual, linguistic, and cooperative work force that corresponds to a new phase of productive development based on the excess of work, or, in other words, on the creativity of living work", while Virno (2004: 100) goes as far as to say "Post-Fordism is the empirical realization of the 'Fragment on Machines'".

[40] And even more so with the rise of the alt-right (Nagle, 2017).

[41] As Peters (2015) argues, digitally-mediated 'connective action' is no organizational panacea for political movements in any case.

No politics without inquiry

It is not my intention to deny the possibility of categories such as the socialized worker a priori. As Negri (1982: 209) states: "All concepts that define the working class must be framed in terms of this *historical transformability of the composition of the class*." Certainly, viewed within its initial historical moment, the idea of the socialized worker came about because of the apparent dead end of the idea of the mass worker, as well as legitimate pressure to develop a conception of the working class which extended to the labour of reproduction:

> As we used to put it: 'from the mass worker to the social worker'. But it would be more correct to say: from the working class, i.e. that working class massified in direct production in the factory, to social labour-power, representing the potentiality of a new working class, now extended throughout the entire span of production and reproduction — a conception more adequate to the wider and more searching dimensions of capitalist control over society and social labour as a whole. (Negri, ibid.)

But within Negri's analysis, particularly when it later melds with the idea of immaterial labour, there appears to be an overdetermination between a perceived shift in the technical composition in the class (logically or politically inferred, rather than empirically observed in any robust sense) and the projected political composition of this new class subject. Although an initial 'sense of direction' may serve as an appropriate impetus for a re-examination of class composition, post-operaismo tends to place a prescriptive weight on a presumed new class composition whose political capacities and opportunities appear lacking upon any closer examination. In an historical moment following the deflation of the initial excitement over the revolutionary potential of the internet, in which technologies such as interfaces — as I will argue in later chapters — problematize the way we need to think about control and resistance

in the workplace, it is inadequate to be stuck in the outmoded language of ‘computerization’ or merely rely on assumptions about the organizational potential of computationally-mediated work (Negri, 2017a, 2017b).

Negri’s initial frustration with the political insights of operaismo stemmed from the fact that while successful in individual factories, their methods were not able to keep pace and scale with capital’s development, that is, “involving the entire sociality of the relations of production and reproduction” (Negri, 1982: 207). However, a shift of focus from the class composition as found in particular sites of struggle to the composition of the class at large has meant the post-operaista methodology largely takes the form of ‘immaterial inquiry’, jettisoning the methodological strategy of workers inquiries into actually observable workplaces. Instead, post-operaismo after the immaterial labour thesis “derives its farthest conclusion from some very specific labouring figures” (Nunes, 2007: 190), presenting “a conic perspective that starts as an adequate response to how transformations taking place affect what is ‘close’ to it – but then…shows objects with more distortion the farther they are” (ibid.).

This conceptual approach has been contentious within autonomist Marxism since its inception. In the 1970s, Bologna argued that with the theory of the operaio sociale Negri had merely abandoned recent factory struggles in order to retreat into theory (Bologna, 1976: 27-8 in Wright, 2002: 170-1). Meanwhile Comitati Autonomi Operai (the Roman chapter of Autonomia Operaia) pointed to the methodological weakness of Negri’s perspective on the new class composition:

> precisely the undeniable political importance of these phenomena demands extreme analytical rigour, great investigative caution, a strongly empirical approach (facts, data, observations and still more observations, data, facts) (Rivolta di classe, 1976: 136 in Wright, 2002: 171).

As stated above, my aim in discussing the theses of post-operaismo is not to invalidate them so much as to build the political and strategic case for empirical engagement. So far, while autonomist Marxism has enjoyed a resurgence of interest in the 'information age', autonomist analyses are yet to be fully reconnected with the methodological tradition of the workers inquiry which characterized the earlier years of operaismo. While I note recent attempts — such as Kolinko (2002), Woodcock's call centre inquiry (2017c), and the nascent 'Notes from Below' project in the UK (2018) — this dissertation strengthens the case further yet, and argues for a particular orientation towards workplace technologies as both a prism through which to understand contemporary class struggle and an under-studied component of regimes of 'control' in contemporary workplaces. As Emery (1995: 2) states:

> The new class composition is more or less a mystery to us (and to capital, and to itself) because it is still in the process of formation. … Before we can make politics, we have to understand that class composition. This requires us to study it. Analyse it. We do this through a process of inquiry. Hence: No Politics Without Inquiry.

Conclusion

This dissertation aims to uncover the politics of technologies of work, both in their imposition and in the political forms taken by workers to mitigate them. To that end, this chapter has argued for a class composition analysis which remains open to unexpected class configurations while keeping in sight the situation of technology in class society — i.e. as a site of struggle. Moreover, I have argued for an autonomist perspective with a strategic orientation which seeks to locate the potential for working-class political action. Having argued for the importance of the workers inquiry methodology for this kind of theoretical development, the dissertation now builds a case for the conceptual benefits of greater empirical engagement through the examination of actual technologies

in real workplaces. Before introducing these workplaces in Chapter 3, I first turn to the political nature of management in order to explicate the ideological character of different managerial forms, which will inform my own conceptual development throughout the rest of the dissertation.

2. The Managerial Endeavour

Control is important only because people want it.

Carter L. Goodrich (1975: 4)

Introduction

An inquiry into workplace technologies necessarily invokes questions of management. In this chapter I discuss management ideas and techniques whose influence can be seen in a variety of contemporary workplaces, and which provide a route into discussing the politics of management technologies. Beginning with a discussion of the contemporary managerial techniques known as *algorithmic management*, I argue that the social effects of algorithmic management need to be understood through a more political lens than has been the case so far, which can be achieved by drawing out the genealogical strands which inform this managerial mode. I examine the ways scientific, humanistic and cybernetic approaches to management have conceived of communication and control within a workplace context. In particular, I conduct a reading of selected influential management theorists and ideas on the basis that their contributions can be understood as interventions into workplace politics. My intention is not to provide a comprehensive history of management thought throughout the twentieth century to the present day, but rather to draw out key approaches to fundamental political issues such as the actualization of labour power and the circumvention of workplace antagonism. In considering their implications for class politics, I provide the dissertation with a conceptual framework through which to understand managerial principles and motivations, which will assist my reflections on contemporary managerial struggle and strategy in later chapters. Finally, I warn against the temptation for critical accounts of algorithmic management to take stated managerial ideals (or political will) at their word when assessing the power or control they exert over workers and the work process, continuing my wider argument about the need for class composition analysis to be reconnected with empirical engagement.

Algorithmic management: a problematic term

In this chapter and throughout the dissertation I refer to algorithmic management as a way into thinking about issues of workplace politics. Following a study of Uber and Lyft drivers by Min Kyung Lee et al (2015), the term 'algorithmic management' has come to be used within academic, journalistic and activist parlance as a catch-all term to denote an organizational taxonomy across the so-called 'gig economy' (or 'sharing economy')[42] — where algorithms are imagined as the broker between workers and consumers — through to modern distribution centres (Rosenblat and Stark, 2016; O'Connor, 2016; Claburn, 2016; Plan C, 2017a).[43] Although Srnicek (2016) has noted the formal distinctions between various companies within this field, the fact they are consistently grouped together in popular discourse reflects a common set of perceptions about the nature of the work (e.g. precarious, digitally-dependent).[44] But it is important to note there is not a clear overlap between work in the 'sharing economy' and work which is algorithmically-managed. This is implicit in the forms of work which are often referred to in relation to algorithmic management, but before discussing the issues raised by the contemporary literature on algorithmic management I want to do some definitional work to in order to make the term more useful.

Work in the 'sharing economy' can take many forms — from something like micro-tasking, which would have been impracticable before the internet, to more familiar types of work such as 'ride-sharing' (in practice, taxi driving) and

[42] Although in other contexts it would be appropriate to draw a distinction, in this dissertation I use 'gig economy' and 'sharing economy' interchangeably.

[43] I note there is a different, older usage of the term 'algorithmic management' in scholarly debates in medicine and healthcare.

[44] See the Business, Energy and Industrial Strategy Committee (2017a) inquiry 'The future world of work and rights of workers', which ran from 2015 until 2017, when it was prematurely concluded by an early UK general election.

food deliveries. In some sense they are both algorithmically mediated, in that the purchase of labour power is facilitated by layers of software, but there are distinctions between them. An obvious difference would be that micro-tasking with Amazon Mechanical Turk (MTurk) is conducted through a website rather than an app. In this sense although the service advertises itself in terms of 'crowdsourcing', it functions more like an online labour market, where employers are the vendors and workers shop for tasks. 'Algorithms' remove the need for the task-vendor to employ or search for anyone, while offering 'taskers' (workers) a choice of assignments. An app-based counterpart is found in TaskRabbit. While MTurk focuses on the brokering of 'human-intelligence tasks', TaskRabbit allows people to advertise odd-jobs and errands they need doing offline to a pool of workers who make up their wages through a range of small assignments. Again, 'algorithms' here facilitate advertising, job allocation and payment functions.

However, while both understood as part of the 'gig economy', working for MTurk and TaskRabbit is qualitatively different from other 'gig economy' labour service providers. Uber and Deliveroo, for example, are characterized by the intimate involvement of operation-specific software technologies (in these cases, apps) as a key feature of activities constituting the task-to-task labour of the worker. As with MTurk and TaskRabbit, payment functions are facilitated by the software provider, that much is similar, but Uber and Deliveroo differ in that they set the payment rate for workers across the platform. Workers are connected with jobs too, but unlike MTurk and TaskRabbit (where workers can pick and choose), Uber drivers and Deliveroo riders face consequences for turning down 'assignments'. But moreover, algorithms supervise the 'gig' and determine whether to flag the worker for disciplinary mechanisms to be carried out either by the program itself or by a manager. This is the context in which ideas such as "when your boss is an algorithm" arise (O'Connor, 2016), and it is in this sense that algorithmic management practices extend to workplaces outside of the gig economy.

In particular, the distribution warehouses behind e-commerce sites such as Amazon or Asos have been subject to media investigations into the use of algorithmic management techniques, particularly understood through the concepts of targets and surveillance (Panorama, 2013; Channel 4 News, 2016; Spary and Silver, 2016). While these workplaces do not share the spatial dislocation or wage systems of Deliveroo and Uber, this dissertation finds common threads across workplaces on the basis of workers' experiences of algorithmic management.[45] I explore the observable effects of these techniques later, but in this chapter I want to discuss management ideas largely on their own terms (which is not to say apolitically, by any means). Although in general scholarly discussion of algorithmic management has placed less of an emphasis on distribution centres than on the gig economy, I argue that an account of the politics of distribution centres requires engagement with their management technologies and the histories which inform those technologies. In this chapter, I consider the idea of management, approaches from management history which may help us understand shopfloor realities today, and what the idea of 'algorithms' means for management.

Humans at the centre of the algorithm?

Instead of attempting to arrive at a definitive conceptual account, it is more politically insightful to view managerial insights as solutions to problems, or approaches to scenarios. It is in this spirit that Lee, Kusbit, Metsky and Dabbish (2015: 1603) state their interest in assessing "the impact of algorithmic, data-driven management on human workers" with a view to encouraging what Lee (2016: 44) calls "human-centered algorithmic workplaces". Drawing on a qualitative study involving interviews with Uber and Lyft drivers, their

[45] Lee et al (2015: 1603) note the similarities in algorithmic work allocation, optimization and evaluation across warehouse workers, subway engineers, Starbucks baristas, delivery drivers and the 'crowd-sourced' workers of Uber, TaskRabbit and Amazon MTurk.

passengers, and archival analysis of driver forums and company communications, Lee et al identify a number of flaws in the relationship between algorithmic management and human workers, and argue for existing algorithmic management practices to afford greater consideration to the workers using the platform if algorithmically-managed workplaces are to "support human workers to work with intelligent machines not only in an effective, but also a satisfying and meaningful way" (Lee at al, 2015: 1611). In this section, I will discuss Lee and her co-authors' findings and diagnosis before arguing for the need to analyse algorithmically-managed workplaces politically.

Problems arising

Lee et al (2015) identify three key human-app interactions in the work process of a driver: work assignment (the moment when drivers are offered a job), surge pricing (which dictates what drivers can earn in various locations at certain times based on the relative scarcity or abundance of drivers at that time), and customer ratings (which drivers rely on to keep using the platform). Of these 'moments' in the work process, they focus on *worker assignment* and *surge pricing* to draw out the key problem areas they find within the logic of algorithmic management as deployed by Uber and Lyft.[46] On the allocation of assignments — that is, the process by which drivers are assigned to passengers — Lee et al find that a problem of cooperation is initiated by the lack of transparency drivers encounter in relation to the assignments they are offered: "not only the source of the assignment (i.e., human versus algorithm), but also how the assignment was presented and regulated, influences worker cooperation with the assignment" (ibid.: 1609). Based on a set of interviews with drivers, Lee et al explain that drivers receive an assignment offer with

[46] While Lee et al (2015: 1610) do discuss what a better-designed driver evaluation system might involve, and while evaluation can affect employment in a broader sense, evaluation does not factor into the ongoing organization of work in the same way as the other two aspects of the work process.

limited geographical information, no rationale, and a short time frame within which to decide to accept or reject an assignment.

Furthermore, Lee et al raise issues with the practice of surge pricing (the act of raising ride prices in areas where there are fewer drivers, giving drivers a financial incentive to service those areas). The mechanism used by the two companies, they argue, is built on "economic and rational assumptions" which are unrepresentative of workers' motivations and experiences, such as driving for social reasons over financial incentive, feeling (like passengers) that surge pricing is an unfair practice, or simply that surge pricing algorithms can be unpredictable or ill-suited to the pace of driving work and it is perhaps better to rely on one's own knowledge (ibid.: 1608). In this sense, Lee et al argue a shortcoming of the "supply-demand control algorithms" is that they "were originally designed to solve mathematical optimization problems that involve non-human entities" rather than human behaviour (ibid.: 1610), the result being that more than half the drivers Lee et al spoke to did not allow their work to be informed by the surge pricing algorithm (ibid.: 1607).

Trust through transparency

These computational 'moments' highlight the aspects of algorithmic management Lee is most concerned about: workers' cooperation and trust in managerial decisions. These, she argues, are the prerequisites for effective, human-centred algorithmic governance (2016: 44). She states: "My research suggests simply applying algorithms to a situation won't automatically result in decisions that elicit cooperation, inspire trust, or feel motivating and fair" (ibid.). Lee's main suggestion is to raise the importance of "algorithmic transparency", principally "explaining the reasoning behind assignments" (ibid.: 45). As an example of how a lack of transparency can lead to loss of trust and a breakdown in cooperation, Lee (ibid.) refers to the way Uber and Lyft drivers interact with the job assignment function of the app:

> The lack of transparency didn't only influence workers' attitudes. It also influenced their behaviours around algorithmic decisions. When assignments were undesirable or seemed to make no sense, drivers simply attributed them to errors and rejected them…when the assignment actually could have been made for a legitimate reason.

In this scenario, Lee understands the drivers to have mistrusted what the algorithm had intended, instead using their own sense, apparently misunderstanding that the instruction could have been given for good reason based on information outside of the worker's knowledge. On this account, the app requires drivers to bracket their own judgement in favour of the instructions they are provided with because in following their own initiative drivers stop cooperating with the app (therefore the algorithm, therefore the company) in the intended way, which goes against the aims of the process as it has been constructed by the platform. In lieu of transparency and a rationale for the information given to them, drivers are therefore inadvertently liable to act in ways the system finds sub-optimal.

For Lee, these scenarios build the case for specific engagement with algorithmic management in contemporary workplaces. A more recent study suggests algorithmic management decisions elicit different responses compared with human managerial decisions depending on the nature of the tasks in question (Lee, 2018: 1). Furthermore, Lee notes a change in context since prior engagement with computationally-supported work:

> the recent trend of algorithms assuming managerial roles puts people into a different power structure than when they are 'users' or 'consumers' of algorithmic systems. For consumer applications, people can decide to use algorithmic decisions or not; when those decisions are incorporated into managerial and governance processes, however, it is much more difficult for people to reject or refute them (ibid.: 2).

Read one way, this new context could read like a dream scenario for managers, but drawing on Skarlicki and Folger (1997), Lee cautions that "if organizational and managerial decisions are perceived as unfair, the affected workers experience resentment and anger and may engage in retaliation and acts against the organization" (Lee, 2018: 2). This is one of two ways Lee hints at a political tension between managers and workers, the second being in her discussion of transparency.

Better work

Lee wants to improve the workplace through improving the design of "algorithms to better support human values, motivations, and unique capabilities" (Lee, 2016: 42) in order to "enable more productive, fair, and enjoyable work" (ibid.: 44). Moreover, she argues increased transparency over decisions "may create workplaces where power structures are more equally balanced between workers and managers" (ibid.: 47). Yet the question of algorithmic transparency also reveals a tension between workers and managers. As Lee et al (2015: 1609-10, emphasis added) state:

> The stakeholders involved with work platform apps (companies and workers) complicate providing transparency. … Algorithmic work assignment offers new challenges in design transparency where fully disclosing the algorithm may not be a viable solution. Companies may be unwilling or unable to share the underlying mechanisms of their assignment algorithms, as they might be patented or proprietary assets. Companies may also *desire a degree of user ignorance* to prevent the system from being gamed.

Here, Lee et al are demonstrating an awareness that managers and workers may hold different interests, which comes to the fore in Lee's concern about workers 'gaming' the system. She states: "full transparency might not work to

the company's benefit, as workers may use their knowledge to game the system, maximizing individual benefit at the expense of group optimization" (Lee, 2016: 46). The challenge, as Lee (ibid.) sees it, is: "How do we promote transparency to earn workers' trust but also prevent workers from gaming the system?"

Lee's account is seeking a solution that works in both workers' and managers' interests, but her concern over 'gaming' shows that the technical solution of transparency is not enough to resolve what is in fact a political problem of control, in that too much transparency may cede to workers too much control over their own actions at the expense of managers' fundamental control over the system. Although she wants to improve the quality of work, gain workers' trust and balance the power structures that exist between workers and managers, she is unable to say exactly how much transparency workers should or should not have access to, precisely because workers and managers have different stakes in the company. She notes:

> With Uber and Lyft, drivers have limited power to refuse incoming requests, and there are financial motivations to accept rides — the more they accept, the more they generally earn. In other contexts with different power structures and incentives, finding the right level of transparency would be even more critical (ibid.).

My research aims are different from Lee's. But the tension she identifies at the centre of the question of transparency raises for me the need for a political analysis which is able to transcend the impulse to find a technical solution to the problems workers face in algorithmically-managed work. A political analysis encourages us to think about the ways in which humans are already centred within algorithmic management — i.e. as workers — such as the way 'user ignorance' can be desired by companies (Lee et al, 2015: 1610), and therefore intended or planned. Seeing the workplace as a site of contestation

between conflicting interests gives us a route into these questions. It allows us to see the tension between algorithmic instructions and workers' compliance as more than just a misunderstanding or design flaw; it forces us to ask if workers are in fact ignorant of the rationale behind decisions, or whether they are acting intentionally. Lee's framing of the problem of transparency assumes the human-centredness we should be pursuing does not involve humans (i.e. workers) centring themselves in their own decisions — "maximizing individual benefit" (Lee, 2016: 46) — but instead privileging "group optimization" (ibid.). I note the moral overtones of this framing, but argue there needs to be further interrogation of what is implied by *group optimization.* Does group optimization mean the most optimal set of arrangements for the 'system', the drivers collectively, or the company? It may be the case that workers have no particular desire for direct control of algorithms (Lee et al, 2015: 1610), but the study did note the loss of agency felt by workers who had been taxi drivers before joining Uber or Lyft (ibid.; Lee, 2016: 47), so there is room to ask what managers gain from obscuring decision processes, or indeed to interrogate the role of managerial secrecy in the first place.

Without a political analysis it is possible to be lured into a sort of algorithmic tunnel vision, whereby a desire to see the algorithmically-managed workplace improved leads to a presumption that appropriate algorithmic adjustments will lead to a friction-free workplace. Lee hopes increasing algorithmic transparency will overcome workers' problems of trust and cooperation. In exploring the thought of infusing the work process with more transparent mechanisms she makes visible the problem of finding a degree of transparency which would be permissible to managers before igniting fears about workers taking too much control. What is missing is a question about whether the current degree of opacity (i.e. the withholding of information) is in fact a considered approach on the part of the company. Moreover, current acts of worker noncompliance are assumed to be due to a breakdown of algorithm-worker communication. If it is in fact the case worker noncompliance is a result

of something like *refusal*, then the problems Lee identifies may not be solved by greater transparency anyway — we can imagine a scenario in which Uber or Lyft made their processes more transparent and yet workers decided to make the same decisions as they do now, unswayed by overtures to 'group optimization'. In such a case, we can imagine the 'need' that would arise for stronger managerial intervention in order to ensure workers act as they are intended to within the newly 'human-centred' managerial system. In any case, we can see the need to understand the relationships between algorithms, workers and managers not just in terms of 'interaction' but how algorithms work as a "social software" by existing "as part of assemblages that include, hardware, data structures (such as lists, databases, memory, etc.), and the behaviours and actions of bodies" (Terranova, 2014: 384). To ground this perspective, we can consider for example Trebor Scholz's comment that "currently, digital labor appears to be the shiny, sharp tip of a gargantuan spear of neoliberalism made up of deregulation, inequality, union busting, and a shift from employment to low-wage temporary contracts" (Scholz, 2017: 2-3).[47]

Management

Questions regarding the role of information and its relation to issues of workers' agency and cooperation have been central to the idea of what we have known as 'management' since at least the beginning of the twentieth century. This period has provided a rich history of managerial innovations that are now frequently taken for granted, but in examining this history we can observe the political impulses that have informed key managerial ideas. In this section I revisit selected foundational management ideas and their political implications.

[47] This leads Scholz to his position that the actual alternative to the "individualist ethos of the 'sharing economy'" is for workers to control platforms themselves without managers (ibid.: 2). Scholz (2017) calls this idea 'platform cooperativism', as an alternative to the idea of 'platform capitalism' (see Srnicek, 2016).

In subsequent sections I connect these ideas to cybernetic principles in order to develop an account of the managerial politics of 'data-driven' workplace governance. The principles and techniques I cover are instructive for furthering an understanding of algorithmic management in terms of political considerations beyond those discussed by Lee et al (2015), and provide a groundwork for a class composition analysis of algorithmically-managed workplaces.

The indeterminacy of labour power

Although the organization of work and even large bodies of workers by an overarching authority far predates capitalist social relations (Braverman, 1974: 64-5), the development of what we can now think of as 'management theory' and its associated structures is generally credited with a series of innovations beginning with the industrialist Frederick Winslow Taylor (Hanlon: 2016: 6). As Marx (1976: 677) notes, within capitalist social relations, labour power purchased by the capitalist needs to be turned into actual labour. This is to say *labour power* is a commodity unlike others such as raw materials, in that the capitalist purchases from the worker a *potential for labour*, which then needs to be actualized in the process of production in order for the capitalist to make profit. As Braverman (1974: 54) states:

> …the worker does not surrender to the capitalist his or her capacity for work. The worker retains it, and the capitalist can take advantage of the bargain only by setting the worker to work. It is of course understood that the useful effects or products of labor belong to the capitalist. But what the worker sells, and what the capitalist buys, is *not an agreed amount of labor, but the power to labor over an agreed period of time*. This inability to purchase labour, which is an inalienable bodily and mental function, is so fraught with consequences for the entire capitalist mode of production that it must be investigated more closely.

The labour process and the issue of "realizing the 'full usefulness' of the labour power" thus become the responsibility of the capitalist (ibid.: 57). Where *management* enters is in the endeavour to realize *cooperative* actual labour, which is to say labour that conforms to productive needs (ibid.: 59; Hanlon, 2016: 26).[48] Alongside notions of economic incentive (namely piece work), Taylor's idea of scientific management involved the deskilling of manual labour, a radical separation of the conception and execution of labour (as I will discuss), and the introduction of productivity targets based on time studies. Along with the Gilbreths' work on movement, this early period of scientific management is particularly notable for introducing the idea of 'time and motion studies'.[49] Taylor envisioned a transformation of the entire managerial endeavour, which he argued ought to be responsible for applying scientific measurement to each element of work, and training and disciplining workers to ensure work is being carried out "in accordance with the principles of science" (Taylor, 1911: 15). In Taylor's estimation, the central innovation of scientific management would be the "task idea" (ibid.: 17), by which

> The work of every workman is fully planned out by the management at least one day in advance, and each man receives in most cases complete written instructions, describing in detail the task which he is to accomplish, as well as the means to be used in doing the work. … This task specifies not only what is to be done but how it is to be done and the exact time allowed for doing it. (ibid.)

It is important to clarify here that my use of the terms 'management' or 'manager' denotes a function within the capitalist work process in relation to

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[48] Cooperation here refers to compliance more than collaboration. As Bendix (1963: 281) notes, 'cooperation' became a favoured slogan of employers during the industrial conflict of the post-first world war era.

[49] The origins of these studies and their resonance for contemporary work design have been discussed by Gregg (2015).

the actualization of labour power. The manager, in this sense, is defined by the task of overcoming what labour process theory calls the 'indeterminacy of labour power'. In this sense, management exists to serve the interests of capital, but managers are not necessarily defined by their own sociological demographic or economic relation to production.[50] Practically speaking, it is worth noting the interviewed workers featured in later chapters generally made little distinction between the job roles of 'team leader', 'supervisor' and 'manager', viewing their general purpose and interests to be aligned. In this chapter and in others, I occasionally refer to the 'managerial endeavour' to describe the managerial impulse within the work process without reducing it to individuals.

Cooperation

A discussion of the foundational ideas of management, even on their own terms, necessarily involves reference to workplace politics. Early management theories in particular were responding to real-world political contexts, and theorists were often explicit about their motivations. However, I first outline some of the mechanics of these early management ideas before situating them politically.

Born into a well-heeled Quaker-Puritan family in 1856, by the age of thirty-one Frederick Winslow Taylor had been promoted to chief engineer at the Midvale Steel Works in Pennsylvania (Wren and Greenwood, 1998: 134, 138; Barnes, 1980: 14). Having passed up a place at Harvard Law School, Taylor began work at Midvale as a lathe operator before being promoted both rapidly and on a regular basis, ultimately becoming a prominent management consultant and lecturing at Harvard (Wren and Greenwood, 1998: 135-40). During his time in

[50] Many managers can fairly be considered 'workers of the means of production' in the vulgar sense, but that description alone would belie their relation to other workers.

industry, Taylor identified a persistent problem of poor supervision by managers who neither understood the work process (ibid: 136) nor what ought to constitute a proper days' work (Moore, 2018: 47), exacerbated by what he viewed as the 'interference' of collective bargaining (Nadworny, 1955: 49). Central to Taylor's solution to ensuring effective management and workers' full cooperation is the argument that it is possible to create a workplace without antagonism, where interests are aligned. In this unitary vision of the workplace, outputs do not need to be increased through the intimidating presence of shop foremen. Rather, workers work according to targets based on piece work, receiving individual merit pay for high productivity. Famously, by timing how long tasks require to be carried out, managers in Taylor's system are able to 'scientifically' produce rationalized targets which can be understood by all workers.[51] Taylor worked in correspondence with Lillian and Frank Gilbreth, who regularly attended lectures at his house (Gilbreth, 1926: 34), dedicating a few pages of his *Principles of Scientific Management* to their studies.[52]

Frank Bunker Gilbreth began his working life as a bricklaying apprentice, later becoming an accomplished building contractor (ibid.: 16; Price, 1992: 58). By all accounts obsessed with efficiency even in his personal routines (Wren and Greenwood, 1998: 143), Gilbreth first became known within engineering circles for devising a 'bricklaying system' devised to reduce waste, conserve ability, and reduce costs (Gilbreth, 1926: 27). Central to Gilbreth's commitment to scientific management was a focus on managerial research methods and planning, in particular the use of the motion study, which he and his wife, Lillian, argued would help "increase the efficiency of the worker" (ibid.: 28). The Gilbreths' approach to increasing efficiency, they argued, aimed to increase outputs less through intensifying work and more through the reduction of wasted energy — and therefore fatigue — and increasing workers' accuracy

[51] Leading Taylor to call his system 'scientific management' (1911).

[52] Albeit only Mr Gilbreth was credited.

(ibid.: 21; Price, 1992: 61). Where Taylor focused on measuring activities in terms of the *time* they took in order to calculate how much work a person should be able to complete, the Gilbreths used inventive methods, such as filming workers in self-constructed "laboratories" (Gilbreth, 1926: 41), to focus on workers' *motions*. By observing how different motions could affect productivity, they devised the idea that there was 'one best way' to execute the work.[53] This notion developed something of a mythological dimension in the Gilbreths' self-publicity as consultants, with Lillian promoting the notion for its alleged health benefits — even exalting its benefits to married life, referring to her matrimony with Frank as the 'one best marriage' (Gilbreth, 1926: 25) — and Frank arguing that unions ought to view the Gilbreths' proposed system as a step forward for workers (Price, 1992: 60-1). Compared with the stopwatches used in time studies, the Gilbreths' preference for using cameras was arguably more methodologically robust (Wren and Greenwood, 1998: 143), but it should be noted that the fact the one best way principle advocates improvement through consistent adherence to a productive ideal means it relies on the labour process being stable over time and the external and internal environment being constant.

The one best way principle is, however, less prescriptive on the issue of cooperation. On this matter, Lillian Moller Gilbreth, an early pioneer of industrial psychology, argued for the need for scientific management to consider the *human factors* of the labour process. Taylor was not oblivious to this blind spot: in recognizing that primary knowledge of the labour process lay with the worker he touched on how supervisors ought to talk with workers to develop an affable relationship with them, and he remarked that "There is another type of scientific investigation…which should receive special attention, namely, the accurate study of the motives which influence men" (Taylor, 1911:

[53] The classic example is the study of bricklayers, which observed there were numerous ways to physically lay bricks — some of which were more efficient than others.

62) — although he did not explore these ideas much further. Although it has been argued the Gilbreths' preoccupation with combining scientific management with a 'human' focus (along with their attention to fatigue) was at least in part driven by business competition with Taylor (Price, 1992: 63-4), Lillian Gilbreth certainly contributed a focus on the idea of group scenarios (such as teams) and put the spotlight on the techniques that manage the *worker* rather than just the work, hinting at the 'humanistic' management tradition that would later emerge.

In 1924, the General Electric Company sponsored studies at the Hawthorne plant of the Western Electric Company with a view to establishing a link between illumination and workers' productivity (Wren and Greenwood, 1998: 171). No such link was found, with output increasing in both the control and variable groups. Despite the fact the participants themselves attributed their higher performance to the increased pay, more pleasant working conditions and the novelty associated with participating in the study (ibid.: 172-3), the official summation, led by the Australian management consultant Elton Mayo, was that the test subjects' increased productivity could be attributed to their cohesion as a "social unit", along with the study observer, as a by-product of the research exercises themselves (ibid.: 175). Foundational to a humanistic management approach, Mayo's notion of human relations, arising from his interpretation of the Hawthorne studies, has at its core "cooperation and group activity" (Hanlon, 2016: 137), focusing on the sociality of workers, which he argued is their main source of motivation. Mayo's key contribution is in his articulation of the 'social person' in contrast to *homo economicus*, and his arguments against what he calls the 'rabble hypothesis' — whereby managers view workers as a horde, rather than as a group which is often well-knit. Indeed,

> …the problem as Mayo saw it…is to restore to the individual the sense of intimate and *spontaneous co-operation* with the members of the basic

> unit of organization, the primary working group, with whom he passes his working hours and his feeling that the work of that unit is contributing to some common purpose (Urwick, 1960: 14-15; emphasis added).

For Mayo, it is at this point that a scientific approach to the management of people runs up against its limitations, and, he argues, risks sabotaging management control altogether, unless managers can develop ways to stimulate 'spontaneous cooperation' through seeking "an effective relationship between the worker and his work" (Hanlon, 2016: 143). As we will see, the principle of cooperation recurs in contemporary technological ecologies of management, especially when we arrive at cybernetic managerial techniques which rely on workers' communicative relationship with computational devices.

Control: the early years

Aside from appeals to shared interests, Taylor was explicit about his motivation for developing the *Principles*: organized labour agitators (1911: 5), who he argued had led workers to the belief their interests were not reconcilable with the interests of management. Taylor was led to the importance of finding the optimal productive time-scale for the completion of tasks because, in essence, he did not think workers were being productive enough. Taylor identifies two key problems in then-modern workplaces. The first is a problem of antagonism in the workplace, which is a threat to capitalists' interests. The second, which is the principal manifestation of the first, is what Taylor calls 'soldiering' — the tendency for workers not to work to their full capacity in case it becomes injurious to their own interests; a practice for which Taylor accuses union organizers. In short, Taylor's problem precisely echoes that identified by Marx: the need to turn labour power into actual labour (Hanlon, 2016: 104). Creating a workplace with a better alignment of interests — in fact bringing workers' individual interests in line with capitalists' interests — in the first instance means knowing how much work a person *should* be expected to do. The problem

Taylor identifies is that factory owners are largely ignorant of the precise productive processes which occur on the shopfloor, giving workers a great amount of control over production (1911: 13). Taylor aims to wrest control through the formulation of targets that employees can be expected to achieve on the basis of managers' own empirical inquiries into the workplace. In order to introduce targets which can then become the basis of managerial control, Taylor argues it is necessary to separate the conception and execution of labour. Conception refers to the knowledge and planning of the labour process, the development of strategy and so on, and execution refers to the work being carried out. In separating the two, Taylor advocates a novel division of labour between managers (who deal with conception) and workers (tasked with execution).

Crucially, the conception stage does not happen independently of the workers' execution — the knowledge put into the process by the managers is initially gleaned from the workers themselves. As Taylor (1911: 15) puts it:

> The managers assume…the burden of gathering together all of the traditional knowledge which in the past has been possessed by the workmen and then of classifying, tabulating, and reducing this knowledge to rules, laws, and formulae.

To facilitate this mechanism, he advocates the deployment of employment specialists (unfortunately termed 'shop disciplinarians', despite emphasizing being friendly with the workers as part of their role) who can be tasked with keeping records of employees.[54] As Hanlon (2016: 95-6) notes, Taylor's case for this type of functional management has at its centre "subjectivity, knowledge and what we might now call 'organisational culture'. Before management could manage or leaders could lead, workers' knowledge had to be expropriated and

[54] A function later to be carried out by what we now know as human resources management.

the division of labour made even finer." Through gleaning workers' knowledge, the idea is that managers are able to generate general rules and targets which will govern the work process. Through a combination of targets, piece work and merit pay, solidaristic practices such as soldiering can be undermined through introducing incentives for productive workers and disciplinary measures for those who fall behind.

Scientific management was met with eager objection from organized labour (Price, 1992: 59, 62). But while Frank Gilbreth had attempted to induce and persuade workers by drawing on his own history of having been a union member (Nadworny, 1955: 22), Taylor thought unions destructive and antithetical to his system, which relied on appealing to workers' individual ambitions (ibid.: 5), even advertising the reduction of strikes as part of his consultancy work (ibid.: 23). Like Taylor, Mayo sought to "close the gap between turning labour-power into actual labour and [solve] the employment contract's indeterminacy in the interests of capital" through enforcing cooperation, the division of labour and deploying bureaucratic forms (ibid.: 163). Similarly, Mayo was scathing of union organizers, judging them to be socially inept to the point of mental illness (Mayo, 1975: 23-4). However, Mayo locates the potential for managerial control in the social aspects of the workplace, arguing that too heavy an emphasis on efficiency from an engineering perspective actually prevents the labour process from being as optimal as it could be, "pushing the social needs of individuals into the background and thereby reducing people's capacity for collaboration in work" (Wren and Greenwood, 1998: 175), and for all its claims to science such a narrow approach leaves the social or human aspect of work to "dogma and tradition, guess, or quasi-philosophical argument" (Mayo, 1975: 61). Mayo's approach then is to systematize management's approach to those areas of work previously neglected by Taylorist methods, by focusing on the *worker* as Lillian Gilbreth advocated. In this way, Mayo hoped, it could be possible for "management to gain greater control of the informal work culture of the

organisation through the creation of small-group camaraderie in the workplace and by encouraging workers to communicate their discontent" (Hanlon, 2016: 153).

Management as strategy

It is not the case that Taylor and Mayo had uniquely ambitious designs on the work process, or especially idiosyncratic preoccupations with the power of organized labour. Their ideas provided the groundwork for decades of managerial innovation, but were ultimately based on the idea that it is imperative that capital has a strategy for achieving "certainty of result" — i.e. control — over the productive process against the notoriously 'unplannable' workforce (Panzieri, 1976: 8). This is what Hanlon (2016: 202) means when he calls management "neo-liberal class struggle from above" (ibid.: 3) and a *response* "to labour, to its knowledge, to its collectivity, to its soldiering and to its refusal" (ibid.: 11). Hanlon identifies in management the centrality of the control of knowledge to the control of production, and the aim of achieving "reconciliation between workers and their roles so that they willingly present the gift of 'spontaneous cooperation' to their co-workers and employers" (ibid.: 14) — in other words, to minimize the potential for labour power to go wasted by uncooperative workers.

Collaboration, in this sense, "appears as the management expertise of the capitalist" (ibid.: 25); a method for breaking down class solidarity in order that the flow of actual labour runs with certainty and without interruption. Nick Dyer-Witheford (2015: 51-2) identifies this pattern in the introduction of automated technologies to the US auto industry in the 1970s and 80s:

> In North America, union militants understood the new production technique, with its demand for teamwork and participation, as a challenge to class solidarity that blurred the lines between labour and

> management, and broke down job descriptions and time demarcations, drawing labour into a self-administered exploitation in the name of company identification.

Dyer-Witheford also notes that the new production technique entailed a coupling of such social methods with the increasingly logistical, 'just-in-time' nature of production in the automotive industry, whereby companies could separate groups of workers from each other across a range of sites by breaking down sections of the labour process, to be coordinated more centrally by senior managers (ibid.: 52-3).

Management could therefore be understood as strategy deployed against the tactical actions of workers in their effort to mitigate and manage their own work. Following de Certeau's (1984: 34-7) notions of strategy and tactics, within which strategy is understood as "the calculation…of power relationships that becomes possible as soon as a subject with will and power…can be isolated" (ibid.: 35-6), we can see Taylor and Mayo's early approaches (indeed perhaps even the development of management theory per se) as attempts to generate a strategic *place* for managers by creating privileged positions in the governance of information and sociality which become managers' business alone (see Goodrich, 1975: 56).[55] By observing the tactics of workers to control the work process to their own ends, Taylor and Mayo create a new role for

[55] A strategy, for de Certeau, "postulates a *place* that can be delimited as its *own* and serve as a base from which relations with an *exteriority* composed of targets or threats…can be managed" (1984: 36). He continues: "As in management, every 'strategic' rationalization seeks first of all to distinguish its 'own' place, that is, the place of its own power and will, from an 'environment'" (ibid.). This is different from a tactic, which is "a calculated action determined by the absence of a proper locus. … The space of a tactic is the space of the other" (ibid.: 37). He argues "a tactic is an art of the weak" (ibid.).

management — a steady hand moving purposefully and rationally, and firmly if necessary.[56]

From continuous improvement to adaptive systems

The foundational origins of management go some way to illustrating the logic underpinning contemporary management ideas, but as a 'data driven' approach, algorithmic management also entails notions of improvement and performance, as well as relations between humans and information systems. To situate these ideas within management thought, I first discuss how the Japanese management tradition augments the innovations of Taylor and Mayo, before introducing management cybernetics as a way to connect ideas such as continuous improvement and information management to technical systems.

Kaizen

A frequent correspondent with Frank Gilbreth, Yoichi Ueno was instrumental in promoting systematic management thinking to Japanese academics and managers. Having founded the Japanese chapter of the Taylor Society, in 1912 he wrote *On the Efficiency*, a book which drew on Gilbreth and Taylor's work and applied their principles to Japanese modes of management thinking. In particular he emphasized Taylor's focus on fostering a workplace culture of "mutual interest, cooperation and harmony", which he argued were compatible with traditional Japanese values (Wren and Greenwood, 1998: 151). Ueno's ideas were most significantly taken up by Taiichi Ohno, who joined Toyota after

[56] Braverman (1974: 67) notes the verb *to manage* comes from the Latin for hand, *manus*, via the French *manège*, a riding hall for training horses.

the second world war. Generally credited as the architect of Toyota's distinctive management approach, Ohno was a pioneer of both just-in-time production and *kaizen* (改善) — frequently translated as 'continuous improvement'. Kaizen is not just about refinement over time, but rather everyday/everybody improvement, requiring discipline and commitment to self-reflexivity. The focus is on reducing waste and costs by streamlining processes; each time something is improved, steps are taken to improve again. Within Toyota, kaizen entailed the participation of both management and workers across the organization, as well as attempts at "redefining the worker" through getting rid of fixed times and workloads and making "worker suggestions for improving efficiency mandatory" (Dyer-Witheford, 2015: 50). The idea remains influential, as reflected in Amazon's 'Kaizen programme' (Amazon, n.d.):

> We continuously work to streamline our processes and eliminate defects and we empower all our associates to innovate to help achieve this. … Through the Kaizen programme, associates, working in small teams, can identify areas for improvement giving them the opportunity to influence their working environment and streamline processes.

As I was informed on a public tour of an Amazon fulfilment centre, which I elaborate on in Chapter 3, the company's idiosyncratic approach to kaizen is to hold events where working groups work through the productive process to identify as many 'kaizens' (improvements) as possible.

Total (quality) control

Kaizen widens its focus from the actions of workers to the idea of system improvement. Conceptually, it marks a break with the one best way principle, in that it rules out the notion of an unimprovable system. Instead, continuous improvement signals a more holistic view of the workplace and its processes, extending managerial control and creating a specific role for communication

within its functioning. This approach is exemplified in the work of Kaoru Ishikawa, who argues managers need to foster a system which can continually adapt based on experience. In his critique of the short-lived so-called 'zero defect' movement in the USA, Ishikawa put its failure down to the overbearing influence of Taylorist methods, in which, Ishikawa (1985: 151) states: "Engineers create work standards and specifications. Workers merely follow. The trouble with this approach is that the workers are regarded as machines. Their humanity is ignored." Ishikawa's solution is the development of the 'total quality control' (TQC) industrial philosophy. Incorporating kaizen and elements of Mayo's thought (Hanlon, 2016: 161), at the centre of TQC is the quality control (QC) circle: a regular, encouraged but voluntary meeting of work teams and managers designed to discuss issues ranging from the technicalities and specificities of the work process and current projects, to sources of workplace antagonism arising from either professional or personal issues. As an adaptive, continuous system, TQC retains scientific ideas about the reformulation of knowledge to produce targets but adopts a more holistic and, arguably, cybernetic form: beyond work rates, TQC is concerned with managing work relations through communication and delivering company-wide control to management through attention to intra- and inter-department dynamics. Aside from incremental system improvements, TQC also aims at the diffusion of antagonism and promotion of harmony, as Ishikawa (1985: 64) notes: "A conclusion thus obtained can be understood and accepted by all."

The ethos of TQC is in adapting the company's future processes based on past processes and results. As a company-wide circuitry of control — what Ishikawa calls the 'control circle' (distinct from the quality control circle) — managers are supposed to keep track of processes through six key stages: determine goals and targets, determine methods of reaching goals, engage in education and training, implement work, check the effects of implementation, take appropriate action (ibid.: 59). The QC circle provides a forum for managers to engage workers' "intimate knowledge of the workplace" (ibid.: 64) on these aspects.

The motif of a staged feedback loop is reflected in the QC circle, which follows a ‘story’ to break down aspects of the productive process for workers and give structure to the forum (ibid.: 147). What we can see in TQC is Taylor’s principle of gleaning workers’ knowledge, albeit in a more participatory manner which frames antagonism as constitutive of improvement and harmonization. Fundamentally, the QC circle is intended to become a mode of sociality for the workers (ibid.: 27). But while it is a social space, the QC circle is not a gift of respite to break up the working day. Although the idea of the circle might conjure images of the support circle or a horizontal space, its purpose is to solve problems of *control* by means of research into workers’ experiences; indeed, the progenitor to the QC circle was in the “workshop quality control study groups” of shop foremen (ibid.: 5). The control of the QC circle does not follow a foreman-based ‘I say, you do’ command structure, and nor is it based on the scientific approach’s implementation of key performance indicators. Rather it is the means by which management can control various aspects of the work process through direct communication and encouraging cooperation, fulfilling what both Mayo and Lillian Gilbreth understood to be lacking from the scientific approach, and enabling, as Mayo advocated, “management to gain greater control of the informal work culture of the organisation through the creation of small-group camaraderie in the workplace and by encouraging workers to communicate their discontent” (Hanlon, 2016: 153).

Elements of the QC circle approach can be seen in the kaizen activity of *gemba* (現場) walks. Where the QC circle tightens the feedback loop between conception and execution, likewise gemba walks aim to give managers greater exposure to ‘the job’. From the Japanese meaning ‘the actual place’, gemba activities see managers walking the shopfloor (for example, following a productive process) in order to spot ‘cracks’, identify waste and find ways to simplify processes. Alongside kaizen ‘events’, gemba walks are a part of the managerial strategy of Amazon warehouses:

> the site leadership team holds a daily *Gemba* and will walk around the fulfilment centre together. The General Manager and all heads of department are required to attend. They stop at each of the key processes (dock, receive, stow, pick, pack and ship) to review the top issues in the area.
>
> …
>
> Mark Elsey explained to the managers that he had noticed that, on occasion, the shoes put into plastic bags for delivery were getting stuck at the top of the chutes used to sort parcels for delivery. This was causing jams on the chutes which meant our computer systems found it harder to read the barcodes identifying each order. This in turn meant more orders needed to be checked and manually sorted.
>
> During the Gemba Walk Mark said he thought the solution to this challenge would be as simple as polishing the chute to make it more slippery and to encourage the plastic bags to move more quickly down the chute.
>
> …
>
> Regular Gemba participant and Senior Operations manager, John Hayes, said: 'Mark's advice was the first thing we sought… His idea was so simple but it came from him knowing the process inside out: he was the perfect person to recommend a solution and his quick thinking has made the job easier for everyone in the outbound sortation team.' (Amazon Operations, n.d.)

Through gemba and QC activities, we can see how the kaizen approach predicates managerial control on its ability to take a proactive stance to the workplace which is also responsive to contingencies as they emerge. In contrast to the implication we see in Taylor and the Gilbreths — of the task of management being to detail a masterplan with which to govern work and workers — kaizen combines scientific and humanistic approaches to develop

a strategic approach which is simultaneously able to intervene at a tactical level by reacting to (and, crucially, accommodating in some sense) events or circumstances which were unanticipated. As I will now discuss, it is an ethos which shares key traits with a cybernetic managerial approach.

From knowledge to performance

Despite the differences between kaizen and Taylor's vision of scientific management, there persists the central Taylorist principle of the separation of conception and execution, which acts as the foundational organizing principle of modern workplace management within capitalist social relations, acting as a feedback loop which governs the workforce and determines the standards by which its cooperation is measured. However, although it is arguable that contemporary management still exists within a Taylorist paradigm, we can nonetheless observe key differences in its operation, especially in computationally-mediated workplaces. Negri (1989: 106) observes that "control in the literal sense is no longer a necessary condition for production: today control is provided by book-keeping", but as Pickering (2010: 253) notes "most of the information that one can collect on an organization is useless and can be discarded". The point may sound flippant, but in an era of the unprecedented ability to amass data from work and workers, it might be reasonable to expect more data could be collected than anyone could reasonably find a use for. The substantial point underpinning Pickering's comment is that within a context so information-rich as a modern workplace or company, it is more appropriate to assess performance and effects than to try to know or learn everything there is, the idea being that "information is not about *knowing* but *doing*" (Dyer-Witheford, 2015: 42). This perspective is strongly reflected within the cybernetic management approach.

Underpinning the cybernetic approach is what Pickering calls an "ontology of unknowability", an aspect of cybernetics that "tries to address the problematic

of getting along performatively with systems that can always surprise us" when particularly complex systems elude representation (Pickering, 2010: 23). This implies a different sense of control to that which is hierarchical, linear and "flows in just one direction in the form of instructions for action"; instead, "in line with its ontology of unknowability and becoming, the cybernetic sense of control was rather one of getting along with, coping with, even taking advantage of and enjoying, a world that one cannot push around in that way" (ibid.: 383). In relation to the idea of 'black boxes' — processes which *do something* but whose internal workings are not observed — Pickering details the different impulses of *scientific* versus *cybernetic* stances: where the scientific stance wishes "to understand their inner workings in a representational fashion", the cybernetic stance sees the scientific impulse as "entailing a *detour*, away from performance and through the space of representation, which has the effect of *veiling* the world of performance from us" (ibid.: 20). He continues:

> the hallmark of cybernetics was a refusal of the detour through knowledge — or, to put it another way, a conviction that in important instances such a detour would be mistaken, unnecessary, or impossible in principle. The stance of cybernetics was a concern with performance as *performance*, not as a pale shadow of representation. (ibid.: 21)

By way of a simple illustration, we can think of performance in this sense as in the "satisfactory performance relation" we have with door handles, where we are able to anticipate effects and actualize a desired series of actions without having to understand the precise mechanism (ibid.: 23). As I now discuss, within an organization such a relation relies on effective processes of communication and feedback which can produce a more generative, distributed form of control.

Managerial systems

The ontology of unknowability is demonstrated in Stafford Beer's notion of the 'exceedingly complex' system. Beer says the world can be thought of in terms of three types of system or entity: simple, complex and exceedingly complex. While simple and complex systems "are in principle knowable and predictable, and thus susceptible to the methods of the traditional sciences" (ibid.: 222), exceedingly complex systems (the economy, the brain, the company) are probabilistic in nature and have to "function in and adapt to an endlessly surprising, fluctuating and changing environment", which is to say they are "not fully knowable or adequately predictable" (ibid.: 223). These are systems which are "so complex that we can never fully grasp them representationally and that change over time, so that present knowledge is anyway no guarantee of future behavior" (ibid.: 23), presenting fundamental problems for management. For Beer (1981: 17), this means management (as the profession of control) ought to be considered in relation to cybernetics (as the science of control), given that in each case there exists an aim to negate the effect of disturbances to the functioning of a system. For the company this means "[developing] techniques for survival in a changing environment", particularly its ability to "adapt itself to its economic, commercial, social and political surroundings, and it must learn from experience" (Beer, 1959: 17).

Beer observed that companies tended to lack an accurate understanding of their actual internal workings. As Pickering (2010: 253) states:

> What organizations had…was organization charts of hierarchical power relationships running downward from the board of directors through vertical chains of command devoted to production, accounting, marketing, and so on. Beer's claim was that such charts did not, and could not, represent how firms actually worked. They functioned, at most, as devices for apportioning blame when things went wrong.

Beer argued organizations based on probabilistic systems risked ataxia if they were not sufficiently adaptive to changing circumstances, such as system disturbances which cannot be determined before they occur. As such they must not only continually improve, but they must be robust enough that they can adapt and change course quickly (ibid.: 273). One proposal was what Beer termed a 'viable systems model' (VSM), an organizational form based on the idea of the self-regulation and adaptivity of a system across a variety of components that are in conversation with each other, with managers "positioned within purposefully designed information flows" (ibid.: 244) such that they can steer the firm by balancing interlocutory processes.

For Beer, the VSM presented the possibility of reorganizing the firm around the computer "to effect a transformation that was social as well as technological, to rearrange the human components as part of an adaptive technosocial system of information flows and transformations" (ibid.: 253). Within this set-up, managers could exercise effective control by virtue of their position among communicative flows. In this sense, managers in the VSM occupied a 'servomechanical' role by virtue of their ability to "use feedback processes to cancel out the effects of disturbances on their operations" (Dyer-Witheford, 2015: 42). A critic of capitalist managerial practices, Beer sought to undo hierarchies of command and control through "adaptive couplings between levels" which would distribute decision-making 'authority' through the system, but as Pickering (2010: 267) notes, "these adaptive couplings could easily be 'switched off' and replaced by asymmetric ones", meaning the VSM was not necessarily a particularly "potent bulwark against the institutional arrangements that Beer wanted to obviate."

A more explicitly asymmetric version of a company-wide adaptive management system is Robert Kaplan's 'closed-loop management system' (CLMS). Based on the influential 'balanced scorecard' model (Kaplan and Norton, 1996), the CLMS aims to extend managerial control beyond a primary focus on the

financial bottom line towards a better distributed and more systematic architecture of control by incorporating strategy and operations (Kaplan, 2010: 28). The closed loop resembles the repeated stages of the TQC model. In six stages, the CLMS threads together: the development of strategy, translation of strategy, aligning the organization, planning operations, monitoring and learning, and testing and adapting (ibid.: 27-8). Kaplan (ibid.: 29) states: "The integrative and comprehensive closed-loop management system has many moving parts and inter-relationships, and requires simultaneous coordination among all organizational line and staff units". Despite somewhat euphemistic references to translation, aligning, monitoring and learning, what the CLMS demonstrates is a cybernetic approach to management whereby managers are able to account for and control external and internal disturbances through the effective communication of productive and organization processes — which is to say the various labour processes within the company — from workers to managers, which is then channelled into strategic 'alignment' directives.

The CLMS demonstrates what Pickering (2010: 274) calls the "democratic fragility of the VSM". Beer aimed to distribute decision-making within the functioning of the system, relying on adaptive couplings to act as checks and balances across operational and managerial levels, but the extent to which adaptive couplings are integrated into the system — to keep it "genuinely cybernetic" (ibid.: 267) — appears to be a normative decision based on managerial prerogative. As Pickering (ibid.: 273) concedes, without adequate adaptive couplings VSMs could become "rather effective systems of command, control and surveillance" used to curb workers' demands rather than incorporate them. Werner Ulrich (1981: 35 in ibid.: 268) presses this line of argument in his critique of Project Cybersyn, which was largely designed by

Beer.[57] Ulrich criticized the model for being 'purposive' rather than 'purposeful', meaning that without substantive built-in goals the system would end up implementing whatever ambitions were brought to it in a top-down fashion.[58] Although adaptive couplings were built into Cybersyn as reciprocal (rather than one-way) devices, there remained an asymmetrical relationship with regard to goal-formation, which generally came 'from above'.[59] In this sense, it could be said that while the adaptive couplings of the VSM mediate performance, the disciplinary aspect of the model (ensuring 'certainty of result') remains top-down in practice.

Data-driven

Both the VSM and CLMS demand adherence to 'the system'; a tenet which is further fused with tracking technologies in algorithmic management and one which, as I will discuss at length in Chapter 4, has its own political effects. Phoebe V. Moore refers to the contemporary managerial epoch as one of 'agile management systems', agile being an intentionally slippery term invoking leanness and adaptivity as well as flexibility and insecurity.[60] She states:

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[57] Project Cybersyn was the name given to a planned cybernetic economic management system developed during Salvador Allende's socialist premiership. It was destroyed following Augusto Pinochet's military coup in 1973. See also Medina (2014).

[58] Pickering (2010: 268) clarifies: "a 'purposive' system is a means to some extrinsically specified end, while a 'purposeful' one can deliberate its own ends".

[59] To his credit, Beer did attempt to address this question in his later work on 'syntegration'.

[60] Moore's conceptual use of 'agile' here transcends that of the 'Agile manifesto' (Agile Alliance, 2001). Situating contemporary management practices against older managerial forms such as scientific management and continuous improvement, she posits agile management as "a form of total quality management *and* a high-performance work system" (Moore, 2018: 63). The condition of 'agile workers' produced by this managerial form is reminiscent of Mark Fisher's (2009: 34) description of contemporary work: "As production and distribution are restructured, so are nervous systems. To function effectively as a component of just-in-time production you must develop a capacity to respond to unforeseen events, you

> Agility both intensifies management responsibilities seen in the era of scientific management and escalates the role of the engineer and technician, also seen in Taylor's recommendations. The primary difference between scientific management and agility is the even-greater emphasis placed on technology, to the point that we are symbolically asked to 'serve' the machine (Moore, 2018: 59).

The object of the engineer, in this case 'the machine', is notable for the great precision with which it can track workers' performance — spatially, temporally, and in the case of 'quantified self' style wearables, even physiologically (ibid.: 21). The range of tracking technologies available to managers means they "can know more than ever before about workers as technology constantly tracks second by second information of their movements and internal functioning" (ibid.: 10-1), producing "new 'knowns'" through the massive accumulation of data (ibid.: 10). And yet, the vast amount of data produced[61] and the real-time nature of its transmission problematizes the idea that any manager can now 'know' everything; instead, there persists an ontology of unknowability, complemented by a managerial system which is able to help managers 'get along performatively' (to use Pickering's earlier phrase) with the wider organization as an exceedingly complex system. In other words, management is computationally supported in establishing a "satisfactory performance relation" (Pickering, 2010: 23) with the company by virtue of an advanced infrastructure of tracking technologies which connect processes and workers' actions.

Within this formulation, Moore suggests machines may begin to look more like tool bearers than humans do, their tools being "seemingly ever more precise

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must learn to live in conditions of total instability", although it should be noted Moore retains a distinction between just-in-time and agile (Moore, 2018: 63).

[61] Moore (2018: 8) refers to an experimental project where a single employee was able to produce over thirty gigabytes of data per week via three tracking devices.

calculations about human labour", put to use in the management of the workplace (Moore, 2018: 3). A key principle in sustaining this arrangement is that "Data is treated as a neutral arbiter and judge, and is being prioritised over qualitative judgements in key performance indicator management systems and digitalised client-based relationships" (ibid.). Klipfolio, a company specializing in team performance dashboards, asserts that "data doesn't lie", claiming its data visualizations "provide an objective view of current performance and can effectively serve as common ground for further dialogue" (Klipfolio, 2015). Here 'data' echoes Ishikawa's (1985: 64) notion of the conclusion which "can be understood and accepted by all", and is intended to act like a managerial instruction presented rationally and the result of empirical monitoring. The labour relations involved in this tactic are well-understood; citing an unnamed senior manager, Eckerson (2011: 187) writes once "workers [question] the validity of this metric or that data and you begin debating the accuracy of the data…it's a downward spiral from there".

In this chapter I have discussed a range of management approaches which have sought, in different ways, to intervene in the politics of work with a view to enhancing managerial control. By focusing on key interventions in the scientific and humanistic traditions, I have been able to show how informational and social techniques can be used to ensure "certainty of result" (Panzieri, 1976: 8) from workers, such as through the alignment of interests between managers and workers. The principle of managers occupying a key position in information flows is reflected in the cybernetic perspective on management, which understands the company as an incredibly complex entity to the point that there exists an 'ontology of unknowability', meaning control needs to take a more computational form based on the massive collection of data. These ideas are particularly relevant for understanding the politics of algorithmic management, such as the effect of algorithmic management on workers and the organization of authority, which I will discuss in Chapter 4. Drawing on Robert Kowalski's idea that "algorithm = logic + control", Goffey (2006: 18)

argues that “Algorithms obviously do not executive their actions in a void. It is difficult to understand the way they work without the simultaneous existence of data structures, which is also to say data.” As such, and as I explain at the beginning of Chapter 4, my analysis does not focus on the specificities of particular algorithms, but rather the “physics of real processes” (ibid.: 16) that algorithmic management implies.[62]

Algorithm + management = ?

Ubiquitous management?

Speaking of the Motorola WT4000 wearable scanner, which will feature in Chapter 3, Applin and Fischer (2013: 3) discuss how “The sensors within them can be used for surveillance of worker movement and further, for monitoring compliance to script processes. This type of surveillance moves the rationale from tracking of data, to tracking of behavior.” Meanwhile Motorola (2008, 2009) markets to buyers the real-time capabilities of its tracking devices. Within devices such as these we can see elements of a range of managerial approaches, from the separation of conception and execution advocated by Taylor to the continuous improvement impulse of kaizen, to the performance-oriented feedback loops of cybernetic management and the real-time tracking practices which emerge in ‘agile’ management. All these aspects of the managerial endeavour have consequences for workers, whether generating data to be used in disciplinary situations or monitoring cooperation with ‘the system’ or internalizing the performance expectations generated by

[62] In this sense, Goffey (2006: 17) argues alongside Foucault that “the algorithm as a statement…is not analytically reducible to the syntactic or semantic features of a language; it refers instead to its historical existence and the way that this historical existence accomplishes particular actions”.

management, displayed as a reflection of the worker in the handheld or wearable device.

The history of management ideas I have discussed here raises political questions of algorithmic management beyond those of transparency and optimization indicated by Lee et al. Rather, it encourages us to think about how principles such as cooperation, knowledge and performance operate within a work context. But algorithmic management also introduces new aspects to the workplace which encourage us to think about communication and mediation within the context of labour relations — the way managers (as the custodians of technology) are aided, and the way workers negotiate their position as media users. If, as Lash (2007: 71) proposes, "A society of ubiquitous media means a society in which power is increasingly in the algorithm", then the proliferation of managerial digital media technologies leads to questions about the character of algorithmic power at work and its consequences for class composition. We know workplace technologies are becoming increasingly intimate (Moore, 2018; Gregg, 2011), and we know the power of digital media can be leveraged against users in other contexts (Schüll, 2012), so it indeed might be reasonable to ask whether managers are now coming for what Franco Berardi (2009) calls "the soul" — the proliferation of digital media such as wearables, extending managerial power to every corner of an algorithms' reach, and by extension every cognitive and corporeal action of its diligent user.[63]

Drawing on his research on Deliveroo, Jamie Woodcock suggests the idea of an 'algorithmic panopticon'. In his words:

[63] Berardi (2009: 21) clarifies: "The soul I intend to discuss does not have much to do with the spirit. It is rather the vital breath that converts biological matter into an animated body. I want to discuss the soul in a materialistic way. What the body can do, that is its soul, as Spinoza said."

> The use of automation to manage the labour process creates what can be conceptualised as an algorithmic Panopticon [sic]. It starts from the sense that 'it's the algorithm that's the boss', automatically collecting and comparing data across the entire company (Woodcock, 2017a).

The result is that in the absence of a physical supervisor or manager (or 'augmented supervisor'), the 'algorithmic panopticon' provides a means of governing the workplace without physical presence (Woodcock, 2017b).

But Woodcock problematizes the idea that the consequence is a lop-sided settlement which places the 'frontier of control' (Goodrich, 1975) squarely in managerial hands. Rather, his insistence on the panopticon metaphor relates to what he argues is Deliveroo's reliance on an "illusion of managerial control, albeit backed up with evidence of detailed supervision and occasional disciplinary acts" (Woodcock, 2017a).[64] Owing to Deliveroo's limited capacity for carrying out disciplinary measures (in part due to Deliveroo's lean model; in part due to workers' "bogus self-employed relationship with Deliveroo"), Woodcock argues the company relies on close monitoring via a digital control infrastructure (including GPS and user interface interactions) to maintain practical control within the work process despite managers' spatial distance from the work place, noting that "The appearance of an omnipresent and automatic method of supervising and disciplining workers is a cost effective method of control" (ibid.). This form of organization inculcates "the feeling of being constantly tracked or watched" among workers but belies a "precarity for the platform itself" (Woodcock, 2017b). The crucial point is that the appearance of control is *illusory*, founded on a "precarious assemblage" of managerial

[64] Woodcock notes and responds to the objections which have been raised to the application of the panopticon metaphor to workplaces by McKinlay and Taylor (1998) and Taylor and Bain (1999). Further reading on that issue can be found in Woodcock (forthcoming). I have decided not to dwell on the precision of Woodcock's terminology in relation to Bentham or Foucault's uses of the term, but rather the substance of Woodcock's contribution.

techniques within which Deliveroo relies “on an algorithmic Panopticon to manage the indeterminacy of the labour process” (Woodcock, 2017a). In this sense, Woodcock problematizes the suggestion of a fairly incidental lack of transparency, such as identified by Lee, by identifying a strategy of opacity on the part of the company, albeit with uncertain results.

The management theories discussed in this chapter give little impression of the potential of workers’ resistance after the theories’ implementation, but Woodcock’s research suggests management algorithms alone do not overcome the indeterminacy of labour power. His work on Deliveroo prompts us to consider, for example, what information won’t be gathered into performance data, what knowledge will be retained by workers, and whether algorithms may in fact conceal data from managers. In other words, Woodcock reminds us of the gaps that remain in the real-world application of managerial models, which, to paraphrase Cleaver (1979: 42-3), “it serves little purpose to study…unless they are recognized as strategies that capital must struggle to impose”. As this chapter suggests, such a struggle involves considerations of ensuring workers’ cooperation. Moreover, the increasingly complex systems indicated by algorithmic management raise questions of the persistence of unknowability as a condition of managing a cybernetic environment, despite the increase in tracking capabilities. As de Certeau (1984: 40) suggests, the strategic “expansion of technocratic rationality” could make itself vulnerable to a scene of “Brownian movements of invisible and innumerable tactics”, which opens up the prospect of workers’ resistance, which I explore in Chapter 5. First, I continue the present study by turning to empirical cases through which to further discuss the politics of algorithmic management and lay the basis for Chapters 4 and 5.

3. Means of Distribution

Only by understanding the actual conditions of life and the actual strivings of an actual working class at a certain stage of its development, can the problems of humanity as a whole be understood.

Ria Stone (Romano and Stone, 1947)

Introduction

This dissertation has made the case for autonomist engagement with the politics of new managerial technologies and examined the theoretical perspectives within which their use can be situated. In this chapter, I describe the labour processes of a range of computationally-supported distribution work settings in order to draw out some of the conceptual issues presented by 'algorithmic management', broadly construed. In doing so, I begin the class composition analysis proper by rooting it in the experiences of workers I have spoken to, as I advocated in Chapter 1. After outlining the significance of logistics work, I introduce my methods before presenting a series of case studies based on interviews, documentary sources, photographs and a tour. I arrive at a discussion of what I call management interfaces, the politics of which becomes the conceptual focus of Chapter 4. This chapter therefore serves to describe the *technical* class composition of algorithmic management in distribution work, providing a basis for the *political* analysis of algorithmic management in Chapter 4 and, ultimately, the inquiry into the political forms available to workers in Chapter 5.

Logistics of inquiry

From warehouse to their house

As discussed in the introduction, the logistics sector has in recent years attracted political attention on a variety of fronts, from its association with 'zero-hour' contracts in the UK to its status in (or as) the infrastructure of globalized capitalism. This dissertation homes in on the work processes and class relations of distribution work from warehouses, such as those which fulfil internet shopping orders and replenish supermarket stock, to algorithmically-mediated delivery services, such as those where 'self-employed' drivers and

riders deliver parcels and food to customers' houses. The cases that comprise this chapter do not follow one particular supply chain, although some of them are practically sequential (for example, a supermarket 'online shopping' department and a supermarket shopping delivery), and I have broadly ordered them to complement these relations where they exist. The cases detail the work of a 'picker-packer' in a supermarket distribution warehouse, an overview of an Amazon 'fulfilment centre' based on a guided tour, and the experience of pickers in an e-commerce distribution centre. As Rushton et al (2014: 303) note, in outbound distribution "order picking typically accounts for about 50 per cent of the direct labour costs of a warehouse". Also featured is the work of a Christmas temp 'packer' at another e-commerce warehouse and a supermarket 'shopper' who collects online shopping orders. Finally, I outline the work of a supermarket online shopping driver, an e-commerce delivery platform driver, and riders for a food delivery platform. As I will show, each of these jobs has its specificities, but they also correspond and diverge with one another in interesting ways that help us understand the technical composition of algorithmically-managed distribution work. Of the cases I discuss, the food delivery platform is the odd one out by virtue of its lack of contact with warehouses in any sense,[65] but, as I will show, it provides a useful point of reference both in elevating the 'algorithmic' component of the types of work discussed throughout this dissertation, and in demonstrating the managerial continuum between warehouse-oriented work and the forms of work usually discussed in relation to algorithmic management.

[65] Albeit we could point to the growth of so-called 'dark kitchens' in the service of Deliveroo, which problematizes any sharp distinction between restaurant deliveries and other forms of goods fulfilment delivery (see Butler, 2017).

Technical composition

In its 'Hotlines' inquiry into call centres in Germany, the communist inquiry group Kolinko (2002) sums up what it argues is the historical importance of examining the work process: "The way people work in a call centre is neither an accident nor the product of a master plan. Rather it is a result of the class conflicts over the last decades and has to do with workers' behaviour." Their statement broadly encapsulates the autonomist perspective on technical class composition, introduced in Chapter 1 as the component of class composition analysis that focuses on the organization of labour within the work process. An inquiry into technical composition, says François Matheron (1999), is an "analysis of the labor process, of the technology, not in sociological terms but rather as sanction of the relations of force between classes", which is to say the labour process as it arises generatively from the balance of power between labour and capital.[66] The technical composition analysis in this chapter therefore provides an exposition of the fundamental labour processes of the different cases, before clarifying aspects that provide a route into teasing out the class relations (as political composition) over the following two chapters.

It should be noted that the departure from what Matheron refers to as the sociological composition does not arise from a hard-headed attitude towards the discipline of sociology, historical debates notwithstanding.[67] Rather, a class composition analysis is in fact concerned with avoiding the pitfalls of formal descriptions of class as prescribed by orthodox Marxist tendencies; namely, it intends to explain the practical relations of workers to the productive process, and therefore the possibility of exercising power, rather than classifying workers purely as "'non-possessors' of the means of production" (Kolinko,

[66] The unusual use of the word 'sanction' likely arises from its translation into English. The Larousse dictionary gives the French *sanction* as 'conséquence naturelle d'une acte'; i.e. natural consequence of an act.

[67] See Chapter 1.

2002). Particularly given the 'interest' in working-class organization and liberation hanging over the workers inquiry and political accounts (in Cleaver's sense of the term),[68] it would be philosophically problematic if autonomist praxis were to define the situation and characteristics of the working class as a remainder to capitalist structures, such as in classical terms of the relation to the means of production. Chapter 2, for example, reviewed a number of management theory positions whose implementation envisions little room for autonomous working-class organization; the benefit of a class composition analysis is it understands the organization of work as a practical scramble for the 'frontier of control' (Goodrich, 1975). For Kolinko, this is a crucial point: "The possibility of self-organization can only be derived from the fact that workers have a practical relation to each other and to capital: they are working together in the process of production and they are part of the social division of labour" (Kolinko, 2002).

Workers inquiry

Chapter 1 made the case for a reconnection of autonomist analysis to the methodological approach of the workers inquiry. Others have likewise argued for a revivification of the workers inquiry (Woodcock, 2017c; Notes From Below, 2018; Figiel et al, 2014), but as with the 1960s operaisti, there remains an open question over the actual methods entailed. The workers inquiry is a fundamentally 'interested' methodology, in that it attempts to capture what is at stake in the research site and does not hesitate to commit the research to a political objective. In this vein, Woodcock (2017c: 32) notes: "It is important to stress that the workers' inquiry was not seen solely as academic method; instead it formed an important component of a political project." Certainly, there is a tension between the norms of much academic research and the more explicitly political ambitions of those who pioneered the workers inquiry in

[68] i.e. With a primary focus on the fundamental power struggle within capitalism.

1960s Italy, as discussed in the section on 'proletarian sociology' in Chapter 1. Wellbrook (2014) argues the formalities of contemporary academia mean it is simply unsuited to generating meaningful contributions to workers' struggles. Part of Wellbrook's perspective reflects a longstanding debate about workers inquiries having two types: inquiry 'from above' or 'from below' (Reiser, 2001; Woodcock, 2014; Notes From Below, 2018).[69] In large part owing to two contrasting approaches adopted by Romano Alquati for his inquiries into Fiat and Olivetti, the 'inquiry from above' is generally characterized as involving an external researcher engaging with a workplace through methods such as interviews or surveys, whereas an 'inquiry from below' privileges 'co-research' between participant-observers and other workers. Although a caveat is often made that an 'inquiry from above' is welcome if the conditions do not permit an 'inquiry from below', current researchers in this area are quite unequivocal that an 'inquiry from below' is always the preferred methodology where possible (Notes From Below, 2018).

My sense is that the distinction between the two is overstated. While I appreciate the democratic impulse that accompanies the preference for inquiry 'from below', the implication that inquiry 'from above' carries a lesser strategic benefit appears misplaced. Although it is fair to acknowledge that the criteria and norms of some types of research project (such as a doctoral dissertation) may hinder direct application to workers' struggles within the framework of the research itself, the usefulness of the research to those struggles arguably has as much to do with dissemination as method. Alquati's initial interview-based inquiry at Fiat constitutes an inquiry 'from above', but nonetheless it has passed into labour movement lore. More influential yet is Paul Romano and Ria Stone's 'The American Worker' (1947). Produced through the Johnson-Forest Tendency, it is an inquiry of two halves, with Romano's autoethnography as a

[69] It is in this sense Wellbrook (2014) poses the attributive 'workers inquiry' and the possessive 'workers' inquiry' against one another. Both appear in the literature.

car factory worker followed by Stone's Marxist analysis. While 'The American Worker' is characterized by Romano's direct testimony and descriptions of his workmates, the conceptual development is carried out by Stone, and the project was neither produced in conjunction with other workers nor conducted (in itself) as an organizing project — so it is a workers inquiry neither 'from below' nor 'from above'. It should also be noted that inquiries which are genuinely 'from above' have been advocated by Taylor (1911), Mayo (1975) and others; that is, inquiries seeking to maintain the position of those who already find themselves 'above' in the capitalist social hierarchy. By contrast, a workers inquiry however it is carried out is properly defined by its normative commitment to the political advancement of the working class against the ruling class.

Approach and challenges

Inspired by Alquati's inquiries at Fiat and Olivetti, Kolinko's (2002) 'Hotlines' inquiry, and Woodcock's (2017c) inquiry into the call centre sector, this dissertation is the product of a number of methods that have been used to gather insight into the current state of algorithmically-managed distribution work. As Fantasia (1989: 248) notes, contestation in workplaces does not tend to "'stand still' long enough for a researcher to arrive…and compile a record as detailed as one that might be compiled in a settled community, for example." With this in might, I adopted a flexible approach to data collection which generated eight 'cases' comprising oral evidence, documentary evidence, and (in one case) observation. Case studies not do aspire to representativeness (George and Bennett, 2004: 30), but they are useful for generating and developing theories about social dynamics which might be applicable across a number of sites, while incorporating the contextual distinctions between them (ibid.: 31). George and Bennett (ibid.) note: "Case study researchers are more interested in finding the conditions under which specified outcomes occur, rather than uncovering the frequency with which those conditions and their

outcomes arise." In this sense, the use of cases in this dissertation is appropriate to theorizing the political dynamics of algorithmically-managed workplaces, particularly when anchored in oral evidence. As Thompson (with Bornat, 2017: 5) argues, oral testimony is important to critical research because it is sensitive to sociopolitical complexities and allows the juxtaposition of data from different sources, such as official trade union statements and the voices of rank-and-file workers (ibid.). Its ability to reveal workplace cultures and social dynamics means oral evidence has been of specific importance to labour scholarship historically (ibid.: 147-52), and its use in conjunction with documentary sources has often proved crucial to research on 'grassroots' political activity in particular, for example in developing Belinda Robnett's (1997) theory of "micromobilization" in the African American civil rights movement.

To generate the cases presented in this research, I conducted seven semi-structured interviews (one of which was with a pair of participants), gathered press clippings and trade union press releases, attended two Amazon guided tours, trawled company websites, sourced technical specification sheets, and interviewees provided me with company induction materials, photographs and screenshots. The eclectic compilation of empirical sources reflects the guardedness — and indeed the 'messiness' (Law, 2004) — of the sector and the access issues involved in researching it. Many of the most prominent companies operating in the distribution sector have been noted for their vigilant approach to security when it comes to the labour process, and more specifically, labour conditions. While the former may be a matter of commercial interests, the latter has become a matter of first media and subsequently government interest.[70] This presents a challenge for observing the work sites first hand. I wrote to a number of companies asking to observe their distribution

[70] Among those called to the Business, Energy and Industrial Strategy Committee (2017a) were Sports Direct, Asos and Deliveroo.

centres, or to interview operational managers, but none replied to my correspondence.[71] Although the correspondence explained the research in neutral terms, it is also the cases that adopting a critical or partisan research perspective can close of avenues of investigation (Fantasia, 1989: 251), so even if I had received a reply it could have been the case that managers would have declined to proceed with observations or interviews upon learning more about the research project.

Moreover, the nature of the work presents challenges in finding employees who will take part in the research. Many distribution centres have a high turnover, leading to weak social ties and therefore presenting a problem for attempts to snowball. Non-managerial, temporary and agency employees are less likely to appear on networking websites such as LinkedIn, inhibiting the possibility of contacting employees remotely. One option would have been to stand at the gate of a distribution warehouse and invite people to participate, but there are ethical implications in inadvertently singling employees out; one interviewee who had experience of such 'gate job' tactics reported that managers had threatened disciplinary action against anyone who took part in research on working conditions. With these concerns in mind, I ruled out the potential of recruiting participants at their place of work. As Fantasia (ibid.: 247-8) notes, the conflictual context of working-class political action confronts the researcher with both the issue with the issue of partisanship and the potential that prospective participants may be highly mistrustful of the researcher. In this sense, Fantasia argues, partisanship can in fact be necessary to gain access when researching topics such as workplace resistance (ibid.). With this in mind, I leveraged my own political activity in labour and social movements to

[71] An alternative option would have been to explore the possibility of covert observation, such as conducted by Woodcock (2017c). The option was considered, but practical circumstances meant it was not feasible. However, covert observation (particularly an ethnography) would have carried the further methodological consequence of weighting the study to one particular site rather than a range.

secure interviews with the first two participants who I judged might be competent narrators (Holstein and Gubrium, 1995: 21-5) of working experience in the logistical sector, approaching one at a social movement discussion event, and contacting the other through a trade union. I was able to establish common ground with these individuals to build rapport (Berg, 2004: 99) prior to their participation, which led first to their interviews and subsequently to the interviewees providing me with further access in the form of documentary sources, a further interview and vouching for my credibility when helping me recruit other participants. Two further participants were interviewed together: one was known to me through prior mutual political networks; the other was recruited by the first participant, who vouched for me. Given my ethical obligation to avoid harm to participants (Rubin and Rubin, 2012: 89), I agreed with participants that their identities and participation would be kept anonymous, as well as the exact locations of their workplaces or interviews, given the possibility that not only could such information be used to identify them, but there exists a precedent of workers facing punitive consequences for talking to investigators in this sector (Berg, 2004: 65; Gibbons, 1975).

In 'The American Worker' (1947), Romano used a diary to build a composite picture of the workplace based on observations and anecdotes. In addition to developing a 'bricolage' of empirical sources, I also chose to conduct interviews in a semi-structured way so they could provide as opportunities to elicit stories and situational detail (Rubin and Rubin, 2012: 97). Upon introducing consent forms to the participants, I took the opportunity to introduce the overarching themes of the study and signpost the broad trajectory of the interview (Holstein and Gubrium, 1995: 41). Drawing on a 'vignette' approach (Barter and Renold, 1999) and sensitive to the principles underlying co-research inquiries, I began each interview by asking the participant to describe a typical day (drawing on Kolinko, 2002), including asking hypothetical questions (e.g. 'What happens if…') and clarifying details. I treated this as my "essential question" (Berg, 2004: 85) which anchored the interview by allowing the participant to verbally

‘show’ me around the workplace during a normal working day (Rubin and Rubin, 2012: 116). Subsequently, I allowed the interviews to flow quite freely, adopting a friendly and responsive style which took the participants’ ideas seriously (ibid.: 36, 38). Occasionally I offered some of my own knowledge and anecdotes relating to the sector to encourage elaboration on context to encourage participants to elaborate on context as well as their own attitudes and beliefs (Holstein and Gubrium, 1995: 45), but I was mindful to merely ‘echo’ participants when they were talking in-depth (Berg, 2004: 109). Although the interviews were all semi-structured, I did draw on Berg’s advice by keeping an interview schedule to hand to ensure the interviews did not skip any relevant areas of discussion (ibid.: 84). What follows is a set of descriptions of the various labour processes, generally reflecting the ‘typical day’ structure but with extra information pertaining to the technical organization of aspects such as performance tracking where necessary. In line with my agreement with participants, all names have been changed.

Cases

Supermarket distribution centre, Greater London (Lorenzo)

Among the industrial parks of the Heathrow service area, a food distribution centre works on behalf of a national supermarket to sort and send food to stores across London. I speak to Lorenzo, a ‘picker-packer’, whose job involves moving stock from large pallets to cages which will be delivered to supermarkets. His day begins with a text message, prior to the start of the shift, which tells him whether the shift is confirmed or cancelled based on his productivity the previous day. The shift begins in the briefing area, where a shopfloor manager tells a group of around eighty employees the day’s targets and delivers feedback (often somewhat forcefully) on the previous day’s performance figures. Paid time begins when employees receive a ‘watch’ — a

Motorola WT4000 wearable device strapped to the forearm (Figure 1) — and scan a barcode to clock in in the briefing area.

Figure 1. Motorola WT4000 series wearable terminal with ring scanner. Source: Lorenzo (with permission).

Having clocked in, employees type a personal four-digital code into the watch and are allocated either the 'chilled' or 'produce' section. The chilled section is kept between zero and two degrees Celsius, and the produce section around ten degrees Celsius. Lorenzo explains that work in either section can be described as hostile due to the cold. Work takes place on one of six 'grids' (Figure 2), each designated by a certain produce type. Produce will often involve carrying large boxes of vegetables, whereas 'small items' work will involve packing produce like sandwiches and yoghurts. Lorenzo tells me the division of produce often tends to inspire a gendered division among workers.[72]

[72] In the first instance this tends to lead to men taking on the heavier work, but Lorenzo did also note that some workers try to assert a 'men only' rule in the meat grid regardless of the actual physicality involved in handling meat.

On entering the allocated work section, shopfloor managers[73] tell the workers which pallets are ready.[74]

Figure 2. A ‘grid’ lined with cages at Greater London supermarket distribution centre.

Source: Lorenzo (with permission).

The shift is made up of ‘assignments’. Each assignment involves being allocated a pallet, scanning the pallet, moving the pallet using your assigned

[73] There are four supervisors, or ‘shop floor managers’, on the floor. They are located between the grids and pallets.

[74] The pallets having been sorted by the employees working on ‘breakdown’ in the Goods In section.

trolley, and unloading items from the pallet into cages along the grid (Figure 3). Each cage corresponds to a particular destination, and the aisle along the grid is around 100m in distance. Once cages are full, workers from the Goods Out section will move them to shipping bays, but picker-packers must bring new cages to the grid (for which they will be given a set amount of time). Pallets can contain anything from one (large) to 500 (small) items, and often weigh around 600-700kg. Sometimes it can be the case that although a pallet is physically 'ready' it cannot be electronically 'received' by the picker-packer because it has not been registered into the database yet, causing a detrimental effect on the productivity rate.

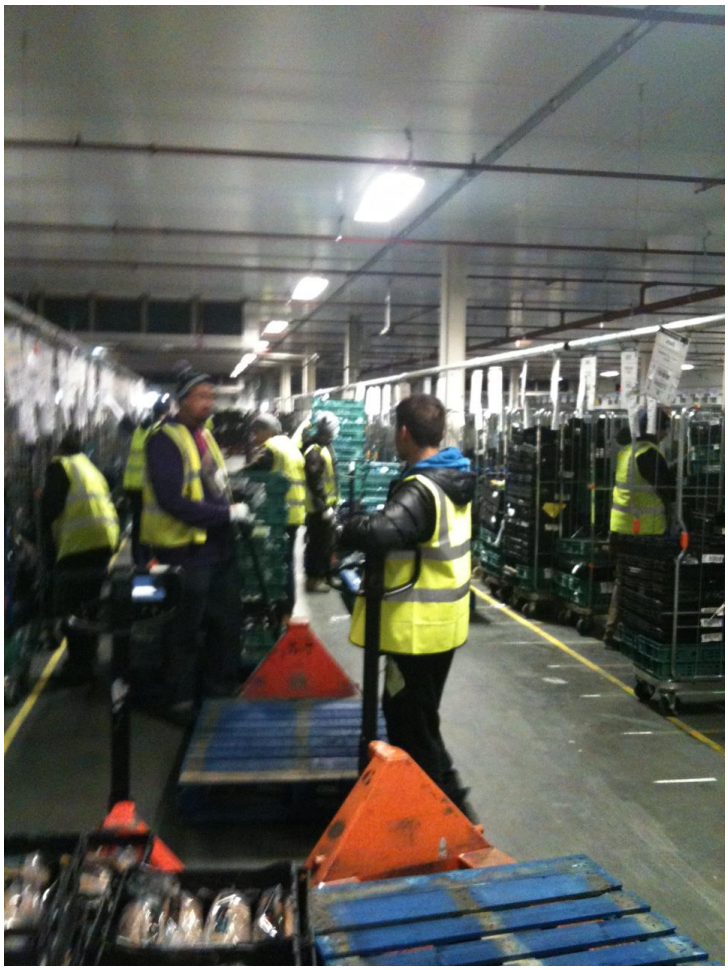


Figure 3. Workers returning pallets at Greater London supermarket distribution centre.

Source: Lorenzo (with permission).

The watch contains a screen interface, a number pad, and a barcode scanner which is clipped onto the end of the index finger. Once workers have a pallet, the watch will tell them where to go (i.e. which cage) and which items to transfer. This involves scanning both the cage and item each time, and 'confirming' receipt of the item via the buttons, which adds to the physicality of the work.

> [The watch] is sort of heavy, it's like maybe, I don't know, 400 grams or something? Which doesn't seem too much, but if you've got every day and you have to like.. I mean, how many times, you could calculate.. 200 items per hour, but that's like, let's say, 1600 per shift, and for each item you have to look at it like at least.. So you make this kind of hand movement about 4000 times or something. So, and you've got the scanner combination, you've got the scanner on the finger, so you basically use your finger to kind of operate the scanner.

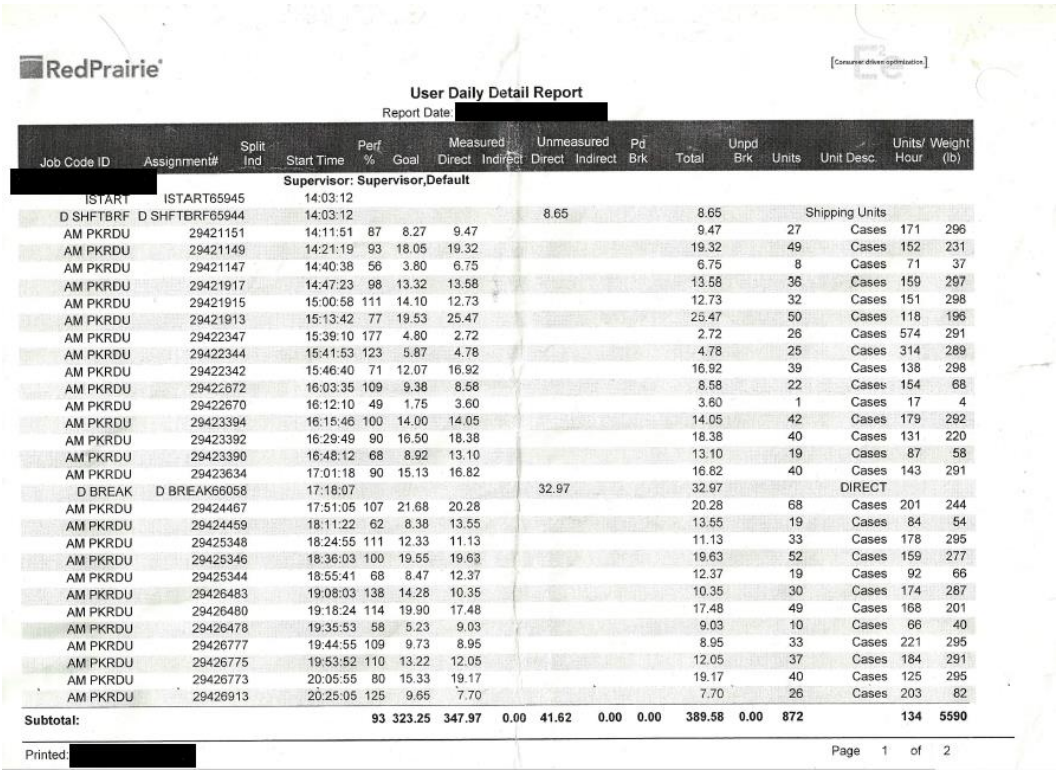
A Motorola (2008) specification sheet states the wearable terminal with strap weighs either 391.2g or 440.7g depending on whether the terminal features an extended battery. Through the scanning of items, managers compile records of the workers' productivity rates both per assignment (pallet) and across the shift. Two main figures are communicated to workers: a percentage figure based on the company's hourly pick targets, and a cases per minute (CPM) rate. In addition to the text message and briefing room session, there are several ways for workers to be informed of their productivity rate:

> One is a person [supervisor] of the temp agency — this doesn't apply for the permanent workers — comes along and picks out people who are too slow and they show them a print out, they show them a print out which shows, let's say, up to the last half an hour what your pick rate was, and if it's, let's say, below ninety percent or something they say you have to work a bit harder. (Figure 4)

> The third way was, or temporarily is, a screen inside the warehouse. So they have screens where you can, at the end of the grid, when you return, you can see your own code and the percentage. The problem that they have with that is that workers (laughs) were standing there for about five minutes, you know, to wait for their number to come up and they had always like a commotion in front of these screens, so they abolished them again.[75] … They were like in the airport where you like wait for your kind of you know number to come up…maybe they had like ten codes on there and there are like eighty people.

Another method exists in the unauthorized use of the supervisors' computer, which I will discuss further in Chapter 5. There is one break per shift, which must be clocked on and off using the scanner. Workers are released for breaks ten at a time, which can cause delays. Lorenzo explains there can also be delays of up to an hour at the end of a shift because workers must stay until their pallets are finished. At the end of the day, workers scan off the grid and clock out, ending paid time, and then return the wristwatch to a supervisor.

[75] Lorenzo clarified the screens were used for six months before being switched off, with supervisors citing health and safety reasons. They were later switched back on, but no reason was given.



RedPrairie

[Consumer driven optimization]

User Daily Detail Report

Report Date: [redacted]

Job Code ID	Assignment#	Split Ind	Start Time	Perf %	Goal	Measured Direct	Measured Indirect	Unmeasured Direct	Unmeasured Indirect	Pd Brk	Total	Unpd Brk	Units	Unit Desc.	Units/ Hour	Weight (lb)
[redacted]			Supervisor: Supervisor,Default													
ISTART	ISTART65945		14:03:12													
D SHFTBRF	D SHFTBRF65944		14:03:12					8.65			8.65			Shipping Units		
AM PKRDU	29421151		14:11:51	87	8.27	9.47					9.47		27	Cases	171	296
AM PKRDU	29421149		14:21:19	93	18.05	19.32					19.32		49	Cases	152	231
AM PKRDU	29421147		14:40:38	56	3.80	6.75					6.75		8	Cases	71	37
AM PKRDU	29421917		14:47:23	98	13.32	13.58					13.58		36	Cases	159	297
AM PKRDU	29421915		15:00:58	111	14.10	12.73					12.73		32	Cases	151	298
AM PKRDU	29421913		15:13:42	77	19.53	25.47					25.47		50	Cases	118	196
AM PKRDU	29422347		15:39:10	177	4.80	2.72					2.72		26	Cases	574	291
AM PKRDU	29422344		15:41:53	123	5.87	4.78					4.78		25	Cases	314	289
AM PKRDU	29422342		15:46:40	71	12.07	16.92					16.92		39	Cases	138	298
AM PKRDU	29422672		16:03:35	109	9.38	8.58					8.58		22	Cases	154	68
AM PKRDU	29422670		16:12:10	49	1.75	3.60					3.60		1	Cases	17	4
AM PKRDU	29423394		16:15:46	100	14.00	14.05					14.05		42	Cases	179	292
AM PKRDU	29423392		16:29:49	90	16.50	18.38					18.38		40	Cases	131	220
AM PKRDU	29423390		16:48:12	68	8.92	13.10					13.10		19	Cases	87	58
AM PKRDU	29423634		17:01:18	90	15.13	16.82					16.82		40	Cases	143	291
D BREAK	D BREAK66058		17:18:07					32.97			32.97			DIRECT		
AM PKRDU	29424467		17:51:05	107	21.68	20.28					20.28		68	Cases	201	244
AM PKRDU	29424459		18:11:22	62	8.38	13.55					13.55		19	Cases	84	54
AM PKRDU	29425348		18:24:55	111	12.33	11.13					11.13		33	Cases	178	295
AM PKRDU	29425346		18:36:03	100	19.55	19.63					19.63		52	Cases	159	277
AM PKRDU	29425344		18:55:41	68	8.47	12.37					12.37		19	Cases	92	66
AM PKRDU	29426483		19:08:03	138	14.28	10.35					10.35		30	Cases	174	287
AM PKRDU	29426480		19:18:24	114	19.90	17.48					17.48		49	Cases	168	201
AM PKRDU	29426478		19:35:53	58	5.23	9.03					9.03		10	Cases	66	40
AM PKRDU	29426777		19:44:55	109	9.73	8.95					8.95		33	Cases	221	295
AM PKRDU	29426775		19:53:52	110	13.22	12.05					12.05		37	Cases	184	291
AM PKRDU	29426773		20:05:55	80	15.33	19.17					19.17		40	Cases	125	295
AM PKRDU	29426913		20:25:05	125	9.65	7.70					7.70		26	Cases	203	82
Subtotal:				**93**	**323.25**	**347.97**	**0.00**	**41.62**	**0.00**	**0.00**	**389.58**	**0.00**	**872**		**134**	**5590**

Printed: [redacted]

Page 1 of 2

Figure 4. Productivity print out, Greater London supermarket distribution centre.

Source: Lorenzo (with permission).

Amazon fulfilment centre

On two tours of Amazon's LTN2 fulfilment centre, I was able to glimpse the basics of the labour process there. The tours follow the journey of a stock item, which gives you the chance to see different groups of workers. The centre is hot and noisy. Stock comes into the warehouse via a Goods In bay. 'Associates' shelve the items in the pick tower based on available space. Aisles are divided into stacks, stacks into bays, bays into shelves, and shelves into sections. The shelves are colour-coded, and each shelf section has its own barcode. The shelver scans the barcode on the item and the barcode on the shelf section, and the item is stored. Items are stored 'at random', in order to ensure shelvers and pickers need not walk further than necessary. Pickers are tasked with picking items from shelves and loading them into totes (plastic

boxes). Each picker uses a handheld scanning 'gun', which is attached to the wrist by a looped cord. Scan guns, a Motorola MC3000 model, are stored in a docking bay, with a screen showing how many guns are docked, in use, in repair, or unaccounted for at a given moment. The scan gun possesses a screen interface, which displays the next item to be picked and its location, as well as information about how many items have been picked, and "generally how you're doing" (in one tour guide's words). We were not given the chance to look at a scan gun on the tour, but a BBC Panorama (2013) investigation shows the gun's interface displaying the picker's individual pick rate and a timer. When a fellow 'tourist' asked what would happen if targets were not met, the tour leader said the company would try to find out if the employee needed to "receive more training" or be moved to another area, because targets are based on rates that have previously been achieved. Items ordered online are conveyed via a live database to scan guns across the distribution centre. The scan guns track where employees are within the picking spaces based on the last barcode they scanned. A Motorola (2009) specification sheet says the device "provides real-time wireless data exchange for maximum productivity." In principle, the database should allocate new orders to pickers who are within optimal distance of the item, ensuring both that the item is picked as soon as possible and that pickers do not have to travel great distances between picks.[76] Pickers walk to the location of the item as identified on the handheld screen, scan the item and shelf barcode, and place the item in a tote, which is on a trolley. After picking the item, the handheld scanner gives the picker instructions for the next order to be picked. A picker is unlikely to pick a whole order, but rather items from across multiple orders. A tote can fit around thirty items, depending on size. Full totes are placed on a conveyor by the picker.

[76] This is a form of waste reduction management inspired by Toyotist principles, as are many aspects of the Amazon management system.

Once conveyed, totes arrive at sorting stations. The sorter takes the tote from the conveyor and scans each item, checking the quality. A screen display tells the sorter where to put the item on a trolley. Each sorter has a trolley, which is divided into shelves (such as A-F), which are divided into shelf-sections (such as 1-8). Each shelf-section is a separate order. The sorted trolleys are wheeled a short distance to a parallel set of packing stations. At the packing station the packer will start at A1, taking the items and scanning them. A screen display will tell the packer which cardboard box to use, while a sticker printer will print a barcode label. The screen also tells the packer their productivity rate measured in items per hour (Panorama, 2013). The packer makes the box, packs the item, and if necessary puts brown paper into the box to protect the item. Once the box is filled, the packer enters the box code onto a tape machine, which dispenses the correct amount of tape for that box. Lastly, the barcode label is put onto the box. The package is placed by the packer onto a conveyor. The conveyor takes the parcel to the SLAM ('scan label, apply manifest') machine. In seconds, the SLAM machine weighs the item to make sure it is likely to be the correct order, scans the packing barcode, prints a sticker label with the customer's address and puts the label on the parcel. Incorrect items are conveyed to one side — likely causes are either incorrect orders or too much brown paper cushioning in the box. Correct items are conveyed onto the last conveyor. The final conveyor, like all the others in the centre, is made of rolling cylinders rather than a belt. On this one, red blocks shuttle from side to side. As parcels come down the conveyor, the shuttles move to push the parcel off the conveyor down the correct chute into the appropriate loading bay, based on the courier. Associates then stack the parcels on pallets (big items around the edge, small in the middle) before wrapping them in cling film. The pallets are loaded onto lorries to distribution centres, where they are posted to customers.

As noted on the company's operations website, each day the management team takes part in a gemba walk (inspired by the kaizen management

philosophy), which the general manager and heads of departments all attend. “They stop at each of the key processes (dock, receive, stow, pick, pack and ship) to review the top issues in the area. This helps the leadership team to understand what associates are working on and allows the teams to highlight any support they need” (Amazon Operations, n.d.). Cleaning is happening all the time, but the entire centre stops processing orders for one hour each day to allow machine maintenance to take place. The operation also appears to be paused while workers file into the canteen. The announcement of the break was the first point at which workers were seen together; there are around 300 associates on shift at normal (off-season) times, but they appear to work alone unless they are based in the Goods Out bay, which is the only place I observed associate-level staff talking to each other. Meanwhile, the forces of management are present in a number of ways. At their least prominent, there are notices around the centre with health and safety advice, instructions or allusions to the company’s continuous improvement ethos, and television screens on the ground level of the centre displaying a slideshow of three slides: a health and safety instruction, a short clip of an associate performing a task related to that area of the centre (e.g. packing a box), and a message relating to Amazon’s fundraising, charity or community achievements. More conspicuously, in the middle of the ground level there is a security area with desks and overhead monitors, and a human resources ‘help centre’. Supervisors appear to wear differently coloured high-vis vests and seem to group together. The managerial hand also appears in the canteen, where organized fun/theme days occasionally occur, and employees are encouraged to post their hobbies and interests on one board, and their workplace crushes on another.

E-commerce distribution centre, Yorkshire (Elaine)

A distribution centre in Yorkshire covers the area of approximately five football pitches and is three storeys high. It serves the global distribution centre for an

e-commerce site specializing in clothing and employs a large number of people from the local area, which was deindustrialized through the 1980s and 1990s. The retail website is the umbrella company, which handles marketing and purchases on its website, but the fulfilment of orders at the distribution centre is overseen by a logistics firm that runs the warehouse and oversees staffing. Elaine, a local trade union organizer, estimates around half the staff are employed by an agency, with the other half employed by the logistics company. Employees of the logistics company are employed on 'flex' contracts, meaning employees' working hours may be extended or reduced depending on company needs but they remain paid at a constant salary rate.

When arriving on-site, workers go through security checks. The basic check involves guards using security wands, but workers also press a 'randomizer' which allocates people for one of two levels of more detailed search. Personal items are placed in lockers, and then workers clock in by swiping an employee card, beginning the paid portion of the shift. Workers are allocated to either Goods In or Goods Out. In Goods In, stock from HGV loading bays is unpacked and sorted for storage at a rate of sixty-five items per hour. In Goods Out, workers are given a 'gun' (also known as a 'controller'), which houses a barcode scanner, a digital interface and a wrist strap. The interface tells the employee what to pick and where to find the item. The pick line is laid out in what is described as a 'snake' (Elaine gesticulates with an 'S' shape), which is designed to prevent congestion because in principle workers should start at one end and come out the other, repeating this route throughout the shift.

The 'gun' also records the employee's pick rate, showing the worker a number. Elaine tells me the target is 185 items per hour, but targets are not fixed or regulated. Workers' average pick rates are calculated for the whole time they are clocked in, including toilet breaks. "Downtime" is monitored by team leaders via the handset, who are responsible for disciplining workers who fail to reach their targets. Team leaders and section leaders comprise the

supervisory layer within the warehouse, with managers above them. Other staff include security guards who operate a 'stop-and-search' policy and monitor "both visible and hidden" CCTV (XPO Logistics, 2016).

The warehouse appears to run a lean model based on the demand of the retail website. This means targets can fluctuate significantly, and historically employees have often had very little notice when their shift has been "flexed up" or "flexed down", with instructions sent via SMS to workers' mobile phones, but following a trade union initiative, workers are now given twenty-four hours' notice of shift times.

E-commerce distribution centre, Hertfordshire (José)

José applied via an agency to work for a prominent e-commerce company as a Christmas temporary worker in one of its distribution centres. He was successful and began working as a packer about eight weeks before Christmas. Personal items were not allowed on the distribution centre floor, so he would begin a typical day by leaving his personal possessions in a locker, before walking to the briefing area and logging in with an electronic pass card. The briefing area contained large screens with a PowerPoint showing health and safety information, canteen offers, and other information such as rules. At the briefing, which usually lasted four or five minutes, supervisors would tell workers the group targets, make them aware of any company messages, and occasionally announce novelties such as free pizza being provided at breaks or prizes for the most productive workers. José describes a wall with workers' names and photographs, assigning each of them to a workstation:

> There are eight lines, and you've got in this line twenty-six workstations, and you are to see yourself and your picture and then it says if you are singles or multis at the side, so they tell you, 'Line two. Workstation ten. Multis'.

Workers would be assigned ‘singles’ or ‘multis’, referring to whether they will be packing one item per package or multiple items. ‘Singles’ carried a productivity target of 102 items per hour, whereas for ‘multis’ workers would be expected to achieve 182 items per hour. José would move to his assigned workstation and scan his pass card. The workstation’s monitor would check his name and then ask him to check the workstation is clean and stocked with unmade boxes. Either the workstation would be ready or he would need to do further preparation, in which case he would follow instructions on the screen advising him on making sure the workstation is ready. Once ready, the shift could begin; José stood at the screen and it instructed him to scan the barcodes of a tote or a moveable ‘wall’ containing segmented shelves with a scanner which is attached to the workstation. There were supposed to be two barcodes per wall but often they had been removed and not fixed. José would scan items from the wall or tote, check the screen’s instructions, assemble the correct box and put the item(s) in, before placing the package on a conveyor belt that runs alongside the workstations at all times.

Sometimes the conveyor would get jammed and switch off, in which case José was told to pile boxes on the floor beside him until it was moving again in order to maintain his productivity rate, which was being measured by the workstation scanner, but he tells me sometimes people would take the opportunity to log out and go to the toilet, or they would just take a short break despite the productivity calculation. José would continue scanning and packing until everything from the wall had been packed. At this point, there is supposed to be a new wall ready, but José said it was not always the case, which would mean waiting around. Across his shift, José had two breaks of thirty minutes each. Originally, he says, everyone went at the same time, but then the company began to stagger them. Breaks meant José would sign out of the workstation computer and leave the warehouse floor through metal detector security gates in order to get to the canteen, doing the opposite on the way back.

The monitor José used showed him details of whichever item he was handling, as well as the necessary box. It did not show his productivity, but both the company and the temp agency had supervisors on the warehouse floor at different supervisor 'stations'. There were also security stations with large monitors showing CCTV. The team leaders, who work for the agency, would go to workers at the packing workstations and tell them their productivity based on a print-out. José once asked how he could check his own productivity, but he was told he could only ask a supervisor for it. Workers were told that the most productive temp workers could win a contract with the company, but José was not offered a permanent contract.[77]

Online supermarket distribution centre, Sussex (Todd)

Todd works as a 'shopper' as part of the online shopping department at a major supermarket. Based in a normal store which is closed from 11pm to 7am, Todd begins work at 4am and finishes at 10am. His job is to collect items from shelves; these will be compiled into full shopping orders to be delivered to customers' homes. When Todd arrives, he attends a team meeting in the empty loading area, where information will be relayed to workers, results of 'secret shoppers',[78] or managers will use the time to motivate workers (either positively or negatively). It is a new feature; team meetings used to occur once a week in the training room in much smaller groups. After the meeting Todd takes a handheld scanner from a shelf and logs into it. It gives him a 'shop' and he goes to the starting point with a special trolley which holds eight boxes. Each box corresponds to an individual customer, but generally Todd will not collect one customer's entire order — instead, on each shop he will pick a

[77] But on his last day he was offered a Snickers and a Fanta.

[78] The 'secret shopper' is a research tool used by companies to see whether their employees are adhering to customer service rules or guidance.

portion of eight customers' orders, and the full orders will be compiled after he has taken his full trolley to the rear-of-house warehouse.

The scanner shows one item at a time on a screen with its precise location, and after each item is picked the next item on the interface will be the next closest item. If an item is in its location, it is Todd's responsibility to locate it. In the case of an item being sold out, Todd makes an appropriate substitution. After scanning the item, a different screen appears which tells Todd where to put the item on the trolley. It used to be the case that a trolley may fill up before the shop had finished, but since the introduction of a "new system" products are weighed and measured, and shops are calculated to incorporate the spatial aspects of transporting the products on the trolley. If there is not enough room in a box for the specified product, Todd presses an on-screen options button followed by an 'item will not fit' button, which will cancel from the shop any comparable or larger items which had been intended for that box.

When Todd has filled his trolley, he takes it to the loading area where boxes are put in rows to be loaded into particular vans. It is a busy area; while there are between twenty and forty shoppers on shift working front-of-house (as well as a full team of shelvers), there are generally only five or six team members sorting boxes for the vans, and even fewer actually loading them into the vans (of which there are generally around twelve). Supervision is carried out by two shop-side team leaders, a manager for the tote sorters, a manager and team leader for the vans, two overall managers, and the head of the store. Store security begins at 7am or 8am.

Todd's performance is measured based on items picked per hour (IPH). His target used to be 115, but since the new system was brought in it has increased to 125. The new system involves streamlining measures which have led to more densely packed (and therefore heavier) trolleys. In the past, a particularly large shop would be around 120 items, and normal shops would often have

half-full boxes after the shop had been completed, but he says now it is “not uncommon to see a 200-item shop where literally the whole box will be full up”. There is nothing on Todd’s scanner to tell him whether he is reaching his target, but team leaders have access to live IPHs on a computer and will usually tell workers if they are not performing well enough.

At the end of a shift it is common for team leaders to ask shoppers to stay on longer if they are part-way through a shop, but with the new system it is becoming more frequent that shops will be finished before the end of the shift, in which case Todd is asked to help the shelving team.

Online supermarket delivery, Greater London (Lorenzo)

Some time after our interview about the supermarket distribution centre, I received an email from Lorenzo telling me he had a new job and asking if I would like to talk to him about it. He now works as a driver for a large supermarket chain, home-delivering grocery shopping bought online. Lorenzo tells me there are two types of distribution centre where orders are fulfilled before being loaded for delivery — superstores with ‘shoppers’ who pick customers’ items from normal supermarket shelves, and specialized warehouses, which are not available to the public. Lorenzo works at the latter type. He says it employs around 1400 workers, including around 600 drivers, though not at the same time because shoppers in particular often work part-time (Lorenzo guesses there are around 200 shoppers in the warehouse at a given time). He estimates around fifty percent of the drivers are BAME, mostly southern Asian or Afro-Caribbean, and around ten percent are eastern European. Drivers are generally employed as permanent staff but some work through an agency. He observes that shoppers work with handheld devices up and down aisles, putting items into totes. Conveyors ultimately take the items to the loading bay where loaders fill up the van sequentially. As a driver, Lorenzo collects the van from the loading yard after it is loaded, and he says

there are generally no mistakes with how the vans have been filled. He does not have an allocated delivery area, but he is generally confined to the same geographic ‘quarter’ of London, servicing the area about fifteen miles each way from the distribution centre.

Lorenzo works in two four-hour blocks with a break in between. His work revolves around using a handheld device similar to those used by postal workers and couriers. The device incorporates sat-nav, customer orders, a scanner and a mobile phone. Lorenzo tells me there used to be different devices, but workers asked for an integrated machine. Most of the time he relies on the sat-nav, which was difficult at first. He puts the customer details into the sat-nav and it gives him traffic updates and the route. The sat-nav is “intelligent” — Lorenzo says drivers are encouraged to take a “better” route if they know one so the sat-nav will “learn”. The sat-nav usually works, but occasionally creates problems if there are highway regulations such as where carriageways have been narrowed to prevent large vehicles. In addition to the device, drivers have a paper manifest so they can still carry out the job if the machine fails (including taking signatures). Each four-hour block will generally take Lorenzo to between four and ten customers, up to a maximum of twenty in a full two-block shift.

Lorenzo (generally) follows the sat-nav to the customer’s door, but it can be hard to find addresses on built-up estates. He does not have to scan totes out of the van, but the totes have labels and the sheet will say how many totes a customer has. At the customer’s house the device is mostly used to collect a signature, but if the customer is unhappy about an item Lorenzo scans the item to take it off the bill, which will credit the customer’s online account. The customer is allowed to keep the item; it is left to the driver’s discretion. The device can also be used as a phone to speak to a call centre in case there is a delay, in the event a customer is not home, or in situations where there is a balance left to pay on an order, but Lorenzo says he only ever uses his private

phone because the device does not allow him to access customer details while he is on a call. He says drivers actually tend to rely on their own phones “to an extent” because it can also be better to use Google Maps than the device’s sat-nav. He has to carry the totes into the customer’s kitchen and sometimes tries to make conversation.

After four hours he is expected back at the yard (including for lunch), but he is not expected to return before the four hours are up, even if he did not need the full amount of time to complete the orders. Sometimes productivity can be as low as three customers in four hours, in which case he can take long breaks sitting in the van as long as he does not leave the route, but sometimes there are days when he will struggle to finish inside four hours. If drivers are left with spare time between deliveries, they are encouraged to call customers to see if they would like their delivery sooner, but each customer has a delivery time-slot, drivers are not allowed to turn up early unannounced, and there has to be an allowance for travel disruption, so the schedule tends to be fairly generous. Lorenzo says there is generally little time pressure put on workers, such as targets, but the reception desk will use positive encouragement to try to get workers to take an extra lot of orders on their van if there are driver shortages and they have room.

> You can say like, ‘No I don’t want a double.’ They encourage you and the guys at the desk, they are really good at the, ‘Eh brother, you can do it!’ Y’know?

Lorenzo says drivers can refuse to take extra loads, but they will be paid overtime if it is needed to finish orders, there are no penalties for being late, and the length of their breaks will not be affected. It took Lorenzo about a month to realize this, and he said until that point he found the job quite stressful because he was always rushing to be on time while trying to get used to the sat-nav and unfamiliar parts of the city. Sometimes the job can still be stressful

due to the physicality and if driving conditions are poor, but now he says on a good day the job can be enjoyable:

> On a good day it's a bit of this, kind of, 'masculine freedom'. You're driving, you listen to some music, you drive through areas of London you haven't seen, you're going through some estates, there's a kind of easiness about it.

He also enjoys meeting the wide range of customers, and says it is interesting to see how different people live and eat.

> You go to some people and you feel like you assist someone to commit suicide because basically they don't eat and just drink…and then you go to people with like three servants.

But customers form the main source of sociality, and Lorenzo says:

> I never had a job where I talk less.

He often talks hands-free to friends as he drives, and he sometimes chats to other drivers he sees at the beginning and end of shifts, in town or in the canteen, but he says even after six months he probably only knows about twenty of the 600 drivers. In terms of supervision, Lorenzo says he did not see a manager for the first three months; he was only introduced to one following a complaint in which a customer complained Lorenzo had not been apologetic enough about a case of late-running:

> He said, 'Yeah okay, these things happen, but you always have to smile.'

Lorenzo is aware his work record is kept on file. He says he once scratched a bus and had to have a return-to-work meeting when he was ill for four days within six months ("that's over the three percent mark"). But minor misdemeanours like lateness do not seem to be a big problem, as long as drivers call in to the call centre on-route and, above all, they do not leave the route. While some deviations are permitted (such as "better" routes), workers are informed their movements are monitored for location (via the vehicle's GPS and front-facing CCTV), speeding and things like sharp braking (measured using a telematics box).

E-commerce delivery platform, Greater London (José)

After he stopped working as a warehouse packer, José began driving for a delivery platform that connects him to nearby e-commerce warehouses via a smartphone app. After downloading the app, he filled out his data, driving licence information and bank details. He waited ten days for a background check and then received an email saying his application had been activated. He has access to sixteen training videos through the app. The app advertises time slots when he can take his car to the warehouse and pick up parcels for delivery, generally either the same day or the next day. Once he has assigned himself to a slot the app tells him when he can check in at the warehouse. When he arrives on-site he checks in up to fifteen minutes before the shift is scheduled to begin by giving his name, and he is given a double-decker trolley filled with parcels. He takes the trolley to his car and scans the parcels off the trolley with the app using the camera on his phone. José says you are generally expected to take as many parcels as will fit, a normal amount being around forty, after which he tells an employee how many parcels he has taken.

The shift begins with a swipe of the app. José follows the GPS built into the app — he is not allowed to use an alternative GPS app — which can cause problems as it tends to be less reliable than some other apps. This is an

important issue because for José to make the delivery (or make an attempted delivery) his app has to know he is in the right place. If it thinks he is at the wrong location, he has to call a support line where an operative will recalibrate his location. Attempted deliveries tend to get returned to the warehouse; the company generally asks drivers to try to leave parcels with neighbours, but José says it is not always practical in the time frame.

José is paid for a four-hour slot, in which time he can usually deliver thirty-five to forty-five parcels. If he has not completed all the deliveries in that time-frame, he has little option but to continue regardless, because if he logs out without having delivered all the parcels the app may not pay him. On the other hand, if José finishes all his deliveries early he still gets paid for the full four hours. Apart from the training videos, José receives little in the way of supervision — he mentions just an occasional email with things drivers should not do (and which may cause them to be terminated). He sees other drivers at the warehouse because they queue in two lines, but says there is not much time to talk and the starting hours differ day to day.

Food delivery platform, south coast (Jamie and Noah)

> It's an automated food delivery service without the automation. (Jamie)

Workers of a food delivery platform at a southern coastal town are formally self-employed, like others who make deliveries on behalf of the 'gig economy' platform company. Workers join the platform with a very basic telephone interview, after which they have an induction with a 'lead rider'. Following a basic online test,[79] they go to the zone office to have the app (which is not publicly available) installed on their smartphone. When signing up for the role,

[79] Questions range from 'Do you wash your hands after you go to the toilet?' to 'You come to a red traffic light. Do you a) stop or b) go?' Respondents who fail can take unlimited resits.

workers are informed they will be expected to work both a Friday and Saturday of the same weekend twice a month.

I speak to Jamie and Noah, a recent graduate and a university student who have been working for the platform as cyclists. Before work, Jamie and Noah endeavour to leave their other jobs early, go home to make sure their mobile phones and riding accessories are fully charged, and turn the app on as soon as they leave the house again. A shift begins whenever the worker logs into the app and marks themselves 'available'. When I speak to Jamie and Noah, the company is testing a feature called Pulse with some riders, which tells the rider if demand is low, normal or high, and offers the riders a graph of order demand. Although the feature is in a beta phase, both informants point out it has aroused some cynicism and suspicion among riders about its accuracy.

The app starts scanning for orders as soon as the rider has marked themselves available, refreshing every twelve seconds. An embedded map is featured, displaying directions to the 'zone centre'. The zone centre is a designated spot in the town centre for workers to wait for orders. Jamie and Noah tell me the company's chosen zone centre led to riders being asked to leave by a nearby business, so they have informally created a new meeting point. However, most workers do not use the zone centre (especially if they live in the town centre already), and there is a different assembly point for 'peds' (moped riders who work for the platform) because of local traffic rules. Zones can cover either an entire metropolitan area (as in this case) or a section of a city.

Workers in this zone earn £4 per drop, though there are different pay models across the country and continent. Each 'drop' involves a new order being allocated to a rider via the app. Once the worker accepts, they must make their way to the restaurant, collect the order, and take it to the customer. The app offers a map and directions to the restaurant and customer, but I am told riders prefer to rely on their knowledge of the area. If the worker does not accept,

they are issued an ‘unassigned’ penalty. They can have up to ten percent unassigned before they attract the attention of managers.

If there is a problem with a drop, such as a puncture or having a crash, the rider has to call the managers in the zone office, who will communicate with the restaurant and/or customer and give the rider an unassigned penalty. The app also contains a link to an 0800 number, which will connect to the customer in the event they cannot find an address.[80]

In the zone I investigated, there are two zone managers and, Jamie and Noah estimate, between 300 and 600 riders. Workers do not have access to the staff numbers, but they tell me there has been a surge in new riders due to a recent recruitment drive, which has led to more workers quitting due to there being less work to go around. The two types of riders (cyclists and ‘peds’ — moped riders) expect different performance rates. For a cyclist, averaging four drops per hour is an achievement, but peds can hit higher numbers of drops. Jamie and Noah say that at the time of the interview, ten drops per shift is good for cyclists, but for peds the figure is more like fifty or sixty.[81] Some cyclists put this down to the way orders are allocated to riders, the process of which is the source of speculation to workers. In particular, peds tend to reach higher drop rates by picking up a greater number of ‘doubles’ and ‘triples’, where multiple customers’ orders will be picked up from the same restaurant at the same time, meaning they can earn £8 or £12 for a single collection.

The app monitors where the rider is via GPS, and their location is made available to both the restaurant and the customer. When the drop is complete, the app will usually allocate a new drop within a reasonable distance, which

[80] In the UK an 0800 number is free to call from a landline, and typically either low-cost or free from a mobile.

[81] It should be noted that although moped riders do have higher hourly averages, they also tend to work longer shifts than cyclists.

can lead to riders staying in one area of the zone for most of the shift. Cyclists' shifts tend to last two or three hours, with riders logging out of the app when they choose (at busy times by using a feature on the app, 'make this my last order'), because if their drop rate dips it will bring down their hourly average (which is recorded in the app). During peak hours riders often take risks in order to earn a higher hourly wage.

> The peak period is concentrated… So on Friday night, I'd be sitting at the zone centre, and your phone bings, and like, right this is the start and I have to cycle as many miles as I can before 9.30, and then the money stops…that was the situation on Friday, it just all dried up for cyclists at 9.30, but you know, like I've got, say, two hours to absolutely bust my balls and cycle the most amount of miles for the most amount of money. (Noah)

On finishing work, some workers will congregate in zone central to compare stats using the 'My Deliveries' (i.e. order history) feature of the app. Most riders will just go home, but the process of assessing stats post-shift is a common experience.

> There's this constant problem where you'll come in from a shift and probably about seventy to eighty percent of the time you'll do the calculations and you'll be really disappointed, and that's kind of a horrible moment, because they make it easier, they give you the My Deliveries thing which shows you your deliveries per hour and if you see an hour with no deliveries in it, you're like, 'I literally didn't work for an entire hour.. I didn't make anything, I got zero per hour' and like that's just.. the app literally shows you your earning capacity, and I think it has a great demotivating capacity in a sense. (Jamie)

Once a week or less, workers are sent an email with a breakdown by the company. The emails vary — each of my informants received a different type of (semi-)regular email — but they tend to include some metrics, such as average hourly earnings, time to accept orders, time to restaurant and time to customer. It is not clear what the intended purpose of the email is, as the workers I spoke to say the metrics had never been brought up in their verbal communications with managers, which were already limited.

Technical composition in distribution

The purpose of describing work processes in this way is to gain a better sense of how work is organized and how workers interact with the labour process (and its technologies) in their daily activities. But as I stated in Chapter 1, the technical class composition of work also bears a relationship to political class composition, in that it is the terrain on which struggle occurs. As Kolinko (2002) states, the organization of work is "neither an accident nor the product of a master plan" — something that becomes more apparent in the following chapters. First, I summarize key aspects of the technical composition of algorithmic management, particularly at the interface between workers and management, which provide a route into thinking about its political character in Chapter 4, before I move on to an analysis of worker resistance in Chapter 5.

Tracking

Each of the cases is characterized by the presence of some form of performance tracking, typically involving a mobile personal computer (with the exception of José's Hertfordshire e-commerce distribution centre, where he used a scanner attached to a static personal workstation). In all the warehouse cases, tracking was carried out using a scanner device — either a 'gun' or a 'wristwatch'. Tracking was described primarily in terms of productivity rate

(such as items per hour), but with the exception of José (whose work required him to remain static), the workers' ability to carry out their work also had a spatial dimension, most commonly in terms the worker being told the location of their next task. This aspect was most significant in the work process described by Elaine, Todd and on the Amazon tours, because the worker's next task would be assigned on the basis of their last scanned location (Lorenzo, by contrast, was acting based on the products he scanned from his pallet). In the delivery jobs, the primary form of tracking was based on geographical location, measured by the GPS of their mobile phones, or in Lorenzo's case, the multi-purpose handset. As Lorenzo was driving a company van, he had further means of being tracked in the form of the van's telematics, CCTV and its own GPS. While Lorenzo's progress was tracked via a scanner (with a paper back-up copy), José, Jamie and Noah all recorded their progress via an app, through which José scanned items with his mobile phone's camera, and Jamie and Noah interact with buttons on the app. In terms of tracking, Jamie and Noah had an added temporal dimension to their performance measurement, in that restaurants and customers would be anticipating their arrival.

Evidence of tracking would be available to workers in different ways. BBC Panorama (2013) showed an Amazon picker's handset with a visible pick rate and countdown timer, but of the warehouse workers I spoke to only Lorenzo had any access to his own performance data — primarily in the form of a morning text message telling him whether the prior day's performance would award him another shift, but also in the form of the screens which were used intermittently at the edge of the grid. In all other cases, workers either had to ask for their productivity information or would only receive it verbally from a supervisor at their decision, generally if workers were underperforming. No one I spoke to knew how warehouse productivity targets were set, except that Elaine described them as "unregulated", whereas the Amazon tour guide said they were based on what the company knew to be achievable. At Todd's workplace the targets were increased with the introduction of a new 'system',

which he explained through the incorporation of new product-specific measurements. For the delivery workers, the clearest evidence came from their GPS map as they worked. For Lorenzo and José this was important because there were penalties for being in the wrong location, but otherwise their performance was not based on the ability to achieve a high productivity rate. Jamie and Noah, by contrast, were not penalized for taking alternative routes (although they would do so knowing their movements were visible to multiple parties), but did receive a weekly email with performance figures, as well as earnings calculations via the app. With the exception of Lorenzo and José's delivery jobs, target-based performance (whether productivity or delivery speed) is the basis of supervisory discipline, and in one case shift allocation. For Jamie and Noah, the combination of time-based performance and piece-work means riders often take risks on the road.

Transmission

Information transmission takes different forms for delivery workers and warehouse workers. Delivery workers interact with an app (or job-specific device) which connects to the company via GPS and mobile data signal (3G/4G). With the exception of José, warehouse workers interact with a handheld mobile device through scanning barcodes and selecting menu options, which transmits data via an in-built radio data terminal.[82] In both cases workers communicate with what repeatedly gets referred to as 'the system' (or more succinctly, 'it') — a computer database (or databases) that manages stock or order progress, tracks the work of employees, time-stamps activity, calculates performance, and assigns new tasks where necessary. In all cases except the static workstation and Lorenzo's pallet work, new tasks are assigned to the worker based on their most recent tracked location, whether the next

[82] In Rushton et al (2014), 'radio data terminal' is used synonymously with 'scanner'.

item to pick, the next food order to collect, the next parcel to deliver or the next route to follow.

As is apparent from Chapter 2's discussion of Taylor, the principle of individual productivity being calculated as tasks-per-time is by no means novel. However, three things are striking about the logistical media at the centre of the labour process in these cases. First, the continual streaming of work data in real-time: as long as the device is logged in, everything it does (including 'downtime') is transmitted from the worker to a database. Second, the spatial dimension. As Jesse LeCavalier (2016: 4) points out, "information can be moved incredibly fast but objects must still be moved"; it would be one thing to interpret the algorithm merely in its quantitative dimensions, but we can see that it does matter *how* a task is carried out, for example pickers not walking too far at Amazon or delivery riders being encouraged to cycle fast. To maintain control of these processes, logistical media are crucially locational (Rossiter, 2016: 4). Third, the persistence of opacity with regard to how 'the system' works: what it does or does not track, how it allocates work, how decisions are made, and what happens with the data. These are the primary elements of what I call 'management interfaces'.

Management interfaces

Real-time spatial tracking is to the performance era what time and motion was to the command era, in that it shapes workers' relation to work and to being managed. Real-time spatial tracking enables the intensification of work but exceeds the need for 'representation'; as I will demonstrate over the next two chapters, this can be both to management's advantage and disadvantage. But as Rossiter (2016: 6) notes, logistics is not simply about speeding processes up, but also about 'calibrating time' according to different factors and interests. Work process data is bound up within these calculations, which entails a necessary alignment of social relations — not just once or at regular intervals,

but in real-time. As Rushton et al (2014: 355) state: “The continuous measurement of performance is obviously essential to monitor process improvement”.

Central to the technical composition of algorithmic management in distribution work is the ongoing process of calibration, which implicates the location of goods, transmission of orders, means of transportation, management of space, and the actualization and management of labour power. One sense of a ‘management interface’ is the moment at which the control of labour is brought into calibration with other (quantifiable) logistical processes. Similar to Hookway’s (2014) notion of an interface as a set of relations which together produce an effect, the management interface occurs when the ‘unplannable’ element of labour is brought under sufficient “technical control” (Edwards, 1979: 112) to allow productive processes and capital accumulation to run with little turbulence, whether through the simple actualization of labour power within the agreements of the employment contract, or more drastic actions such as withdrawing shifts or ‘flexing’ working hours at short notice according to business needs.[83]

What is notable about these cases is that the management interface (as calibration) can occur with relatively little involvement from human managers. Instead, part of the supervisory burden is taken up by a personal (handheld) device, which relays instructions to workers and performance data back to ‘the system’ (either to be stored on databases or fed back into algorithms). But interactions with the device also represent a management interface, closer to Cramer and Fuller’s (2006: 150) description of an interface as

[83] Edwards (1979: 112) defines technical control as involving “designing machinery and planning the flow of work to minimize the problem of transforming labor power into labor as well as to maximize the purely physically based possibilities for achieving efficiencies.”

> the point of juncture between different bodies, hardware, software, users, and what they connect to or are part of. Interfaces describe, hide, and condition the asymmetry between the elements conjoined. The asymmetry of the powers of these bodies is what draws the elements together.

In this sense, the interface is both a meeting point and a threshold defined by asymmetry between parties.

These two perspectives of the 'interface' suggest different things about how labour is technically composed within the distribution process. As a 'moment', the management interface refers to how labour is calibrated in relation to other logistical processes (and by extension other labour processes), i.e. how it is managed as a necessary component of a logistical chain. 'Calibrated' here can entail timing, pace and movement across the workforce, as well as shift allocation.[84] As a 'place', management interface refers to how labour is managed as living labour, through instruction, tracking, targets and identification, i.e. pertaining to the balance of social forces. In this sense, the interface refers to issues of workers' cooperation, which is to say the actualization of labour power. The device itself contains a graphic user interface — this is not my interest here — but the device is interesting in the sense of its dual role 'in the interface' (a factor in an ongoing temporal alignment) and 'at the interface' (as a threshold between workers and 'the system'). As I discuss in the following chapters, this element of the technical composition of distribution work helps us understand the politics of algorithmic management.

[84] And, a wider study could argue, employment relations, social composition, etc.

Conclusion

Following Chapter 2's discussion of management theories in relation to algorithmic management, this chapter has begun to analyse the management of distribution work by introducing a series of cases at various points in the outbound distribution process. Following further discussion of the methodological approach, I have described the technical composition of a set of workplaces that share various aspects of 'algorithmic management'. From these cases I have drawn out three aspects for further discussion: tracking; the temporal, spatial and opaque features of 'the system'; and the idea of the 'management interfaces'. I have argued real-time spatial tracking helps us think about labour in two senses: as a logistical component, and as a social force. This has led me to consider two senses of 'interface' within the algorithmically-mediated labour process: interface as a moment of logistical calibration, and interface as a threshold or meeting point of asymmetric elements. Overall, this chapter has described the technical composition of distribution work in such a way that we may consider how the use of cybernetic and non-machinic components create a distinctive managerial effect. This will be the topic of Chapter 4, which discusses the political effects of algorithmic management, before arguing for the significance of the workplace resistance that exists in these workplaces in Chapter 5.

4. The Meaning of Algorithmic Management

couldn’t find my boss
so I stopped and did nothing
then my boss found me

Haikus About Crap Jobs (2016)

Introduction

Having situated algorithmic management within a history of management ideas and technologies in Chapter 2, and responding to the relevance of class composition analysis and the workers inquiry methodology established in Chapter 1, in Chapter 3 I began a class composition analysis of algorithmically-managed distribution work by describing the technical composition of a series of empirical cases. These cases showed the centrality of tracking and information transmission to the organization of work by algorithmic management, and I began to reflect on how these techniques affect the temporal and spatial aspects of work, while their internal workings, or logic, remain opaque to workers.

The starting point of this chapter is a basic recognition that algorithmic management is about more than just the rational organization of processes. In this sense, although the term 'algorithmic management' could invite a focus on the specificities of particular algorithms, an explanation of specific algorithms as technical artifacts would not necessarily assist a critical analysis of algorithmically-mediated work as a sociopolitical imaginary. Even if barriers of access could be overcome and sections of code could be obtained, it is not clear that we would find in them the hidden principles of algorithmic management, and certainly not ones with the explanatory power to account for the modes of organization and politics that lie beyond the point of algorithmic execution. As Nick Seaver (2018: 378) argues, "press on any algorithmic decision and you will find many human ones". This chapter therefore builds on antecedent chapters by enquiring into algorithmic management in terms of the effect an enhanced computational capability has upon the managerial operation as a social, political force. Specifically, I investigate what algorithmic management means for four elements of work: 1) labour demand, which I examine through a comparison of different approaches to bringing workers to the work process; 2) workflow, especially workers' experience of work and its

organization; 3) communication, in terms of codified device interactions, ongoing data tracking, and sociality between workers; 4) space, in terms of the organization of the workplace and work. I then build on these concerns by examining the effect of algorithmic management on authority in the workplace — or the effect of algorithmic management on management — not only in terms of the managerial use of an algorithmic management system, but also the types of managerial subjectivity it produces.

The chapter serves as an analysis of the politics of managerial power indicated by algorithmic management. It politicizes the technical composition found in distribution work by asking what the effect of algorithmic management techniques are on workers, as well as human supervisors, and through advancing an account of the forms of management instantiated by algorithmic management technologies such as handheld scanners. In doing so, this chapter sets out the political terrain of the algorithmically-managed distribution workplace in preparation for a discussion of workers' political agency in Chapter 5.

What algorithmic management means for work

In Chapter 3 I introduced a series of workplaces and roles which are subject to algorithmic management. In this section I examine four key effects of algorithmic management which rearrange aspects of work, particularly as felt by the worker, with consequences for the balance of political forces.

Labour demand

In their study of Uber, Rosenblat and Stark (2016: 3759) argue managerial strategies of "worker engagement" — i.e. the point at which workers are engaged in work — are predicated on "information and power asymmetries"

which empower the employer to “effect conditions of soft control” (sic). In Chapter 3’s cases this dynamic can be felt most firmly in the text messages reported by Lorenzo and Elaine at their respective distribution centres. At Lorenzo’s Greater London supermarket distribution centre, a text message is sent to tell workers whether their shift is confirmed or cancelled based on their productivity score on the previous day. While the supermarket distribution centre’s shift allocation system is based on agency workers being employed on zero-hour contracts, at Elaine’s Yorkshire e-commerce distribution centre, text messages tell workers whether their upcoming shift has been lengthened or shortened based on a contract stipulation which allows the company to make adjustments to shift times based on its need for labour. In both these cases, information and power asymmetries rooted in the workers’ employment contracts are leveraged at the expense of their economic security. However, cases situated in the ‘gig economy’ offer differing ‘worker engagement’ approaches to meeting their demand for labour, each of which has to account for the formal choice to work that exists in gig economy work.

The first — referred to here as Flex — is the tool used to match freelance drivers such as José to package collection slots. Flex drivers use an app to accept requests to collect parcels from an e-commerce warehouse depot at an advertised time, after which the app is used in conjunction with the smartphone to track the delivery route using GPS and record the delivery of parcels using the camera as a scanner. The second is Pulse, a new tool built into Jamie and Noah’s food delivery platform app which tells riders whether demand is high, medium or low.[85] Both tools are used to ensure there is a labour supply in place to meet the demand of distribution; neither company technically employs its delivery drivers/riders, so while the app’s users form the labour pool in a sense, the Flex and Pulse tools are mechanisms for ‘activating’ workers in such a way that each company only pays for the labour time it wants. To do this

[85] At the time of interview, Pulse was in a beta phase.

both apps rely on contacting workers 'out-of-hours', in that Flex and Pulse are both constantly available to workers without them having to 'log in' or accept an assignment, and they are both predicated on off-duty workers using the tools to decide whether to take on future work assignments (whether immediate-future in the case of Pulse or near-future in the case of Flex). Aside these similarities, the two tools have notable distinctions in how they work and the effects they generate.

Flex might be considered akin to an app-based version of similar SMS-based shift allocation systems, as used by distribution centre workers such as Lorenzo in Greater London, in that they both communicate remotely whether and at what times labour is needed. However, unlike that system, the Flex tool is not based on productivity and therefore is not a disciplinary tool; the notable difference is that rather than commanding or denying attendance, Flex advertises a choice of shifts as demand is created, reflecting the formally self-employed status of its workers.

> I have to check the [job] offers every day. I can check even the offers the same day…so sometimes you have blocks in a short time that you can give a short notice, but you take the risk, it's not every day like this. Sometimes you can go in the morning and, 'Oh I want to go today at 11 o'clock' and at 8 o'clock you check and maybe there's not any block until 5…You can know if you have accept the block the day before, but that depends if you say, 'Tomorrow I want to go 10 or 11 o'clock,' but you check, 'Oh it's only blocks from 12 or 1 or 2.' Okay I accept it or I take the risk tomorrow…but maybe next day there's still no blocks until 4 o'clock. (José)

But the effect is still a binary approach to ensuring only the exact supply of labour needed to fulfil the tasks required: workers are either wanted or not

wanted, explicitly, and accepting a collection slot via the app means accepting the work.

Pulse approaches labour allocation in a different way. As far as Jamie and Noah are concerned, what Pulse says about demand appears to have a weak correlation to the actual demand for riders to fulfil orders. This could be attributable to the beta testing of the tool, although Jamie strongly suspected it is a design feature intended to dupe workers into logging onto the app, potentially at the expense of their earnings if demand turns out to be low:

> To be honest I don't know if it's intended to be accurate. (Jamie)

> I wouldn't trust it as far as I could throw it. (Jamie)

Such an accusation could be disregarded as conspiracy-minded, but a similar conclusion was reached by Rosenblat and Stark (2016: 3777) in their study of Uber. The approach to ensuring labour supply is continuous rather than binary — there is only ever high, medium or low demand (never no demand) and these appear to correlate to busy, normal or less busy order times respectively, rather than bearing relation to the number of riders logged-in and available.[86] Whereas Flex workers are kept at a distance from the work process — their ability to access it at all is tightly regulated through bounded 'offers' (i.e. time slots) — Pulse aims to ensure the oversupply of labour rather than a matching of supply with demand, so there are always riders available whenever a delivery comes through.

> You have to remember that it doesn't bother them whether you turn up to work and earn much money, so I take quite a cynical view of those, like, demand management tools because in their ideal world all their

[86] Despite being advertised in terms of demand for drivers (Waters and Woodcock, 2017).

> workers are working all the time and they're paying them nothing because it costs them nothing to have a rider sitting there doing shit all. (Noah)

This is made possible because riders are paid per delivery rather than for the time they are logged in. As such Pulse 'entices' rather than advertises; the actual work allocation will be done by the algorithm after riders have logged in, and even in periods of 'high demand' there is no guarantee of work.

Scrutiny of 'precarious' forms of work such as those found in the gig economy tends to focus on the terms of employment, variously described as casual, precarious or 'bogus' (Woodcock, 2017b; Cant, 2017; Segalov, 2015; Business, Energy and Industrial Strategy Committee, 2017a), but Flex and Pulse show us how casual contracts are made workable for the companies by facilitating the activation of 'dormant' workers, giving substance to Rosenblat and Stark's (2016: 3777) impression that in Uber "the rhetorical invocations of digital technology and algorithms are used to structure asymmetric corporate relationships to labor". In the case of Flex, we can observe the way technology allows the labour process to be based on casual work: labour is no less crucial to the work process, but it can now be organized in such a way that workers are kept away from sections of it until they are necessary. Because e-commerce delivery drivers in particular are entering the work process at a later stage of distribution, the company can assess how many deliveries need to be made and therefore precisely how many drivers are required, although the Yorkshire and Greater London distribution centres are able to use contractual stipulations to achieve a similar effect.

Food delivery platform riders are also entering the labour process at a late stage, filling the section of the work process which requires cooked food to be delivered to customers. But the company approaches the scenario differently: although formally similar to running deliveries for José's e-commerce platform,

the delivery of hot food demands a more immediate allocation of labour — clearly a Flex-style system of advertised delivery slots would not be fit for purpose. The food delivery platform therefore necessitates an available pool of ready workers, which allows the company to advertise estimated delivery times to customers. In contrast with Flex, where slots are advertised to all drivers who have the app, the food delivery platform measures its pool of available workers by requiring riders to log in to the app, a threshold that once crossed means riders can be allocated jobs and penalized for refusing to accept orders — in other words the threshold past which workers are on 'company time' and must be available. Riders are not remunerated for the time they spend waiting while logged-in, despite the principle that they make themselves available for penalization, so the role of Pulse is to encourage riders to cross the threshold of logging in by setting an expectation (unreliably, according to Jamie and Noah) of how much time they can expect to spend idle — therefore unpaid — once they log in. As with Flex, this is a 'lean' approach to work allocation which benefits the company by reducing the unproductive labour time it pays for (see Chapter 2), but Pulse represents a novel way to encourage workers to cross the 'factory gate' unpaid with the uncertain promise of work the other side.[87]

[87] An added benefit to the employer is the reduced need for consistency (i.e. retention) of personnel. Workplaces can have a fairly high turnover, attracting workers from student (Todd) and migrant (Lorenzo) labour pools from the local area with seasonal contracts (José) or through agencies (Lorenzo). Where workplaces are located on industrial parks, such as in Greater London, it is not uncommon for workers to move between various distribution jobs all within close proximity to each other, which is possible in large part due to comparable ergonomic expectations (as discussed later in this chapter). José, for example, had at various points in the recent past worked at three of the sites mentioned in this dissertation.

Work flow

Having entered the workplace, work can begin once the worker has logged in to a computational device, most commonly a handheld scanner.[88] At this point, the work flow begins — understood here not as the flow of goods and processes across the whole productive process, but as the main component of the process of working. Put simply, it is the point at which the worker has settled in to their shift and begins to 'get on with' the job. For every worker I spoke to, there would come a point after initially beginning work where they would describe how 'then you just go on like that…'. These periods, which comprise the bulk of the working day, are when the worker and their handheld device work together most intimately. For managers, this is the key period of data gathering and productive labour time. For workers, it is the time in which their experience of the work process is most consistently shaped. Vehicular distribution work and warehouse-type distribution work have different but comparable work flows.[89] As shown in Figures 5 and 6, there are entry and exit points which can either mark the end of a shift or the end of a 'shop', but the central repeated work flow (in a darker shade) is largely consistent through the shift.[90]

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[88] The exception being the food delivery platform, where logging in to the app *is* entering the workplace.

[89] NB The food delivery platform workflow, although vehicular, more closely resembles a warehouse-type work flow. As I noted in Chapter 3, although the practicalities of platform work and warehouses are different, their form is similar; the app turning the town into a virtual warehouse for food delivery riders.

[90] There are occasions on which the consistency of work rhythms are interrupted by what appear to be technical irregularities - in such cases, workers are generally encouraged to contact a supervisor if one is available.

Figure 5. Typical work flow in vehicular distribution work.

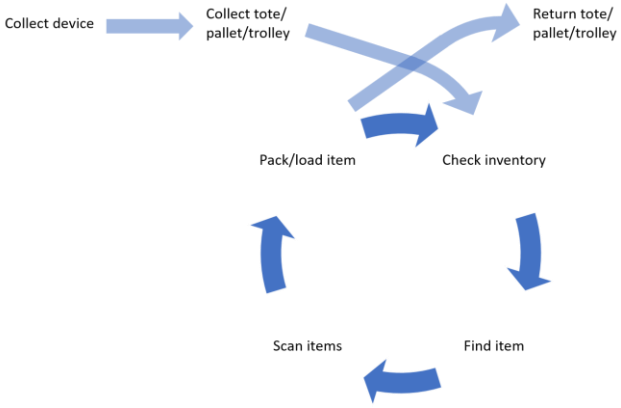

Figure 6. Typical work flow in distribution centre work.

A common reflection across everyone I spoke to was that the fundamental basis of the work was, in one way or another, following the instructions set by their personal computational device (i.e. data terminal). As Berardi (2009: 75-6) notes, there is ambiguity about the extent to which the use of softwarized devices have brought about a standardization of labour, although we can recognize the certain interchangeability they facilitate. He states:

> We can say that the digitalization of the labor process has made any labor the same from an ergonomic and physical point of view since we all do the same thing: we sit in front of a screen and we type on a

> keyboard. Our activity is later transformed by a concatenation of machines into…the moving of forty metal boxes or a restaurant's provisioning.

Yet, he continues, we also know that at the same time the content of what we do can be completely different, so we could also say the work has become more specialized — although we can acknowledge it wouldn't take very long to gain the operational knowledge of a different job because the simplification of the labour has made it more interchangeable (ibid.). As we now know, the devices involved in the distribution workplaces discussed here require more effort on the part of the worker than to "sit in front of a screen", yet the presence of the screen and indeed being present to the screen are both fundamental elements of the work flow in each case, regardless of whether the worker is also required to push a trolley, pull a pallet, ride a bicycle or drive a van in addition. We can say, therefore, that much of the skill involved in successfully carrying out the work boils down to successfully acting on the basis of a digital interface — much like the skill of driving safely having as much to do with acting on the basis of a dashboard as the ability to coordinate oneself and take account of one's surroundings (Bartlett and Tkacz, 2017: 9n12).

The organization of work flow facilitated by the personal data terminal affects the way work is structured and experienced. An algorithmic management system — or simply 'the system' — is able to direct workers and control their manifests (i.e. task duties) in real time, reducing the technical need for group-oriented plans of action directed by human managers, or even the need for workers to come on-shift at the same time. In this context, events such as team briefings serve more humanistic or ideological purposes, reminding workers of their targets or the values of the company rather than being a technical

requirement to orient workers to the day's tasks.[91] Put simply, they are a social and political choice, which explains their use in some cases but not in others. Changes in the management system at the Sainsbury's online shopping department have meant a reduction in shared start locations, with a knock-on effect for the sociality of the work:

> With the new system there is no dedicated starting point for each shop. Now shops can start half way through Ambient 1 and go on Ambient 2, and vice versa. The biggest concern here is that it will be harder to tell who is on each shop with you. Before I'd be able to ask a mate if they were on Ambient 2 next, and if we both were then we'd be able to go around chatting. Now we can't rely on that. (Plan C, 2017b)

While attempts to stop workers talking with each other are not novel to algorithmic management, as I will discuss later in this section, we can see the breakdown of sociality as a by-product of the organization of work flow which contributes to the phenomenological experience of being an algorithmically-managed worker. In her study of Las Vegas gambling machines, Schüll (2012: 56-7) draws a comparison between the "profit logic of temporal discipline" in gambling machine design to techniques of behavioural management in industrial and disciplinary environments. Most strikingly, she focuses on how the ambition of "continuous gaming productivity" (ibid.: 52) is delivered by the promotion of an "embodied relation" between gambler and machine (ibid.: 174). Machine gamblers enter a state of 'flow' in which they lose their sense of time, and, according to casino design guru Bill Friedman, "their sense of reality, existing only for the moment, for the next bet" as their "embodied experience

[91] We could speculate that a purely algorithmic system would see workers come on-shift or be paid only when strictly necessary; an idea floating in the background of the cases that use flexible contracts or operate on a piece-rate model.

in the material world is exchanged for a timeless flow of repeating moments" (ibid.: 49).

Schüll's account is illustrative for thinking about the way a form of control is iterated in the relationship between user and device. In particular, she highlights how psychologist Mihaly Csikszentmihalyi's original use of "the term 'flow' to describe states of absorption in which attention is so narrowly focused on an activity that a sense of time fades, along with the troubles and concerns of day-to-day life" (ibid.: 166) becomes subjugated to the economic logic, reinforced by "the configuration of the machine, whose programmatic interactive parameters allow gamblers little in the way of tactical or performative improvisation" (ibid.: 179). This is politically salient when thinking about the embodied, rhythmic relation between workers and personal devices. As Rossiter (2006: 159) notes: "The possession of time by any kind of worker is the condition of possibility for the organization of labour." We can think of this not only in terms of individual access to time, but collective access to 'shared time' across the workforce. Panorama (2013) documents the sense of urgency felt by Amazon workers as they race against timers on their devices in order to achieve productivity targets, and yet the device produces a strange sense of time where the worker's ability to control their time is repeatedly reduced to the next twelve seconds. Like the goods in the warehouse, as embodied by the tote or pallet, workers are also just-in-time, a lean flowing force whose actions play out for twelve second at a time before being reset.[92] Rossiter (2016: 40) argues: "Logistics robs living labor of time. At the level of labor management, logistics registers the calculation of time against the performance of tasks and movement of things." If algorithmic management devices contribute to the production of a continuous present (Fisher, 2009: 58-9), then as well as

[92] The premise of the sci-fi thriller Source Code (2011, dir. Jones) comes to mind, wherein the protagonist has a set amount of time to work out a puzzle before his timeline is reset to the beginning.

thinking about the worker being denied foresight into the future, we can also think about the relegation of the need for narrative memory (ibid.). Instead of learning from past experience or being able to recall working patterns or routes, instead of needing to be able to recall details of the day in order to colour in productivity print-outs, memory is outsourced to the algorithmic management system in abstracted, quantifiable ways.

Communication

The types of work flow produced under algorithmic management demonstrate particular norms of workplace communication. As discussed at the end of Chapter 3, algorithmically-managed communication particularly involves tracking and transmission, especially as facilitated by handheld devices, which are workers' primary tools in most algorithmically-mediated distribution workplaces. At the most fundamental level, these devices enable rapid communication between workers and their labour, at the point of work, and the managerial 'system' across a number of databases. This forms the basis of what we can think of as data communication. Aside from data communication, algorithmic management also has a powerful effect on human communication. Largely a by-product of working practices, the deleterious effect of algorithmic management on human communication, both among workers and between workers and managers, was deeply felt by the workers I spoke to and is important for understanding the affective regime produced in distribution workplaces.

Data communication is facilitated by personal software devices, most typically a handheld scanner, which acts as a site of instruction, command, inventory, recording, tracking, seeing, transmission — and therefore communication and control — within the work environment. The device operates as a logistical interface, connecting live orders to workers in real-time, but it also acts as a "point of juncture" (Cramer and Fuller, 2006: 150) between workers and

management: workers interact with the device via its display, scanner and positioning system throughout the course of their work flow, which updates databases on the progress of a given job or set of tasks in real-time; meanwhile the management system provides workers with tasks or instructions, and sometimes targets, and provides shopfloor managers and supervisors with information about workers' productivity.

As such, the device represents a threshold between the realm of work's execution, to be carried out by the worker, and work's conception, the realm of the employer's 'business' beyond the worker's reach (see Goodrich, 1975: 56). Through calculating the relationship between time and actions (and space, as we will see), the algorithmic management system provides managers with choices about how to scrutinize workers' performance against targets — for example in the group setting of the briefing or one-on-one on the shopfloor with the use of print-outs, via text message when used for shift allocation, or in order to have workers compete against each other, as demonstrated by the use of public television monitors in Lorenzo's supermarket distribution centre.

For the worker, disciplinary measures are generally the culmination of a process of data mediation beginning with their use of the handheld device. This leads to anxiety about the degree to which devices track and transmit an accurate reflection of the work carried out, and in particular whether the metrics against which workers' performance is scrutinized by managers are able to account for mitigating circumstances such as items being in the wrong place or the inventory being inaccurate. In general, such contextual and contingent factors are not accounted for within the productivity system, which usually appears to be calculated simply as completed actions divided by logged time (e.g. items per hour). One exception was in Lorenzo's distribution centre where upon making a mistake, workers had to find a supervisor who could use a special code to log the handset out of the productivity system to give the supervisor time to rectify the issue. The time spent locating a supervisor,

however, negatively affects the workers' productivity score, which in Lorenzo's case was directly linked to shift allocation.

It is important to note workers' productivity scores are a predominantly political device intended to ensure the maximum actualization of labour power. Across all the workers I spoke to, achieving 100 percent of the target was a fairly rare occurrence. In Lorenzo's supermarket distribution centre, successful shift allocation depended on achieving ninety to ninety-five percent of target. In José's e-commerce centre, it appeared the targets were more or less unachievable:

> I talked to all the people, and I talked to permanent staff that had been there for a year, nine months, seven months. And I said to them, 'Right, I just talked to our colleagues and they got the same warnings as I do about the target. Could you tell me anyone who meets the target?' And you know how I said we are maybe 400 people per shift? Only three or four people meet the target…I said, 'Why do they put the target so high?' and they said to me, 'Because if they put it lower, the people then will achieve it and they won't have motivation to get more productivity' is what I was told. (José)

Despite the perpetual state of underachievement experienced by workers, the companies they are working for represent some of the most successful national and international customer-oriented supply chains. In this context, it is difficult to see how workers' stated performance is accurately correlated to the actual logistical performance of a warehouse's operations. In this sense, the tracking of workers is contributing to two parallel processes — the actual logistical alignment which is necessary for the just-in-time distribution of goods into, through, and out of a warehouse, and a managerial regime which revolves around ensuring the productivity (and therefore cost-efficiency) of workers. Nonetheless it is conceivable that workers could fall foul of what Pasquinelli

(2015b) calls ‘algorithmic vision’. Highlighting the problem of apophenia within algorithmic governance (“the experience of seeing patterns or connections in random or meaningless data”), Pasquinelli notes “There is an excessive belief, indeed, in the almighty power of algorithms, in their efficiency and in the total transparency of the metadata society” (ibid.: 9). I will return to the idea of the “almighty power of algorithms” later in this chapter, but the initial implication for workers is that they may have no recourse if managers draw patterns which are not substantiated by reality.

Alongside data communication processes there exist norms around *human communication* in the algorithmically-mediated workplace. Contrary to the sorts of expectations of intellectual and communicative sociality usually found in discourse about the post-Fordist workplace, both broadly (Tomaney, 1994: 162-3; Piore and Sabel, 1984: 278) and in autonomist thought (Lazzarato, 1996: 135; Terranova 2004: 88; Negri, 2017b; Virno, 2004: 61-2), the overarching norm within algorithmically-managed distribution work appears to be one of minimizing communication between workers, specifically talking, either indirectly or directly.

> I never had a job where I talk less. I worked there now half a year and I know probably twenty people out of the 600 drivers, you know, that I would talk a bit more to. You talk a bit like in the morning or like beginning and end of shift, but very minimal, but yeah never had a job where I talk so little. Yeah it can be a bit lonely. (Lorenzo)

> The workforce on any one night is composed of a hugely complicated number of different people, right, so you can’t know everyone, and you don’t know who’s gonna be working on any one night, and you haven’t got a mode of communication that can reach anyone, and there’s no common workspace. Loads of people don’t use [zone centre], like loads of riders never go to [zone centre], like there’s a select few of us who

> choose that community, a lot just don't…For the first month I worked I didn't even know it was there, I just worked. (Jamie)

These forms of communicative reduction are generally felt as 'part and parcel' of the job by virtue of its organization through personal handheld devices, which is further emphasized in delivery roles where workers each have their own mode of transport. However, direct attempts at minimizing verbal communication, particularly supervisory intervention, are also reported.

> You used to be able to talk to people as you went along. Now, and I don't know why, but the team leaders have got a lot more hands on. They will just stand at the end of the aisle and watch you, and if you're talking they'll tell you off for talking, it doesn't matter if you're meeting your.. So for example, I had a shop I did the other day: the IPH is 125, I had a big 180 item shop, I got IPH of 250…Even if you're getting something like a 200 IPH, they'll still say, 'Stop talking, you've got work, don't talk' and stuff like that, so it's fucking like being in the mafia d'you know what I mean? It's like a code of silence. It's really added to the mood of the place. (Todd)

> Often some managers basically shout at you, y'know, 'Stop talking!' Y'know, they don't like you to talk because they say you make mistakes when you get distracted and you don't work enough. (Lorenzo)

While being told not to talk at work is hardly novel or unique to either distribution work or algorithmically-managed work, this form of antisociality was widely reported across the cases. In the context of algorithmic management, rules against talking serve the purpose of directing workers' attention to their personal device by creating an environment where communication is channelled through hardware rather than across the social space of the workplace. Although a by-product of the organization of work and management

rather than its aim, such efforts to reduce unproductive labour time contribute to the intensification of work and imply an affective dimension to the work whereby workers feel isolated from one another. This experience contradicts accounts of computationally-dependent work which focus on the increase in cooperative forms of working (see Mills, 2013), and problematizes the idea that the increased coordination *of* workers necessitates increased cooperation and communication *between* workers. In Lazzarato's thesis on immaterial labour, he states:

> if it is no longer possible to lay down and specify jobs and responsibilities rigidly (in the way that was once done with 'scientific' studies of work), but if, on the contrary, jobs now require cooperation and collective coordination, then the subjects of that production must be capable of communication — they must be active participants within a work team. The communicational relationship (both vertically and horizontally) is thus completely predetermined in both form and content; it is subordinated to the 'circulation of information' and is not expected to be anything other. The subject becomes a simple relayer of codification and decodification, whose transmitted messages must be 'clear and free of ambiguity', within a communications context that has been completely normalized by management. (Lazzarato, 1996: 135)

In algorithmically-managed distribution work, jobs and responsibilities are still being laid down rigidly, in a broad sense. There is flexibility in the specific tasks being placed onto workers, but "cooperation and collective coordination" does not come from the workers being composed as a team and communicating with each other directly; rather it is cooperation and coordination solicited 'from above', mediated through 'the system'. As approached in a different way by Lee (2016), there is ambiguity in the extent to which workers know they are being coordinated at all, but to clarify Lazzarato's own ambiguity it should be

made clear that the ‘coordination’ of jobs pertains to workers being coordinat*ed* (by the management system) rather than coordinat*ing* themselves.

However, Lazzarato does provide an insight into the nature of the communicational relationship, in that it is “predetermined in both form and content” (Lazzarato, 1996: 135). This is to say communication between workers (horizontally) is mediated through the forms of data communication conducted (vertically) through the device and management system. As the worker uses their scanner or app, information is relayed both *by* and *to* the worker through predetermined functions within the user interface. We can think of this in terms of the display and the on-screen options the worker interacts with, but also in terms of the constant communication generated by and for the real-time calculations made by the management software to fulfil the dual role of logistical coordination and performance tracking. As such, whatever the worker does (or does not do) with regard to the specific tasks assigned will generate data in ways they have no control over. This is the primary mode of communication in algorithmically-managed distribution work, which in turn provides the basis for intermittent worker-supervisor communication, as I will discuss later in the chapter.

Space

Many of the uses of data tracking, both product oriented and worker oriented, could be facilitated by an electronic check-out till. A version of that form of management can be seen at José’s warehouse packing station, where his role entails being stationary at a computer, taking items from a movable ‘wall’, scanning and packing them into appropriate boxes, and placing them onto a conveyor belt to be taken to the ‘goods out’ section. But for mobile distribution workers — especially pickers — algorithmic management entails a particular relation to movement through space.

Warehouse pickers receive instructions on a graphic interface attached to a handheld scanner. After each item is picked, the screen gives them a location for the next item. Throughout a shift, the worker's movements are organized through the algorithmic assignment of items. In the case of an Amazon warehouse, the route walked by a picker is 'planned' by real-time calculations which account for the status of orders, as well as the location of stock and other workers. The workload is configured as "a continuous process rather than as a goal-oriented sequence" (LeCavalier, 2016: 40), with the handheld device acting as the worker's eyes and, to some extent, brain. One result is an altered sense of spatial awareness, the worker not knowing where they are going until they are told to go there, or — in the case of warehouses with tall stacks — having much awareness of where their co-workers or supervisors are at a given time. Spatial disorientation is heightened in a warehouse like one of Amazon's, where stock is generally stowed on a random basis. As LeCavalier (ibid.: 42-3) notes, "seemingly counterintuitive spatial manifestations appear and are increasingly normalized" because logistical organization entails a mediation between an abstract (quantitative) environment and a concrete (qualitative) environment which "enables an imagination that focuses on action rather than form and that measures distance in time" (ibid.). An artifact of this imagination, Amazon's random stow system entails that goods brought into the warehouse are stored randomly rather than categorically, the rationale being that it will reduce wasted labour time both in terms of pickers' task of searching and the ability to direct workers' movements according to algorithmic calculation. Such a concern for the productive use of movement and the rational use of space may call back to the Gilbreths' motion studies, but the key difference is algorithmic management entails a governance of actions which is not based on a 'one best way' which workers can learn or perfect, but a temporally and spatially specific 'one best way' calculated in real-time and incalculable and unknowable to the worker.

Such a system relies on workers effectively becoming tracked or 'sensed' entities alongside stock via tracking devices (see Agre, 1994: 104). Pickers cannot see the next item(s) they will have to collect, so they are limited to acting solely on the basis of the information being displayed on their device at a given moment. The item queue and therefore their projected work route — the worker's spatial movements throughout a shift — can conceivably be reprogrammed continuously as the worker works, without ever knowing any of the alternative future work patterns they could have been assigned. And yet workers are assessed according to the metrics of a system which is not only unknowable to them but seemingly unknowable to their human supervisors too, as I will discuss further below. Moreover, this arrangement has practical effects on workers' own abilities to manage their workload: Todd explained that in the previous system at his online supermarket distribution centre, workers had access to the full 'shop' (manifest) for their trolley. As such they could employ unsanctioned 'tricks' for making the work physically easier and more mentally stimulating, such as leaving the trolley at the end of an aisle and picking items from shelves using a carrier bag. In the new system, workers cannot see beyond their next item, forcing them to move through the store in more regimented and enforceable ways, unable to function according to their own sense of the best course of action.

Through considering the effect of algorithmic management on workers' interactions with space, we can see the way workers rely on the result of a feedback loop which is presented to them on their personal interfaces. Instead of receiving appraisal or evaluation about how they could organize their work flow better, the device they work with plays an organizing role in that it relays information accrued from the worker's actions and uses them to calculate directives which take into account other logistical factors, which the worker can put into effect without having to make decisions for themselves. In this sense, while the handheld scanner carries a literal digital user interface, it also occupies an interface position in the sense theorized by Hookway (2014); that

is, the interface as a moment of alignment or calibration, in this case between physical actions, transmitted signals, databases, algorithms and other processes. The handheld device therefore provides a way into thinking about the live system of symbolic and moving parts of the logistical operation, the 'system' possessing a god's eye view which facilitates the interlocking of discrete processes at a distance.

What algorithmic management means for authority

The algorithmic frontier

What emerges from the previous section is the sense of the frontier of control described by Goodrich (1975), or the point beyond which "there shall be no discussion" (ibid.: 56). At this point, information generated by the worker — whether active, such as through scanning barcodes, or passive, such as allowing a certain amount of time to elapse between codified device interactions — crosses a threshold as it passes into the 'system', out of reach of the worker's control or (over)sight. Practically speaking, workers may be aware of certain points at which their data surfaces, such as on their supervisors' computer monitors. As I will discuss in Chapter 5, technically this does not necessarily put the data out of a worker's view, but once the data has reached the computers, workers can do little to intervene in its use by a manager or supervisor. With work information recorded, transmitted and stored digitally on managerial databases, managers have choices about what to do with the data: from updating targets to marking workers for discipline (or 'further training'), from adjusting the work allocation via SMS to reorganizing the work process altogether. This characteristic of information technology is what Zuboff refers to as *informating*. Along with *automating* certain procedures, she argues information technology is specific in that it produces

textual information about ('informates') an organization or work process which was previously beyond the purview of machines (Zuboff, 1985: 8). In the 1980s, Zuboff argued the informating capacity of information technology would shatter the Taylorist division of labour by creating (or providing access to) information at the point of production: "technology returns to the worker what it once took away, with a great deal more as well" (ibid.: 15).[93] Following this section, I am instead able to describe an extreme Taylorization, but one within which the status of management (and managers) is problematized.

As well as the continued development of the material dimension of power, which Zuboff calls 'technique', there is also a rearrangement of authority — as the 'spiritual' dimension of power — at the heart of algorithmic management (see Zuboff, 1988; 2015: 81). In this section I discuss this rearrangement in terms of the elevation of the authority of 'the algorithm' and the subduction of the supervisory function. As such, I show that algorithmic management is not just about equipping management with a set of tools collectively referred to as 'algorithms'; rather, it entails a new managerial mode, and with it the production of a new managerial subjectivity. As Woodcock (2017a) notes, there is a question mark over the degree to which algorithmic management actually enhances managerial control, or whether it just provides an illusion of control. In this section of the chapter, I investigate the managerial politics of algorithmic management and reveal the character of management in algorithmically-managed distribution work.

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[93] She continues: "The worker's knowledge had been implicit in his or her actions. Informating makes that knowledge explicit; it is a mirror reflecting what was tacitly known but now is in a form that is public and precise" (Zuboff, 1985: 15). Zuboff's reading of Taylorism seems to take very literally scientific management's attitude to the conversion of worker's knowledge into managerial functions. However, Taylor only listed the harvesting of knowledge as an example of managers' new responsibilities as part of a systematic approach to obtaining workers' "initiative…with absolute uniformity" (Taylor, 1911: 15). Arguably, an informating technology would have been an ideal complement to Taylor's proposal.

Algorithmic authority

Algorithmic management relies on the elevation of the authority and status of algorithms within work. For workers this takes two primary forms: first as social regulation, second as generative power. Building on Lash's account of the types of rules which govern a society of ubiquitous media (2007: 70-1), the regulative power of algorithms emerges most obviously in the way performance calculations are leveraged against workers. Whether at team briefings or on the irregular occasions when supervisors approach workers with print-outs of productivity scores, the calculations the 'system' makes based on workers' actions are the central focus of disciplinary relations between workers and managers, and they are intended to become the primary motivator for workers to perform to a desired standard. But in a further, more technical sense, Lash encourages us to consider the way power is found "in the algorithm" in the way algorithms produce *generative* rules as they function (ibid.: 71). For example, as algorithms 'informate' work, data is fed back into the information workers receive and must act on via their handsets. Circumventing the need for appraisal or traditional learning, control is maintained throughout the system on a more 'protocological' basis (see Galloway, 2006), whereby software is able to organize information based on the effects it monitors across the digital network and the various moving parts of the labour process without the need for workers' abilities as human agents.[94] This process can be observed in simple terms in the way item replacements enacted by workers in Todd's online supermarket distribution centre affect the future shops of all other workers, without them necessarily knowing a change has happened at all.[95]

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[94] I am also reminded of Agre's 'grammars of action' (1994).

[95] To demonstrate: if the system tells Todd to pick Marmite and Todd sees there is no Marmite, he uses his handset to tell the system Marmite is out of stock. Either the handset will suggest he choose Vegemite or another yeast extract, or he may tell the system he has selected Vegemite as an appropriate replacement. To ensure no other workers have to go through this process, and possessing the new information that there is no Marmite (whatever

However, both these forms of algorithmic authority suggest a destabilization of the position of human managers on the shopfloor. As I have discussed, as pickers work they cannot see the next item(s) they will have to collect and are effectively limited to acting on the basis of the information being displayed on their handheld scanner at a given moment. But supervisors do not have access to the logic of the algorithmic management system either, and it is clear from the pace and scale of the logistical process that algorithms are making decisions independently of managers constantly. The effect is that algorithmic management appears less as a tool for managers to wield as they choose, and more like a system which incorporates everyone on the shopfloor — including human managers — and develops its own authority. Although the system produces calculations which may be used by managers against workers, it is not clear to what extent (if any) human managers are themselves involved in many of the decisions which go on to affect workers. Rather, the 'algorithms' of algorithmic management appear as a paternalistic force which command the obedience not only of workers but also of supervisors themselves, the main difference between the two groups being the degree to which they are denied knowledge of the managerial process and the political power to discipline. Under algorithmic management, management itself is further divided not only into the 'disciplinarian' and 'executive' (i.e. shopfloor and corporate), but into the human and computational.

Managerial distantiation

Algorithmic management has been framed as the automation of management (Woodcock, 2017b; Cant, 2018), especially middle management. The extent to which business intelligence systems can threaten the role of the middle

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the stock database may have said before), the system will change the shopping manifests of other pickers, i.e. telling them to pick Vegemite rather than have them look for Marmite at all. After Todd has performed an 'item replacement', his colleagues will be unaware they were ever initially supposed to be looking for Marmite in the first place.

manager has been stated by Eckerson (2011: 48), and recent studies of Deliveroo (Woodcock and Waters, 2017) which dwell on the idea of information technology supplanting a middle stratum of supervisors and managers are in many ways rehearsing classic debates in the organizational literature (Simon, 1977: 28, 30-3; Zuboff, 1988). Certainly, the straight replacement of managers by machines appears to be one dimension of algorithmic management in distribution work, especially where the work is primarily vehicular:

> I didn't see my personal manager I think for three months. (Lorenzo)

> I've not seen [a manager] in the flesh since I joined. (Noah)

In these cases — online shopping delivery and food delivery, respectively — the workers I spoke to feel their managers are largely absent from the work process as they experience it. However, as I discussed above, the nature of real-time mobile performance tracking devices means managers are still intimately involved in the work process even if they are not physically present. The characterization of algorithmic management as the 'automation of management' therefore fails to tell the whole story. As I have already stated, the use of devices in conjunction with the managerial system means data is continually collected through what Zuboff calls informating. A departure from Zuboff's earlier work, however, is that in the algorithmically-managed workplace, workers' access to information about the work process is limited. This is a Taylorist move, which aims to put management (rather than labour) in a prime control position but without requiring the presence of human managers at the site of work.

Having the screen end of a computer program as the first supervisory layer present to the worker has two key consequences. First, the fact workers carry out the bulk of their work without human supervision means managers can modulate their proximity to the 'shopfloor' — it becomes possible to be

simultaneously physically absent from the work site, yet computationally present at discrete and even minute moments within the work process.[96] Second, the distantiation created by managing workers across a physically distributed network through the use of dispassionate handheld devices allows managers to step behind something of a 'digital veil', providing managers with plausible deniability in relation to the commands and calculations of the algorithmic system. The result is that while managers are able to distance themselves from the shopfloor, the processes of tracking, transmission and performance calculation, and correlate decisions about task (and shift) allocation and discipline are masked by the algorithmic infrastructure, 'black boxed' and made unaccountable. Whereas physical managers can take responsibility and be held accountable for their decisions, even in apparently minor ways, in algorithmically-managed workplaces workers are instead encouraged to "just trust the system" (Todd), putting questionability beyond the reach of human actors.

In the system we trust

By outsourcing a variety of processes to 'the system', chains of command can be rewired and managerial control can be mediated through a technical ecology which is presented as its own source of authority, upholding the rational and objective directives of the work process.[97] As Todd testified:

> There's a phrase at work they keep repeating which is 'just trust the system'. It's like quite quasi-religious, to the point where I like — 'Amen!' — I cross myself when they say it. (Todd)

[96] For an early discussion of this dynamic see Zuboff (1988: 337-41, 342-55).

[97] Possible in part due to the presentation of work process information through numbers presented as 'raw' data. As David Beer (2016: 9) notes, even "the notion of the algorithm" contributes to the "social power of algorithms".

One implication is that any notion of managerial accountability is reduced; decisions or diktats emanating from 'the system' are not immediately traceable to any particular manager or managerial decision, and instead appear ready-formed to be actioned with limited possibilities for workers to challenge them. Should workers raise concerns with supervisors, as Todd states, they are encouraged to "just trust the system", further asserting the idea that managers themselves are secondary to the strategic vision of 'the system' and therefore ought not to be judged or held liable for its judgements.

In this sense, *just trusting the system* and managerial distantiation work hand-in-hand — the instruction to "trust the system" acts as a means of deflecting scrutiny of human managers towards the non-human management infrastructure, as though human managers were entirely separate from it, observers to its mysterious and apparently autonomous workings just like workers. Yet we can also observe situations where the wide reach of algorithmic control actually does surpass the supervisory abilities of human managers — with increased productivity on the part of workers, there is literally too much information for supervisors to meaningfully oversee. Todd described how the pace and scale of the work as mediated by 'the system' can increase worker productivity to the point that managers' attention is divided, forcing them to focus on potential bottlenecks arising in the movement of stock into lorries rather than the actions of those workers assigned to picking tasks, and therefore creating opportunities for reprieve between 'shops':

> You gotta remember…because everybody's doing similar sized shops, it's never that one trolley will come in at a time, it'll always be twenty at a time, twenty at a time, so you know they're rushed off their feet loading these up, getting them organized, getting them ready for the first deliveries at 7 o'clock. (Todd)

> They don't have time to check through 160 boxes with the sheet of paper with all of this, so you take advantage of the lack of manpower. (Todd)
>
> They're too busy, so you take advantage of them running around. (Todd)

In this way we can see that as well as deflecting scrutiny from workers to 'the system', managers are themselves forced to "just trust the system" to some extent, given they are practically unable to check over or supervise the algorithm themselves for sections of the work process.

In Todd's workplace, as with the other distribution centres I have referred to, supervisors are still present — their role has not been automated away. However, they too are subjected to the use of devices and subordinated to 'the system'. Although basic disciplinary functions remain — commands to stop talking, occasional instructions to work harder — the computational system and its devices instead wield a technological authority which appears to supersede the authority of the supervisor. Supervisors, like workers, are subject to this authority; supervisors, like workers, have to "trust the system". As we have seen, this is even the case when supervisors appear to be 'out-managed' by the system, unable to check for themselves that workers' picked items match the manifests they were given.

Under algorithmic management, then, there is a modification of the supervisory role which puts human supervisors in a peculiar position. Concurrent with the elevation of the authority of the algorithm is an epistemological emptying of the supervisory position. While supervisors still have access to a greater range of devices (such as PCs) and system privileges (such as workers' performance data), their job is as much about being in service to algorithms as overseeing workers. Their role shifts towards humanistic intervention: although purely

intimidatory measures are not precluded,[98] the supervisor may offer 'tips' on how to work more efficiently or introduce novelty features into team briefings such as sweepstakes or giveaways interwoven with company communications:

> They try to give you tips how you can go faster… If it works, maybe I could follow the tip, if it doesn't work for me I just find another way. At some points I just get to the conclusion that probably you're not gonna get the target anyway. So I say, 'Okay, I follow my ways,' some tips they help me out, others don't. (José)

> When there is something going on at work, [the briefing] will be to do with work, it'll be to do with changes, so when the [new] system was being introduced it was always about, 'Here's what we know, changes, what to expect' and that. When there isn't it's all something to make you feel like the department is your community, a close-knit group. (Todd)

> It's a briefing at the start of the shift, and they're saying things like, 'Oh today we've got this target,' sometimes they tell to you, 'Okay today we have a free piece of pizza in the canteen.' It's not long, sometimes they tell you, 'Okay park properly…don't take two spaces at once,' it's things like this. (José)

The role supervisors play under algorithmic management is more pastoral than pedagogic. Were it not for their discretionary disciplinary powers, we might more accurately consider them *subvisors* — their role being less about being above ('super-') workers, and more about being in service ('sub-') of algorithms, shepherding cooperation with electronic instructions. The "quasi-religious" quality of the "just trust the system" imperative referred to by Todd reflects not

[98] The humanistic management tradition has not necessarily denoted a humane management tradition. See a fuller discussion in Hanlon, 2016.

only the theological dimension taken on by the 'system' or 'algorithm', but also the ecclesiastical role adopted by the supervisor, who — in reaction to the ontology of unknowability discussed in Chapter 2 — becomes to varying degrees a preacher of the algorithm's sanctity and a shepherd of the working flock,[99] themselves subject on all sides to the unknowable calculations of an apparently omniscient power.[100]

Black-box management: reflections on a new terrain

David Beer (2009: 996) understands Lash's (2007) notion of *power through the algorithm* as "forms of power that are reactive, concealed, and which are shaped on the ground at the multifarious points of communication." This description resonates with this chapter's exploration of algorithmic management in distribution work, in particular the adaptive and 'black boxed' nature of the managerial instruments faced by workers. But algorithmic management also entails a reorganization of management: while we can see the production of a political phenomenology that affects how workers interact with work and each other both prior to the labour process, while working, in the regulation of communication and in how they experience space, it is also the case that relations of workplace authority are rearranged to privilege the standing of the algorithmic management 'system'. Although the supervisory function is reduced in vehicular distribution work (which is arguably a facet of the nature of the work), human managers (particularly supervisors) still play a disciplinary role within distribution centres. But while the algorithmic management system automates aspects of what would historically have been

[99] See Agamben (2011) for a thorough discussion of the theological dimensions of political economy.

[100] It is reasonable to assume supervisors are themselves subject to monitoring by a higher managerial stratum.

the responsibility of human managers, its 'informating' function means the system emerges as a managerial figure in its own right. As with human middle managers' relationship to human upper managers, supervisors in the algorithmically-managed workplace are on the same 'side' as the system, yet subordinate to it and working in its service.

Having analysed a number of the key effects of algorithmic management, I now reflect on algorithmic management as a new development in the scientific management paradigm. I then turn from a discussion of algorithmic management as a political technology towards reflecting on it as a political topography which acts as the context for the forms of worker resistance I discuss in Chapter 5.

Taylorism for the twenty-first century

This chapter has shown how algorithmic management affects both workers' experience of work — in terms of work allocation, communication and the political phenomenology of work — and the relations of authority within the workplace, such as the elevation of algorithmic authority and the creation of both physical and political distance between managers and instructions or decisions. These are the effects of an extreme Taylorization facilitated by a real-time algorithmic system, in which we can see a separation of conception and execution right down to the way workers move through a distribution centre.[101] Heightened computational capacity means there is a greater wealth of data which can be produced and calculated, which disrupts the role of supervisors: whereas in the past information about the work process would have to be gathered over time or by undertaking routine research exercises,

[101] 'Way' here mainly refers to the physical routes taken by workers, as in 'direction', but other research (Moore, 2018; Neff and Nafus, 2016: 129) has shown that the integration of wearable tracking technologies into computationally-mediated workplaces is affecting how workers move in a more bodily sense, as in 'manner'.

the algorithmic management system is based on the real-time production of work data as it 'informates' the work process. Concurrently, the conversion of data into directives is largely automated, and can factor in a far wider range of tracked processes (and at greater speed) than human managers may be capable of. While algorithmic management operates within a Taylorist paradigm, it signals a key development in terms of its ability to decentralize the managerial endeavour, not by distributing power across the workforce in a more democratic way, but by way of a digital media infrastructure within which real-time cybernetic feedback loops produce a more generative form of control.

Although there is an epistemological hollowing-out of both workers and supervisory shopfloor management, algorithmic management appears to entail only an ever-greater maximization of computational knowledge of the work process. Algorithmic management appears to substantiate Piperno's (1996: 127) claim that:

> The central aim of information knowledge is not the completeness and coherence of facts and judgments on the world, but rather the optimization of procedures, be they for decisions, diagnosis, management, or planning. Information knowledge incessantly transforms procedures so that the action may be more effective and, above all, faster.

It is not important for workers or even supervisors to retain or expand their knowledge of the productive or logistical process, because 'the system' produces a continuous present which is based on calculations that are cast as authoritative and trustworthy. This logic enables the optimization of commercial operations, but it also acts as a technique of managerial power.[102]

[102] It is useful to recall Bendix's (1963: 278) reading of Taylor here, which argues one of Taylor's objectives was actually to eliminate personal managerial authority through a greater

Waters and Woodcock (2017) observe that at Deliveroo, workers are not provided with an actual performance target, only an email to say whether they achieved it or not; a scenario which demonstrates the fundamental informational asymmetry typical of algorithmic management.

Informational asymmetry

The food delivery platform riders I interviewed felt the black-boxing of managerial processes (in their case within an app) removed the possibility of certain types of information ever being gained by workers, to the benefit of management and to the detriment of workers, who may wish to contest their conditions.

> So, like if I work as a waiter, I can tell if I'm needed or not, and if I'm sent home early and there's no orders I can be like, 'Well there weren't any orders, there was no one in the restaurant to be fair.' Like obviously it's shit because I should be guaranteed a wage whatever, but you can kinda see the demand. Whereas on our end we have no idea how orders are distributed between riders, whether that changes over time… (Jamie)

> If you can understand the work process fully, it's quite easy to understand how to organize in the work process, whereas what we've worked on is [delivery platform] riders understand the work process about as well as we can do, but we can't penetrate the algorithms and shit going on in our phones. (Jamie)

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adherence to an authoritative 'science': "Once his methods had been introduced, the managers would be as much subject to rules and discipline as the workers themselves. … Thus cooperation resulted from the fact that workers and managers complied with the results of scientific investigations, though it also depended upon a prior mental revolution which made the wholehearted acceptance of these results possible."

> It's all done server-side obviously. The app is a dumb client — when the system goes down…your app just goes blank. So there's nothing going on in the phone, it's all server-side, so there's no way we can even find out. (Noah)

Jamie referred to this scenario as "informational asymmetry". Rosenblat and Stark (2016: 3777) settle on a similar formulation in their study of Uber, concluding that "power and information asymmetries emerge via Uber's software-based platform through algorithmic labor logistics shaping driver behaviour, electronic surveillance, and policies for performance targets." The combination of these technical and political considerations within the algorithmic management infrastructure is perhaps unsurprising when we consider that asymmetry is both an aim of Taylorism (see Chapter 2) and arguably the condition of human-machine interfaces in general (Cramer and Fuller, 2016: 150-1).

But it nonetheless poses issues for thinking about workers' capacity to exercise their agency within the work process. In this respect, Lorenzo identified a key difference between his work at the supermarket distribution centre and the manufacturing job he moved on to regarding the way performance was tracked. The distribution centre collects productivity data using bulky digital 'wristwatches' connected to finger-mounted scanners (Figure 1), which is then collated using SAP software.[103] Apart from the times when near-real-time monitors are displaying target percentages at the edge of the working area, generally the day's performance is only known to the worker the next morning by way of the shift allocation SMS, with supervisors picking specific workers to approach on the shopfloor with SAP print-outs (Figure 4). By contrast, performance at the manufacturing job is tracked on a whiteboard which displays twenty to thirty measures of progress relating to various sub-assembly

[103] For an in-depth discussion of SAP, see Rossiter (2016: 51-6).

and assembly processes. Figures on the whiteboard are updated every hour or so, and the final figures are assessed at the end of the day in a debrief. Because the employees are filling in the performance results themselves using dry-wipe pens, they are in possession of the productivity information before the manager. Lorenzo explained that this provided the opportunity for workers to come up with reasons or excuses as to why the performance appeared a certain way before the manager came onto the shopfloor for the debrief — a far different scenario to the distribution centre, where — as I mentioned in Chapter 3 — the introduction of communal screens left workers trying to work out among themselves how their performance was being processed.

One impulse to what Rosenblat and Stark (2016: 3762-3) refer to as the "blindness" workers face in a situation of informational and power asymmetry is to identify the need for trust over the algorithms at the heart of algorithmic management. This is explored in the literature by Lee (2018), who conducted an online experiment to find out participants' perceptions of algorithmic decisions, but it is also reported as an obstacle to organizing by workers such as Jamie and Noah, who felt the untrustworthiness of the information displayed on their screens (such as the Pulse labour allocation tool) actually led to workers concluding the app favoured certain types of workers (moped riders) over others (cyclists) when it came to the allocation of deliveries, harming the potential for building common cause between the two groups against the employer. However, Edwards and Veale (2017) ask whether the 'right to an explanation' is misplaced, and whether it would offer the remedy transparency advocates desire even if they could 'have' it. In Chapter 5, I show that information asymmetry between management and workers may not be the barrier to political action it first appears, and may in fact offer under-considered advantages for workers to exercise resistance.

Framing algorithmic management

Negri (2017b) imagines that "Today, in the post-industrial era, the body and brain of the worker are no longer docile for dressage and horse-training by the bosses;[104] on the contrary, they are more autonomous in building cooperation and more independent from organisational command." But the picture drawn in this chapter bears a closer resemblance to Fisher's (2009: 34) idea that

> As production and distribution are restructured, so are nervous systems. To function effectively as a component of just-in-time production you must develop a capacity to respond to unforeseen events, you must learn to live in conditions of total instability.

Recent scholarship has underlined the significance of the relationship between management technologies and the development of precarious terms of employment (Waters and Woodcock, 2017; Moore, 2018), but even within the confines of distribution workplaces, we can see the emergence of a relationship between a technologically reorganized managerial regime and a political phenomenology of work based on computationally-mediated directives and algorithmically-enforced performance metrics.

Complementing Zuboff's (2015) notion of 'surveillance capitalism',[105] Waters and Woodcock (2017) suggest algorithmic management can be understood as a "synthesis of panopticism and Taylorism". As discussed in Chapter 2, Woodcock (2017a) suggests the idea of an algorithmic panopticon due to the "illusion of managerial control" underpinning Deliveroo's algorithmic management system. However, although the idea of panopticism may be

[104] This metaphor is likely a reference to the dual meaning of *manège*, originally from French.

[105] And indeed an established literature on 'dataveillance'. See Clarke, 1988; Degli Eposti, 2014.

suggestive of a political will that appears to reflect the motives of algorithmic management, it is far from instructive in terms of explaining the actual balance of forces within the work process. To do that, we need to also see algorithmic management as a "[strategy] that capital must struggle to impose" (Cleaver, 1979: 43) by means of enquiring into the political composition of living labour, which is the basis of Chapter 5.

Conclusion

This chapter has assessed the implications of algorithmic management for the organization of work as experienced by workers and has discussed the managerial politics implied by the algorithmic management system. The algorithmically-managed distribution workplace is one in which workers can see aspects of the work process subject to computational logic, right down to their own phenomenological experience of working and the way they navigate the space of the workplace. The intimate integration of personal computing devices such as handheld scanners means communication becomes codified and sanctioned in particular ways, and within platform-based distribution work, algorithms are used to manage workers' access to the labour process. In this chapter, as across the dissertation, I have opted not to focus on algorithms in terms of discrete lines of code, but to understand them as "part of a complex of power relations" (Goffey, 2006: 19), reflecting the way workers themselves encounter 'the system', with algorithms acting "as part of an ill-defined network of actions upon actions" (ibid.). The conceptual imprecision of 'the system' is partly beside the point, partly the point itself. As I have discussed, the *idea* of 'the algorithm' or 'the system' nonetheless takes on its own authoritarian (arguably theological) quality and emerges as a managerial force on the shopfloor in its own right, to both workers and supervisors alike. But it is able to adopt this role precisely because of its perceived unknowability, and its place beyond the informational threshold. This is the terrain of struggle entailed by algorithmic management.

5. Situations of Resistance

If you got a job,
you can be an agent.
You can work for revolution
in your place of employment.

‘Subvert’, Zounds (Lake, 1980)

Introduction

This dissertation has examined the conditions faced by workers within algorithmically-managed workplaces in the distribution sector. Chapter 3 outlined the labour processes of a number of workplaces and discussed the technical composition of workers within them, whilst Chapter 4 took a closer look at the politics of algorithmic management, drawing out the political implications of informational asymmetry between managers and workers, and discussing the effects of managerial tactics implicated in work involving handheld interface devices. Both these built on Chapters 1 and 2, which examined the class politics of workplace technologies and managerial innovation, respectively. Having politicized managerial practices, in this chapter I bring together strands from all the preceding chapters to focus on questions pertaining to workers' political practices.

This chapter focuses on two main questions: 1) What actions are workers taking against the managerial forms that govern them at work? 2) How do these actions contribute to our understanding of contemporary class struggle in algorithmically-organized workplaces? As such, this chapter is an inquiry into the political composition of workers in these workplaces which, following Chapter 4, continues to focus on the relation between the technical class composition of distribution work and the political forms taken by class interests within them. Whereas Chapter 4 discussed the role of technological organization in the managerial endeavour, both in terms of governing the productive process and foreclosing certain forms of worker association or organization, in this chapter I explore the capacity for workers to contest these forms of control, with a particular focus on political forms arising from the technological organization of the work process. In doing so, I turn from more traditional forms of organizing — such as unionization — towards less formal types of action and the idea of what I call a 'metic commons' as a frame for

understanding the potential for alternative forms of association within the algorithmically-mediated workplace.

Braverman (1974: 17) reminds us of the importance of analysing labour processes as part of an historic evolution of social forms — in particular the importance of not simply accepting "what the designers, owners, and managers of the machines tell us about them" but rather undertaking an "independent evaluation of machinery and modern industry". As discussed in Chapter 1, this extends to the way trade unions often take an 'objectivist' view of technologies of organization (Panzieri, 1980), but in this chapter I extend the principle to the political actions of workers by highlighting the gap that exists between 'official' efforts to improve conditions in the sector — which largely occur outside the workplace and seldom focus on the conditions of working life — and the actions being taken by many workers on a daily basis to maximize their interests in spite of efforts by management to mitigate against the 'problem' of labour. Furthermore, I will challenge the idea that forms of resistance taken on the shopfloor are necessarily individualistic or impervious to collectivization.

Collinson and Ackroyd (2005: 321) note "the empirical coverage of resistance and misbehaviour is seriously incomplete, and there are new terrains in which conflict can be expressed." It is the task of this chapter to continue the exploration of this terrain of conflict and signal observable forms of resistance and organizational misbehaviour within them, challenging the perception that "resistance and misbehaviour may have no future (because, among other things, managers and authorities have acquired effective techniques of behavioural control)" (ibid.). As Ackroyd and Thompson (1999: 5) argue, the notion that there is now no alternative for workers but total compliance does not square with what we know of organizational history, nor with the empirical observations of the current study. But it does raise the question of how we classify 'resistance' at work. Having discussed the central importance of worker cooperation to management in Chapter 2, in this chapter I take a broad

conception of workplace resistance, spanning established forms of worker organization, the autonomist notion of 'refusal', as well as informal instances of misbehaviour, on the grounds that misbehaviour includes a raft of actions which undermine managerial attempts to cultivate a certain organizational culture, following Ackroyd and Thompson (1999: 4):

> the processes which are formative of organizational behaviour are, to a considerable extent, outside the control of managers. This means that behaviour can only be affected to a certain extent. …only degrees of conformity with managerial expectation can be produced. A good part of our consideration of misbehaviour…shows how incorrigible *and* innovative organizational behaviour actually is.

While I acknowledge the limits of the term 'resistance' — particularly in terms of its reactive connotations which belie the priority of working-class struggle established in Chapter 1 — in this chapter I use it as a working term along similar lines to Hodson (1995: 80) to refer to acts "intended to mitigate claims by management on workers or to advance workers' claims against management". The latter part of the definition in particular allows me to shift focus from a primarily 'negative' stance of refusal or non-compliance towards a more 'positive' conception of struggle which invokes the commons of the *infrapolitical* realm (Scott, 1990: 183) and the concept of 'metis', which refers to forms of knowledge or intelligence which arise in situationally-specific contexts and invoke an element of cunning (Detienne and Vernant, 1991). In order to do this, I elevate a selected range of political forms from my empirical findings that demonstrate both political and technological guile, which I conclude is a starting point for thinking about the potential for responsive forms of collective action in the algorithmically-mediated workplace. Here it should be stated that judging workplace resistance in terms of its capacity to transform society would be an impossible burden (Ackroyd and Thompson, 1999: 23). However, it is my intention to argue the significance of actually existing

workplace resistance for those who care about the transformation of class society.

Trade unions and the future world of work

Historically, analyses of political class composition have focused primarily on formalized political expressions, in particular the formal vehicles of the labour movement: trade unions, and — in the past — the relationship of workers to mass workers parties. Taken as an expression as the 'class for itself', trade unionism (including independent or base unionism) has historically been concerned with 'organizing' the labour force to improve the social position of labour against capital. The approaches and characters of different trade unions throughout history (and still) have varied dramatically, and as such it is difficult to sketch a general character regarding unions' political activity, but aspects tend to include negotiating with employers, mounting legal challenges, representing workers in grievances, organizing branches within workplaces, calling strike action and engaging with political parties.

Recognition

In the course of my interviews, I spoke with trade unionists from both a small 'independent' union, the Independent Workers Union of Great Britain (IWGB), and a large mainstream union, the GMB. Involved in a campaign to unionize workers at an e-commerce distribution centre, the GMB organizer told me:

> The end game is a recognition deal. (Elaine)

Tactics towards achieving this end ranged from lobbying shareholders and generating press attention to gate jobs, which was the primary point of contact

with workers at the site.[106] The primary aim of the GMB campaign concerned the use of insecure contracts, with other demands concerning pay, dignity at work and transparency. The centrality of the recognition deal reflects the stake held by trade unions for some time within the modern industrial landscape, namely to act as an intermediary between workers and employers in order to negotiate around the terms and conditions of work. With a political endgame looking something like the co-management of work, Marxist scholars have often lamented the curtailment of trade unions' historically socialist character. Braverman (1974: 10) puts this down to a lack of appetite for workers' control:

> The unionized working class, intimidated by the scale and complexity of capitalist production, and weakened in its original revolutionary impetus by the gains afforded by the rapid increase of productivity, increasingly lost the will and ambition to wrest control of production from capitalist hands and turned ever more to bargaining over labor's share in the product.

The contractual focus of unions does not typically lend itself to questions concerning technology except where it threatens jobs (i.e. technological unemployment brought about by automation), and although unions such as the GMB are and have been concerned with negotiating managerial expectations regarding pick rates (Elaine), their approach is one of collaboration with managers and often invoking the language of fair conditions, which is not necessarily felt to be universally positive. While Elaine, a regional organizer, spoke highly of the GMB's role in arranging for ergonomic studies to be carried

[106] 'Gate jobs' refers to the practice of leafleting and talking to workers at the entrance to a workplace in order to persuade them to join the union. It is a tactic used when a trade union lacks a presence inside the workplace it wants to organize.

out at an Asda distribution centre, Todd felt Usdaw's negotiation regarding similar metrics had potentially made life harder:[107]

> **Elaine**: …we're 83% density organized in Asda distribution and we have…a national body that meet made up of lay-members that are elected by the membership… So they have a regulated pick rate and what that means is they've had time and motion that have come out into the site, and they will then look at all the different variations of how.. day working to night working, lone working, lifting, heights, speeds, erm, whether you're a man or woman, whether you're pregnant, whether the lifting equipment technology that you have fits into it. There's a whole array of assessments that's done.
>
> **CG**: So they'll come out on behalf of the union?
>
> **Elaine**: So no, so time and motion generally come out from the employer, so the employer will come out and they've got different ways of doing it like they can click on a button thing or they can do a timer on a watch and then we negotiate and regulate around that, so we know what our members are able to do…they've took into the factors of how far these people have got to walk. You can get massive big bags of dog food so you're having to pick.. Can somebody pick that up? How do they pick it up? …most people order online by the way, the heaviest stuff, so all the tins and all the bottles, so all that has to be taken into account, how easy is it to get 'Z' item from there and that from there and where do you put it, how do you put it into your trays? So it's all, it's all massively regulated and being talked about and if there's something that's not right we change it, we work with the employer to change it, and because we want it to go smoothly, and we want the business to

[107] Usdaw, the Union of Shop, Distributive and Allied Workers, is a large trade union which primarily represents retail workers. It has recognition agreements with a number of major supermarket chains.

succeed, but not at the health and safety of our members and the workforce…the unions are there as sort of a sort of comparator to try and stop people from exploiting the workers and doing too much, and it's just giving the voice of the workforce.

CG: Is there a union?
Todd: Yeah, Usdaw.
CG: Are they active?
Todd: No, they're shit. Yeah, they're really bad. I've never had the union rep come up to me and ask if I wanna join, I had to find out for myself what the union was, and they're basically just a yellow union. The only interaction I know that they've had with my department is that they agreed the maximum weight for these boxes, which is fifteen kilos. What's fifteen kilos times by eight? That's a lot.
CG: 120 plus the trolley.
Todd: Yeah that's what you're expected to be able to push around the whole fuckin' store by the end of the shop. And so yeah the union hasn't done me any favours, just said I need to have a fuck-off heavy trolley to push around. I'd rather not.

Todd's response illustrates the distance that he felt from what was likely considered a win on the part of his union. For Todd the pressing managerial claims to be mitigated involved expectations around performance and conduct, but for Elaine the key priority was winning a recognition deal, after which concessions could be sought in a pragmatic way that seeks an amenable balance between employers' and employees' interests. As I will discuss later, Todd still found expectations demeaning and acted against them on a daily basis with a range of tactics, even after his union's intervention.

A more generous reading of the historical narrowing of trade unions' claims over the productive process could point to the successive restrictions placed

on trade union activity in the UK, particularly regarding the ability to take strike action. In 2016, 322,000 days were lost to strike action — the eighth lowest annual total since records began in 1891 — around forty percent of which were lost to a single dispute (Office for National Statistics, 2017).[108] In the same year membership of trade unions, in decline since the early 1970s, reached its lowest point in the post-war period (Labour Market Analysis, 2017). These figures support Woodcock's (2017c: 98) argument that trade union membership and activities account for only a section of workers' political activity and cannot be taken as indicative of the whole, and they also suggest trade unions are failing to adapt to the new conditions of work. In the distribution sector, the problem is further exacerbated by unions' priority to recruit in-house staff over agency workers (Lorenzo) — a pragmatic calculation to aim for mandatory recognition agreements.

Precarity preoccupation

Beginning in 2016, a great deal of effort from British trade unions operating and campaigning in the distribution sector was focused on the Department for Business, Energy and Industrial Strategy Committee's 'future world of work and the rights of workers' inquiry, which I referred to in the introductory chapter. Although the announcement of the inquiry was framed against a backdrop of the new technological context of work, it was essentially concerned with issues of a contractual nature (Business, Energy and Industrial Strategy Committee, 2016). It makes sense that unions should be so invested in the contractual direction of travel indicated by the future world of work. Not only does it open the possibility of the degradation of workers' lot, but it threatens unions themselves with a crisis of identity and purpose at a time when trade unions are already largely limited to their claimed ability to offer in-work protection.

[108] 129,000 days were lost to the BMA's junior doctors' strike (Office for National Statistics, 2017).

The conversation around the future of employment contracts in the distribution sector and related 'gig economy' has been dominated by the wider concern around the rise of (or return to) precariousness or 'precarity'. The result has been something of a 'precarity preoccupation', with the issue of (in)secure contracts being seen as the key to all future successes. This has implications for the way trade unions organize their efforts, in particular putting resources into engaging in (or initiating) juridical-legislative proceedings rather than worker-oriented industrial action. It is notable that the activity of the future world of work inquiry has been complemented by recent court proceedings involving Uber and CitySprint, brought by the GMB and IWGB unions. Lena,[109] an organizer with the base IWGB union, told a gathering of the Transnational Social Strike platform (Plan C, 2017a):

> When a court rules that the contract is a sham — I'm talking about an employment tribunal — that's the law, and they have to listen to the law. They can kind of long it out listening to the workers complaining about stuff, but ultimately they have to listen to a judge saying, 'You're operating a sham and you have to change things.' So I'm just saying they have different uses, strikes and legal action, and I think in the long run you have to challenge the legality of what they're doing because that's the cornerstone of their business model and it's the ultimate tool of oppression essentially, like these bogus contracts are designed to deprive people of rights, so you have to assert your rights through the court and we live in a liberal open democracy with an independent judiciary, like we should use that to get workers' rights in my opinion because we need them. (Lena)
>
> Like if you don't get sick pay or holidays or pensions on contracts like we're on, it's really hard, and when pay is at such a disparity across the

[109] Name has been changed.

> fleet, it's really hard to convince everyone to strike so although it's really good for highlighting issues, I think it's almost like a PR stunt and I guess that's pretty much it. (Lena)

This juridical-legislative focus, often combined with publicity campaigns, is typical of the activity of unions big and small across the sector in recent years (Elaine, Lena). It is not my intention here to denigrate attempts to get parliamentary or case laws changed in workers' favour, especially given the costs associated with pursuing employers through the courts, and given the UK's strong anti-union laws it is perhaps unsurprising that unions should choose to focus their firepower on the ears of the state when they have an opportunity, but the scope of their interventions demonstrates a selective focus given the spectrum of problems facing workers in these industries. In particular, there is a strong focus on 'fixing' the employment relationship at the expense of investigating the ongoing technological restructuring of the workplace evidenced throughout this dissertation — an order of priorities well-established within the trade union movement.[110]

While the link between dubious employment arrangements and the technologies governing work is increasingly well-documented (Moore, 2018; Waters and Woodcock, 2017), it is striking that there exists a tendency, even in accounts which turn to questions of how workers may resist contemporary encroachments, to frame possibilities for resistance in terms of workers' ability to find leverage in and against the *contractual* dimension of their circumstances. This has been the case in the recent reports of workers 'fighting back' within Deliveroo and Uber (Zhou, 2017). Although we often see reference to the technologies of management, the response tends to ignore

[110] As highlighted by Nick Dyer-Witheford, the decision by United Auto Workers to opt for contractual security over a stake in technological changes in the Treaty of Detroit, although no doubt well-intentioned, proved myopic and arguably jeopardised the future of thousands of auto workers (Dyer-Witheford, 2015: 39-41).

technologies, instead opting for a preoccupation with the wider legal techniques of precarity.

Even where there remains a nod towards technological managerial practices, a focus on the contractual relation upholds a conception of workplace resistance — and 'organizing' workplaces — which occurs at a predominantly 'macro' level. The perspective becomes one in which resistance is conceived of as largely extrinsic to the workplaces in question. Instead of beginning at the point of subjection (i.e. in the work process) and looking at struggle from the point of production, a strategy exists of trying to gain or force recognition in order for a union to negotiate with the employer or lobby for parliamentary scrutiny. Given we have seen how crucial workplace technologies are to how management enacts (or attempts to enact) its control of workers, it is notable that so far approaches to the issue have neglected to consider how struggles within the workplace might be affected. While contracts are certainly a part of the picture, they do not tell the whole story, not least because contracts describe an ideal type of relation and do not necessarily reflect the realities of work. But in a period of significant organizational change across the sector, it feels significant that workers' organizations are primarily concerned with solutions which do not directly involve workers, but instead ask workers to join in order to bestow trust to organizers who will do bidding on their behalf, while day-to-day they remain in a challenging work environment waiting for a change to occur in a meeting room or courtroom elsewhere. This has been a typical and prominent thread within trade unions alongside (and often running counter to) shopfloor organizing within the 'rank and file', despite workers asking for assistance in this respect, and the fact that everyday resistance is already taking place at the point of subjection 'unorganized', regardless of what unions do:

> A challenge to workers agitating in the industry is to assess the everyday tactics workers use to make their jobs easier and articulate them into a

> campaign. It's hard to imagine a future set of demands for workers that doesn't include the technologies discussed above as fundamental platform on which to fight. (Barr, 2018)

Resistance: what are we talking about?

From misbehaviour to subversion

As Collinson and Ackroyd (2005: 320) note, the academic literature on employee resistance is less than coherent, and the lack of agreement on basic terminology — ranging from labels such as resistance, misbehaviour and dissent — suggests differences of opinion on how the field should be defined. In this chapter I adopt a fairly expansive conception of resistance, approaching Sprouse's (1992: 3 in Ackroyd and Thompson, 1999: 2) definition of "anything you do at work you are not supposed to do". While I do exclude 'positive' incarnations of such activity (though the normative appeal of any such instance is contestable),[111] such a definition is necessary to incorporate forms which are usually excluded from terms such as 'organizing'. I note Ackroyd and Thompson (1999) argue for a wider or separate category of 'misbehaviour' but also note it has come to be used in conjunction with 'resistance' (Woodcock, 2017c: 101). For my purposes here, I see the value of incorporating most of what Ackroyd and Thompson (1999: 31) term 'misbehaviour' — especially with regard to the figure they call "the recalcitrant worker" — within the umbrella of 'resistance', not least because it has a dual meaning with implications for the systems thinking explored in Chapter 2. But as I am concerned with politicizing such acts, I find it useful to refer to Hodson's (1995: 80) definition of actions "intended to mitigate claims by management on workers or to advance workers' claims against management". Appropriate for the discussion of workers'

[111] For Ackroyd and Thompson this form of misbehaviour would fall under the sub-category of 'committed engagement' (1999: 25).

interaction with technical systems, Hodson's definition also allows us to think about resistance through the lens of *subversion*. Subversion means we can think about misbehaviour beyond behaviour, resistance beyond negation, and disruption beyond interruption. Subversion allows us to consider action which may take any of these forms, but which may also be understood as an intervention or creative redirection which is concerned with effecting new conditions and maximizing workers' space within the organization and advancing their interests, even momentarily.

Workplaces are messy, and as such I am keen to retain some of the messiness of resistance when considering workers' practices of non-compliance. It is important to note — as Collinson and Ackroyd (2005: 321) do, paraphrasing Kondo (1990: 224) — that

> there is no such thing as a 'true resister' or an entirely 'authentic' or 'pristine space of resistance'. Notions of 'resistance' may thus appear inadequate because oppositional practices are frequently characterized by ironies, contradictions, and unintended outcomes, while employees often 'consent, cope, and resist at different levels of consciousness at a single point in time'.

As such there is a fine line to tread when politicizing resistance, particularly those practices which were not necessarily undertaken for explicitly political or ideological ends. Woodcock (2017c: 109) notes there have been attempts to reframe as 'sabotage' anything short of complete compliance, but whereas sabotage is intended to disrupt crucial mechanisms or machinery, a lot of the actions we can observe "do not significantly undermine the process of capital accumulation". Nonetheless, they may still be political, such as if they are aimed at reappropriating personal dignity taken by managerial practices (Scott, 1990: 112-3). The resistance I discuss in this chapter encompasses a broad set of defensive actions undertaken by workers. Whereas others may equate

resistance with some notion of 'fighting back' (see Scholz, 2017), here I want to make a delineation between more formalized political expressions of working-class self-activity and less formalized actions which indicate a general direction of antipathy from workers to employers. Such a delineation is useful in separating out what I refer to here as the 'organizing repertoire' from other forms of action, because elevating the significance of less formal forms of action may allow us to tap into the "underlying reservoir of class attitudes" discussed by Braverman (1974: 30), and to consider such actions not only in negative terms of mitigation but also in positive terms of advancement or advocation.[112]

Less formalized political activity is characteristically harder to 'see', as theorists of resistance have noted (Scott, 1990; Ackroyd and Thompson, 1999; Woodcock, 2017c). Although often concealed, such acts need not be overtly ideological; general acts involving the "withdrawal of cooperation" (Edwards and Scullion, 1982: 154) can be thought to be 'always already implicated' in the ongoing struggle for cooperation within the workplace (Hanlon, 2016: 155). It should be noted that the point is debated. In attempting to define the parameters of 'misbehaviour' proper, Ackroyd and Thompson (1999: 21-8) argue for a classification schema of workplace practices which may be considered misbehaviour, resistance, class struggle, etc. This is appropriate for their ends in identifying and elevating forms of activity neglected by the literature on organizational behaviour, and they are right to note there are forms of authority and non-compliance that exist outside of class relations (ibid.: 24). But while I am sympathetic to their claim that it is not accurate to "define all the observed employee motives and practices by using the concept of resistance to control, or to judge its effectiveness primarily through the degree of formal, collective action achieved by workers" (ibid.: 23) — actions may have a range

[112] My use of the term 'organizing repertoire' is influenced by Peters' (2015) idea of 'protest repertoire'.

of motives — this does not mean we cannot think about practices in terms of their amenability for collective action, or whether the dispositions or principles involved in those practices might have a bearing on the prospect of workers advancing claims against management.

A framework of 'refusal'

The breadth, possibility and radical contingency of working-class struggle is theorized by Tronti as *refusal*. For autonomists "the beginning of liberatory politics" (Hardt and Negri, 2001: 204), refusal speaks to the agency of workers implied by the class relation, particularly as the wage labour relation (Tronti, 1965), discussed in Chapters 1 and 2 as the indeterminacy of labour power and a fundamental problem for management. Tronti argues the notions of refusal and revolution cannot be separated (ibid.), but far prior to the ultimate collective and organized political refusal of capitalist social relations (i.e. a revolutionary movement), for Tronti (1972) the "point of departure not only for the antagonism, but for the organization of the antagonism" is the point at which "the working class confronts its own labor as capital, as a hostile force, as an enemy". Tronti recognizes in workers' passivity — namely *disillusionment* with work — the spontaneous and elementary step in refusal, the point at which the worker first refuses to be an "active participant" by "opting out of the game". This is fertile ground for Tronti (ibid.):

> Hence, what appears as integration of the working class in the system, by no means represents a renunciation of the struggle against capital: It indicates a refusal to develop and stabilize capital beyond certain given political limits, beyond a fixed defensive cordon, from which aggressive sallies can then be launched.

Tronti's use of language is unfortunate here, but the idea is that the transition from workers' diligent activity to alienated passivity at work is at the same time

the beginning of active refusal. The task then is to overcome passivity by developing “tactics of organization to actualize the strategy of refusal” — i.e. to collectivize and weaponize refusal beyond its initial spontaneity — in order to act upon “the threat of denying [the capitalist] the mediation of the working class in the capitalist relations of production” (ibid.). This requires an organizational turn which Tronti does less to flesh out — and as I will discuss later, the issue of moving from ‘spontaneous’ action to collective action persists still — but, Tronti notes, “passive non-collaboration in the development of capitalism and active political opposition to the power of capital are precisely the starting point and direction of this organizational leap” (ibid.).

The concept of refusal contains within it both negative forms of action (disengagement; doing a job badly, slowly or disinterestedly) and positive forms (redirecting activity, subversion, denying mediation, ‘aggressive sallies’). As such, when thinking about workplace resistance it complements Hodson’s suggestion of acts that may mitigate managerial claims or advance workers’ claims. Woodcock draws on the concept to reframe the politics of the wider phenomenon of ‘everyday’ resistance, in particular its overshadowing by established ‘official’ forms of industrial action. Continuing his claim that trade union membership is a narrow gauge for understanding the extent of workplace resistance, Woodcock argues that while events like strikes are certainly significant forms of action, they are a tactic chosen for their visibility and spectacle. By contrast, most resistant acts are not those workers would want to advertise, especially in insecure workplaces, but rather those which feel more immediately feasible or sustainable in otherwise powerless jobs (Woodcock, 2017c: 98-100). As such they can be considered along the lines of Tronti’s ‘defensive cordon’, indicating what Scott (1990: 183) calls ‘infrapolitics’ — “an unobtrusive realm of political struggle. … That it should be invisible…is in large part by design — a tactical choice born of a prudent awareness of the balance of power” — but nonetheless grounded in the pursuit of autonomy (Ackroyd and Thompson, 1999).

I now turn to a discussion of the observations in the cases. Following an overview of all forms of resistance observed for completeness, I draw out four examples which demonstrate different degrees of refusal, but which exhibit in various ways a relation to the technical composition and technological organization of the work. In particular, I argue they overcome passivity in their use of cunning intelligence (metis), but also depend on an infrapolitical commons which may offer the basis for the 'organizational leap' envisioned by Tronti.

What is observed?

Resistance took place in every workplace I enquired into. In this section I will present all the forms of resistance relayed to me by participants, before examining a selection in closer detail in the next section. In order to avoid overidentification with categories offered in some of the organization studies and sociology of work literature, I will separate them into simple descriptive categories here which will suffice for our purposes: accidental, formal, informal. For completeness, I will give an overview of every type of resistance relayed to me across my interviews with workers and organizers. I do not claim any of the types of resistance are necessarily new — although some methods, as we will see, are certainly novel in their approach — and while I do not claim every instance of informal resistance is driven by explicit political (ideological) motives, it is my position that they all possess political implications. Having discussed them above, in this section I am bracketing out externally-conducted 'macro' forms of resistance, namely legal challenges and press publicity, which (across the cases I have studied) were actions taken on behalf of workers outside of the workplace.

Accidental resistance

Accidental forms of resistance are those arising as largely unintended consequences of either the technological, practical or social organization of work. Three forms were reported. First, technical malfunctions were reported by every participant, and effectively presented a blockage to the functioning of the productive process, particularly as the majority of workplaces relied on a functioning digital infrastructure and had no recourse to a non-digital alternative. As well as creating down-time for production and lag in productivity, technical malfunctions also tended to generate consequences such as talking and wasting time. Second, the disruption caused by the installation of public productivity screens discussed in Chapter 3, which led to workers huddling at the edge of the grid in order to wait for their 'score' to appear. Third, conflict between workers held up the work process, affected productivity and harmed the 'team' ethos many workplaces were purporting to aspire to. Sometimes arising from the physical organization of work (getting in each other's way) or from perceived slights ranging from favouritism to outright racism (particularly in cases of inter-nationality conflict), inter-worker conflict could be viewed as a failure of human relations management in fostering adequately collaborative or happy working relationships, although it should be noted that in two cases participants described supervisors actively encouraging conflict even in cases of bullying.

Formal resistance

Formal resistance refers to acts which may or may not be 'official' (i.e. trade union sanctioned) but are always intentionally political and generally drawn from the historically established repertoire of organizing tactics.[113] While I do

[113] The IWW encourages organizers to structure their workplace interventions around the 'vowels' of organizing: Agitate, Educate, Inoculate, Organize, Unionize. While to my

not claim to have adopted a representative sample, I feel it is important to note these were reported by a minority of participants. The reported practices were: holding meetings (usually in a pub after work, where shift times permitted), liaising via a WhatsApp group or through social media (where groups were set up for the purposes of discussing political activity), producing a workplace bulletin to be handed out to co-workers, encouraging co-workers to join a union, holding a wildcat strike, holding a slow-down.

Worker meetings were started by self-selected groups keen to organize in their workplaces and were populated by invitation. One social media account was set up as a one-to-one/one-to-many medium for workers to liaise with an external union organizer, and WhatsApp groups were variously either set up for the purposes of organizing collectively (and later as a union) or were commandeered for political purposes having originally been social group chats. Workplace bulletins were authored by workers intent on organizing their workplaces or raising workplace issues with large numbers of co-workers; they were generally handed out at breaktimes, before/after work or between jobs, and typically contained details of perceived exploitative practices within the workplace as well as information about related workplaces and details about workers who were organizing politically in other parts of the company (whether at a different site or in a different country). Encouraging co-workers to unionize occurred either in casual but intentional conversations with co-workers, or in one case as part of a union's efforts to recruit with 'gate jobs' (the practice whereby union organizers stand at the gates as workers are leaving the premises of work). It should be noted all these practices can be considered 'bread and butter' organizing tactics deployed by large, small, and unincorporated worker organizations the world over. While none of them are unlawful, according to participants all of them were viewed with suspicion by

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knowledge I didn't speak to any IWW members, all five are covered in the actions listed here, and all five were in evidence when I spoke to Jamie and Noah (who share a workplace).

managers once, or if, they became aware. In one case, managers were reported to have infiltrated a WhatsApp group and used it to discipline an employee marked out as an agitator, before contriving to scupper a planned union meeting by holding a rival meeting at the same time with a voucher incentive for attendees.

Beyond day-to-day 'bread and butter' tactics, there was one reported instance of a wildcat strike, and one reported organized slow-down. The wildcat (i.e. 'spontaneous' rather than balloted) strike was organized very quickly through WhatsApp groups separately from workers' attempts to unionize (although there would later be wildcat strikes incorporated into union strategy). Wildcat strikes (i.e. the collective downing of tools irrespective of mechanisms such as an official ballot) are typically illegal in the UK, but in this case — a 'gig economy' delivery company — workers used the loophole afforded by their status as 'independent workers' instead of 'employees' to avoid any legal consequences being brought upon them. Arguably the action was not a 'true' wildcat strike (Lena, Plan C, 2017a) because it only required workers to refrain from logging into the app rather than staging a collective 'walk-out', but the effect was the comparable. The slow-down was a one-shift protest conducted by agency workers at a distribution centre. Planned through a series of after-work meetings, the workers had formulated a set of demands, the foremost of which was pay parity with in-house workers. As the agency workers were paid seventy percent of the in-house rate for the same job, the slow-down aimed to reduce workers' productivity to seventy percent of their targets.

Informal resistance

By 'informal' resistance I do not wish to infer from observed actions a trivial or casual tenor. Rather, I use the term to denote forms of resistance which tend to lie outside the union organizer's toolbox. While it is true some acts of informal resistance may be dismissed as selfishness, laziness or carelessness

— indeed Lorenzo, whilst relaying details of some of these tactics with pride still lamented their apparent individualism — I wish to defend their inclusion within the framework of resistance, not least because they form by far the largest category of resistant acts from across my participants' observations, but also because they force us to think about resistance outside of what is familiar despite (in most cases) their familiarity.

The implementation of informal resistance tended to be either individually or knowingly implemented, tacitly 'organized' or cooperatively produced, consciously political or not, but certainly not accidental, always falling within Sprouse's definition of resistance, and almost always the result of what Braverman (1974: 35) referred to as "active dissatisfaction".[114] Across my case studies these included: lying, fudging figures, intentional mistakes, doing a bad job, obstruction (making someone else's job harder), damage, stealing, wasting time (including unsanctioned breaks), taking advantage of devices, snooping (especially logging into supervisors' computers), playing games, making fun of managers, talking, eating, refusing tasks, absenteeism, and attempting suicide. These instances range from the mundane to the extreme, and many of them are common regardless of workplace, but for our broader purposes it is appropriate to outline those which bear a relation to the technological organization of work, especially through the algorithmic management system.

Jamie and Noah described the common practice of workers lying for personal gain. Their food delivery platform means managers are distanced from the site of work, so workers have to liaise with the company via a helpline when accidents occur. A common ruse is for workers to call the helpline near the end of their shift and say they have had an accident on the way to a customer's

[114] Commonly (mis)attributed to personal or generational failings, Braverman (1974: 35) raised the connection between "active dissatisfaction" (which we might alternatively call 'attitudinal resistance') and the nature of the work (such as boredom).

house. The telephone operator will cancel the order, meaning the rider can take the meal home for themselves. Jamie and Noah also described how workers may also go through this process for the novelty of ending the shift with a ‘good deed’ by opting to give the meal to a homeless person. By contrast, José described lying as a defensive action: delivering packages to airports incurs hefty parking charges, so a common practice is for workers to ‘forget’ to pick up items bound for the airport.

Lorenzo contrasted the ability to fudge figures in his new job (where productivity is calculated manually on a whiteboard by workers) with his distribution warehouse job where productivity data is collected and calculated digitally. He described how the non-digital aspect of reporting statistics allows workers to make sure they are ‘achieving’ satisfactory targets. Committing intentional mistakes was described in detail by Todd, a worker at an online shopping department. The practice primarily involves abusing the ‘substitution’ function on the handheld device in order to sabotage the stock database, which is updated according to workers’ inputs, as well as providing the amusement associated with giving customers incorrect items of the worker’s choosing. Moreover, the bottleneck created by the organization of ‘shops’ means supervisors are unable to check whether the substitutions are appropriate.

José described testing the limits of the automated reporting of lateness from lunch breaks at a fulfilment centre, and how workers have begun to waste time more liberally having concluded the targets they are expected to hit are unachievable. Todd discussed how workers could effectively take breaks when they desired by exploiting a handset option under the previous digital system — a practice curtailed until Todd found a new workaround. Meanwhile Lorenzo described how some workers discovered a code they could put into their handheld devices which would take them out of the productivity system, meaning they could take breaks from the ‘grid’ floor without raising the attention of supervisors. Lorenzo also described how workers would secretly log into

supervisors' computers to check their productivity scores. Usually supervisors would only bring productivity print-outs to workers if they were underperforming, but by gaining access to supervisors' computers they could find out whether they were overperforming unknowingly.

'I found this out…'

Of all the observed forms of resistance, I want to focus on those which display creative refusal and subversion — not only to avoid the replication of discussions hosted in other studies, but because some of the examples in particular make inventive use of the technological organization of work which has been discussed in this dissertation. Furthermore, they are notable for how, in spite of the technological strategies used by management, they demonstrate not only the mitigation of managerial claims upon workers but the advancement of workers' claims. These examples, I argue, demonstrate an intimate 'metic' (cunningly intelligent) understanding of the workplace which offers a potential way of thinking about the political organization of workers on the shopfloor.

Four examples in particular demonstrate principles which may be carried into how we can think about shopfloor resistance in algorithmically-mediated workplaces: productivity slow-down, taking advantage of handheld devices in order to reclaim time, intentional mistakes, and snooping. As I will argue, these examples are notable for possessing either the quality of or potential for what I call 'metic commonality' — shared situational understanding leading to collective guile.

Example 1: Slow-down

The only one of the four examples which fell outside the category of informal resistance was the slow-down at a food distribution centre in Greater London. Conceived and planned by non-union salts in cooperation with a small group

of employees, the slow-down is a less common tactic of formal resistance.[115] Distinct from 'soldiering' or 'heel dragging', the slow-down was planned as a one-day protest in support of a set of demands formulated by a group of around ten temp workers at the warehouse. Central to the demands was the relationship between the productivity rate and the system of shift allocation via SMS, as discussed in Chapter 3. The scale of the action's adoption was somewhat spontaneous, but this had been part of the gamble of those who had initiated the action and formulated its rationale and demands. The conception, execution and aftermath of the action is relayed by Lorenzo:

> **Lorenzo:** We had political aspirations — we thought, okay, we have to first of all break the system of shift allocation and productivity rate, so as long as they allocate the shifts as they want and tie it to the productivity rate they will be like rat race, I mean people will like fuss in order not to be in the lowest ranks and then get a shift. So we said like, okay, we want four shifts guaranteed at least per week, never mind the productivity rate.
>
> **CG**: Who's we?
>
> **Lorenzo**: It's a small group of people who initially worked there with a purpose to organize something, so that was three of us, and then that group kind of grew to let's say ten people who would come sit here in the same [beer garden] table, so we had the idea of having that type of like 'demand' if you want, like four [shifts] guaranteed and same wage as the permanents, because the permanents, their productivity rate in general, especially if they've been like longer established there then their pick rate is lower than of the temps and then they don't hassle them so we say like y'know, we do the same work for same money. …the

[115] 'Salting' usually refers to the process whereby union organizers join a workforce in order to unionize it. It is a common tactic of independent or radical unions such as the IWW. In this case the three salts who worked at the warehouse as agency hires were not trade unionists.

> main discussions were like amongst us in the grids, and we said, okay, what is our possibility? Let's just read out the demands in the briefing in the morning before shift… And then we said we were gonna do a day of slow-down, so we work seventy percent because we only get seventy percent, so basic kind of equation, and that was in a sense, people would know at some point we would do it, but not the permanents, the permanent workers were not like included, maybe that was a mistake, maybe it was good because maybe they would have talked, some of them. So one day we said, okay, seventy percent. About three quarters of the temps took part in that you could see, y'know, productivity going down, people were having fun like for one, two hours it was real fun because you could really see everyone is working slow and like making fun of it, going slow motion and you could see the supervisor coming in there to have a meeting with [the logistics company] and, 'What are you doing? What the fuck?' and y'know big kind of.. So for two hours it was really great and then they asked the permanent workers to work overtime, and they did, maybe also because some of them were not even aware that there was something like an 'action' going.. We talked to them a bit but like also we didn't want to be too vocal, but in the end we were too vocal… So yeah we got disciplinary and we got kicked out, and yeah, that was it.

The slow-down at the Greater London supermarket distribution centre was conceived as an intervention into one of the primary political forms taken by management, namely the mechanism which tied agency workers' productivity to their daily shift allocation. The organizing group took advantage of the daily briefing to publicize their demands and relied on the proximity of workers on the grid for other temp workers to join in with the action. Notably, the action made use of and subverted workers' experience of the digital infrastructure of the productivity system. Being used to finding out their productivity percentage on a day to day basis in the morning shift allocation SMS, workers were able

to subvert their experience of work flow to achieve the desired rate of effort (seventy percent of target productivity), which was confirmed in the following day's text messages. The slow-down was also fun, creating an intervention into the usual psychosocial dynamic of the work at the distribution centre by flouting and subverting the authority of the algorithmic system, in doing so making visible the 'illusion' of managerial control and its reliance on workers' cooperation.

Although the slow-down was unsuccessful in achieving its demands, it attempted to overtly mitigate and militate against poor pay, worker competition, unforgiving productivity management and the shift allocation system. The threat of the shift allocation system was also resisted through the act of joining the slow-down, with workers appearing to set aside concerns about the direct effect their participation would have upon their own shift allocation. Meanwhile the action was able to advance claims both overt and implicit: overt in terms of the pay and shift allocation demands; implicit in terms of inter-worker cooperation and collaboration, and in subverting the authority of the productivity system by second-guessing its calculation.

Example 2: Taking advantage of handheld devices

At both the Greater London supermarket distribution centre and the south coast online supermarket distribution centre, a more consistently 'everyday' form of resistance involved taking advantage of handheld devices in order to reclaim time from 'the system'. At Lorenzo's warehouse this involved workers putting a special code into their wrist-mounted interfaces, which would take them out of the productivity system and create time for an unsanctioned break:

> **Lorenzo**: There are different codes, for example, what can happen is that you made a mistake and you want to — because if the checkers find the mistake then you get a [disciplinary] point and you're not

supposed to have too many points for having done wrong stacking — so you can tell the supervisor that you think you made a mistake, then what happens is the supervisor has a little barcode that you can scan, then you're out of the productivity counting element. You've got free time, so to speak, to look and see if you made the mistake, if you find the item or whatever that you might have put in a different cage/in the wrong cage. So that normally, like, you wouldn't know the code because you scan and that kind of quickly gives the information from the scan to the watch saying like, okay, from now on you can go through the cages, it shows you on the wristwatch how many items should be in there and you can double-check. So, some workers know the code — I mean either they've heard it from a supervisor or they have some way to find it out, and the company might change that code because workers use it, yknow you find them in the locker room for five minutes just having a rest, and you know, okay, they've got the code. Where there's a bit like yknow.. some of the workers are private with that because they know only if a few workers have that code it won't..

CG: So they actually leave the grid?

Lorenzo: Yeah they go like y'know in the locker room or it's a bit risky but hang out in the toilet, but they are a bit private about this knowledge because y'know they think if it spreads then too many people use it and then I can't use it anymore because management will come down on it.

Meanwhile in Todd's online supermarket distribution centre, historically workers could make use of a button on the handset menu which would remove items above a certain size from their shop, making the shop go quicker and allowing workers to get rid of heavy trolleys or effectively choose when they took their breaks:

Todd: If it [an item] doesn't fit, you have a button.. the options button comes up with another menu and you can say 'item will not fit', and what

that will do is get rid of any other items in that same box that are around the same size that are left on the shop, so another small sabotage thing that happens…when you wanna go on your break or you just can't be bothered to push the trolley around anymore because it's really heavy, you'll press that for items to get rid of the shops to make it go quicker. So you can get away with it, and you can leave or sit down or do something else.

CG: Do they not realize when they come to pick up the boxes?

Todd: No, they're too busy, so you can take advantage of them running around, the managers like. And because the shops are all sort of.. you're anonymous in doing it because somebody else will have another part of the same shop.

However, with the introduction of a new digital infrastructure, new menu options meant workers were no longer able to determine when their shop would end by taking advantage of the 'item will not fit' button. But within a week of the new system being introduced, Todd had found an alternative way of ending shops prematurely:

Todd: I found this out.. So, on the old system you could end a shop whenever you wanted [unauthorized] and go on your break whenever you wanted. With the new system you can't prematurely end a shop. You can press the 'item will not fit' but that doesn't get rid of everything like you used to be able to. Now you have to finish the shop before you go on your break or whenever you leave or whatever. But I worked out you could pick up another handset that you're not logged onto and you log onto it and then a menu comes up that says 'carry on' or 'exit shop' and if you press the 'carry on' button the shop will switch from this gun to the other gun, which is useful for when you've run out of battery or something like that, or, if you press the exit, it gets rid of the shop and so you can go on your break again. It puts it back into the system.

CG: How easy is it to pick up another gun?

Todd: Well say I take my breaks at 8 o'clock — it's 8 o'clock and my mate's finished and we're gonna go out for a fag and she's already logged off her gun, she'll pass me her gun, I'll log onto that, it'll come into the in-between menu where on the other one it's carry on or exit, then exit. So I worked that out the first week the new system was introduced and the managers didn't know that that could be done, but then they did know about it and I got a bollocking.

CG: How did they find out?

Todd: I guess somebody told 'em, 'cause a few people were doing it as well because I was showing people and word gets round. Um, I was actually showing one of the team leaders once winding her up… Yeah I think that was it, I accidentally went into a really long shop and I said I'm not gonna do it because I want to go on my break, and I would have been there till half 9 and that's half hour before I finish and I was like, 'there's no point taking a break then.' She said, 'No, you have to do it because you can't come out of a shop.' I said, 'Yeah I can,' and just did it (laughs), and yeah maybe that's how they found out. Grassed myself up. It happens dunnit?

In these cases, workers exploited cracks in the digital architecture, taking advantage of the organization of work to advance claims to time and rest in secret by outsmarting the system, seizing the opportunity to act out of the gaze of supervisors and engage in limited collaboration with other workers. In Lorenzo's case, workers were able to resist the claims of the productivity system, in particular the intensity demanded by the maintenance of the CPM rate over time, as well the length of time between breaks, and of course the exclusivity of the code itself, which was formally reserved for supervisors and managers. Until the change of system, using the 'item will not fit' button allowed workers in Todd's case to direct the length of time between their own breaks, and until Todd made his team leader aware of the workaround he had

discovered with his colleague, they had been able to re-establish control over their break times by using the handset-switching technique.

Taking advantage of the affordances of handheld devices involves taking advantage of the physical distantiation of managers and their trust in the algorithmic management system, both in terms of its ability to keep workers working and its capacity to reflect periods of downtime in its performance calculations. As a form of resistance, it allows workers to suspend the work flow by disrupting the data transmission from between their device and the system, allowing them to move about the workplace as they wish in order to take breaks on their own terms.

Example 3: Intentional mistakes

Another type of resistance regularly undertaken by Todd was in making intentional mistakes. This took two main forms: doing product relocations incorrectly, which would confuse the database and lead to stock errors, and giving customers amusing item substitutions.

> **Todd**: When the item isn't where it's meant to be you're normally supposed to do product relocation where you go find where it is and then you have to scan the whole shelf to update the computer system, because it's all live, it updates as it goes. You're meant to do that.
> **CG**: But will your productivity tracking be paused for that time?
> **Todd**: No, no, it won't be paused, it bites into it, and these things can take four, five minutes. Again as a low-level sabotage in dragging heels you either don't do it — you substitute it instead and pick something else — or you find it and instead of scanning all of the items you just scan the shelf number and the one item, and then that fucks up everything else that's on that shelf, and then someone has to do every single item

on that shelf because the computer thinks, ‘This is the only thing on the shelf’. (Todd)

Although there is a clear incentive to cut corners on a product relocation while it negatively affects one’s productivity calculation, it occurred to me Todd seemed rather intent on exploring methods of refusal with little discrimination, so I probed further, asking why he was so keen on committing sabotage:

Todd: You’re bored out your nut... And because the way I’ve always understood this, particularly this job, is.. So, it’s very low-paid work, just for the sake of my self-esteem here Craig, I want to make it feel like I’m being valued, so I want to make my work as expensive as possible by being as least productive as possible. The less work I do in the hour, the more that little bit of work that I’ve actually done is worth. So for the fact of self-esteem I want to make that £7.80 stretch out a bit. So yeah, away from the sarcasm it’s bitterness. You’ll kick out at the boss, at the job, for being shit. It can make the job fun — so one of my favourite things to do at the moment is because they can’t see who’s substituted things, there’s no drawback, no backlash you’re gonna get, so every single film or DVD that gets requested, I substitute for Star Wars: Rogue One, because it’s a sick film and everyone should see it. Yeah just stuff like that, it’s funny, it’s fun to do...

CG: Can they not work out who’s done the substitution? I’m trying to think about the paper chain if you like, in terms of the barcodes and scanners, so if they see the item’s wrong, do they not think, ‘Okay it’s wrong and it’s in that box, and that box was in that trolley, and that trolley was assigned to you’?

Todd: I’m not sure if they can or they can’t, but given I’ve been repeatedly substituting things like Peppa Pig for Rogue One, TV boxsets — someone ordered a TV boxset of something, got given Rogue One instead — so it’s really obvious, like this is not even a connected item.

So there's been instances like that where it should have been them having a word with me, but they didn't.

CG: Will they check the substitutions?

Todd: So they can see the substitutions are happening because they can see what buttons you pressed, but they don't seem to be able to see what's been substituted for what, just that a substitution's taken place… So I haven't been spoken to personally. It seems to suggest that the shopper is made anonymous, I mean I don't know how far it can be pushed, it's something I'm still trying to figure out.

Todd readily admitted the work had something of an infantilizing effect which made workers, especially young workers, want to 'play up', but regardless of tone it is without doubt Todd was expressing his 'active dissatisfaction' and establishing for himself what he felt was a 'defensive cordon' against the more onerous claims placed upon workers by management. In particular, Todd attempted to mitigate the perceived punitiveness of the work, the authority and paternalism of digital instructions, and what Todd considered to be the demeaning character of work, especially its boredom. In doing so, Todd was able to sabotage the 'informating' aspect of the algorithmic management system by sending false information across the algorithmic threshold, taking advantage of managerial distantiation and the communication options afforded by the handsets in order to make fun, get pleasure from insubordination, and possibly inflict reputational damage on the company.

Example 4: Snooping

Todd referred to his understanding of what supervisors could and could not know about workers from their end of the digital infrastructure. This understanding was partially formed on the basis of whether disciplinary consequences arose; it was also partially informed by multiple efforts to see

what supervisors were seeing on their computers, initially in terms of productivity, but also in terms of workers' actions in general:

> [Workers' productivity] is on the computer screen in the area where they [supervisors] load up the trolleys. They have a computer that one person normally mans…they can't see what you're doing…but they can see every single function, every single button you're pressing, but they don't know what shop you're doing it on. (Todd)

> **Todd**: I saw the opportunity to have a look at the screen, so I said to the manager, 'I don't understand, what do you mean?' And she said, 'No it's all up here up on the screen.' She showed me it.
> **CG**: This is their computer?
> **Todd**: Yeah, and it had a list of every single button that had been pressed, but it will just have like, pressed a function button, went on this menu, pressed on this menu, came out of a shop, went onto a shop, came out of a shop, went on to a shop, it doesn't have anything to do with the items, or I don't think it did anyway, so it's something I need to have a look at again.

While Todd's approach relied on engineering excuses to look at the supervisors' monitors, in Lorenzo's warehouse workers adopted a slightly more skirmish-like approach by waiting for supervisors to be in a different part of the warehouse before covertly logging into their PC:

> …workers know how to operate a computer. Normally you're not supposed to touch it but there is for the supervisors a computer at the end of the grid and some workers who have been there a bit longer, they know how to get to the.. So if they want to know like about their productivity rate they can look it up on the supervisor's computer. (Lorenzo)

These actions intervene in managerial political forms by trying to gain insight into the computational vision of supervisors from the other side the algorithmic frontier, particularly through taking advantage of the layout of the workplace in Lorenzo's case, or indeed by taking advantage of the supervisors themselves in Todd's case. In adopting these 'snooping' tactics, both Lorenzo and Todd attempted to gain access 'behind the curtain' to access managerial knowledge regarding workers, thereby surreptitiously advancing a claim to knowledge of their own performance and the asymmetric functioning of the system more broadly. For Lorenzo this was largely a question of assessing whether or not workers had been overworking (in their own way trying to ensure the expensiveness of their labour), whereas for Todd it arose from a wider concern of figuring out which actions workers could get away with. Furthermore, in both cases these participants resisted the assumption of the managerial retention of data generated by workers, both in terms of the range of data points (Todd) and the content of the data (Lorenzo).

Collective action problems

An obvious objection to the politicization of these actions would be to say they are largely the actions of individuals — especially disgruntled individuals or individuals apparently intent on finding ways to be disruptive. But as I have argued above, such actions are nonetheless political even if their scope seems marginal. However, there remains a concern as to whether these 'individual' actions have the capacity to be 'scaled up' or generalized across a workforce as part of a collective endeavour. This was a point of reflection for both Lorenzo and Todd:

> So in that sense, yeah, there're these little individual ways to deal with the system. Normally it doesn't create any collective kind of sentiment. Another way that people try to get a higher productivity rate is by taking single items, that means you don't pull a whole pallet with 200 to 500

items, you take a little single item that is on a smaller trolley, and if you — normally these are located in certain supermarkets — if you've worked there long enough you know this item will go there, so I quickly take it and I only scan in once I'm already there at the end of the grid, and you get I don't know 200 percent for that. So, and some people want to monopolize that, they make themselves have a bit of an easy life, which creates a bit of like, not like a collective feeling. So, in that sense most of these strategies to deal with these kind of imposed system relies on individualist behaviour, so not very heroic. (Lorenzo)

Todd: …it was the team leader making the colleague cry that's made this quite a realistic thing 'cause a lot of people were quite annoyed about this, so one of the tactics is instead of waiting until your shop's finished and then taking your trolley out to the back for them to sort out, when you want to go on your break just leave it in the shopfloor, leave it with the gun as well, go on your break and come back to it after that.
CG: Why would that be problematic?
Todd: So, that would completely ruin the pick speeds, 'cause you're mid-shop and all of a sudden there's fifty minutes of inactivity, and so that would make their targeting system, their way to measure productivity useless, because if it becomes common practice that every shift there's a huge group of people with fifty minutes of inactivity not because they're slow at shopping but because they're going on their breaks and not leaving their guns out the back, yeah it'd be a way to damage the way that they penalize it and y'know the direct relationship with it is that the colleague was made upset over her pick speed.

There are certain principles and concerns here which are reflective of all the interviews to various degrees: the highlighting of "individual ways to deal with the system" and concern about the (usual) lack or (occasional) presence of "collective feeling"; tactics that get learned "if you've worked there long enough"

but a recognition that rendering managerial political forms “useless” relies on them becoming “common practice”. With these issues in mind I now want to abstract from observable moments of resistance to consider the principles they evoke, arguing alongside Thompson and Ackroyd (1995: 629) that

> The essential conditions for resistance and misbehaviour are still present… It is not a case of ‘waiting for the fightback’, romanticizing the informal, or disregarding the capacity of unions to renew their own organisation and strategy. Rather…we have to put labour back in, by doing theory and research in such a way that is it possible to ‘see’ resistance and misbehaviour, and recognize that innovatory employee practices and informal organisations will continue to subvert managerial regimes.

In doing so I will use two key frames: the Ancient Greek concept of *metis*, adopted and revived by a disparate range of scholars in the last two decades, which I will use to discuss the guile demonstrated by workers despite the technological and organizational circumstances they face, and the more familiar political concept of a *commons* — in this case in terms of the infrapolitical realm which exists among workers involved in even informal practices of resistance. I will then discuss how a notion of *metic commonality* allows us to ‘see’ the political composition of workers in the case studies.

Principles of resistance

Metis

A common aspect of the selected examples (as well as other observed instances) of resistance is the presence of metis. With no direct English translation but usually understood as ‘cunning intelligence’, metis (μῆτις) is an

Ancient Greek term denoting the application of a form of knowledge which is variously practical, situated, cunning, experiential, wily, vernacular and deceptive (Singleton, 2014: 102-7).[116] Necessarily difficult to formalize in action, the term is similarly slippery. Often reduced to a quality approaching 'local knowledge', 'responsive intelligence' 'know-how' or a 'knack' (Scott, 2005; Letiche and Statler, 2005; Campbell, 2015), Singleton (2014: 105) draws on Detienne and Vernant (1991), arguing alongside Chia and Holt (2009: 196) that a fuller and more accurate understanding of the term necessarily requires the inclusion of duplicity and in particular guile — political aspects of metis which roused Plato's ire in his meditations on the concept. Detienne and Vernant (1991: 3-4) describe the term as a way of knowing which

> implies a complex but very coherent body of mental attitudes and intellectual behaviour which combine flair, wisdom, forethought, subtlety of mind, deception, resourcefulness, vigilance, opportunism, various skills, and experience over the years.

Resistance involving metis is necessarily active. Metic resistance is not merely a source of drag on flow, but an intervention into the system.[117] The implication for strategies *against* resistance (i.e. managerial innovations) is that they are political rather than technical. Moreover, metis emphasizes the aspect of refusal which is not merely withdrawal, but the inventive action of conducting one's time and energy to reorient labour time towards one's own will against the efforts of the managerial endeavour. In his discussion of *la perruque* ('the wig'), for example, de Certeau (1984: 25) posits the way a worker may

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[116] Due to the lack of direct translation, μῆτις is variously transliterated as metis, mêtis and mētis within anglophone literature.

[117] Regarding the slow-down, for example, the aim of the action was to reduce the performance rate down to seventy percent to make a specific point about pay disparity. Rather than merely working slower than usual, participants had to gauge their work rate based on experiential intelligence and judgement.

creatively divert work time towards their own “free” endeavours, ensuring it is nonetheless “disguised as work for his employer” (sic). To understand resistance as metic is to evaluate the notion of ‘doing what you’re not supposed to’ in such a way that draws out the practical and situational acumen that informs such actions, as well as affirming the agency of the people who undertake them. Resistance in this sense is a subversion (and reappropriation) of one’s own labour, a reorientation of activity towards satisfying one’s own preferences and getting away with it. Woodcock (2017c: 104) notes how it can take some time before workers feel comfortable enough at work to begin engaging with other workers (especially for the purposes of deviating from managerial instructions) because of the initial fear of being sacked for incompetence. What is it that makes the worker feel comfortable after time — comfortable enough to talk on the job and exploit opportunities for non-work activity? It is what Lorenzo and Todd referred to in describing their ‘tactics’ for pushing back against managerial systems — the learned knowledge of where those opportunities exist and how to get away with taking advantage of them. This is metis in action.

Tactics, in this sense, are opportunistic; as de Certeau (1984: 26) argues, they are form of art ‘tricking’ order against itself. Lacking the power afforded by a proper ‘locus’ (see Chapter 2), the art of “pulling tricks” in this way “involves a sense of the opportunities afforded by a particular occasion” (ibid.: 37) which invokes a “clever *utilization of time*” (ibid.: 38-9) — and indeed a sense of *kairos* (καιρός), or the ‘right’ time (de Certeau, 1980: 37). A tactic successfully pulled off is therefore a “guileful ruse” (de Certeau, 1984: 37). But although he connects his theory of tactics to a discussion of metis (de Certeau, 1980: 36-38), de Certeau (1984: 39) states his disinterest in developing a “semiotics of tactics” — his accounts of *la perruque* and battlegrounds serving as illustrations for a theory of consumer culture and practice rather than political resistance. However, the idea that tactical intelligence involves a ‘sense of the opportunities’ is instructive in considering the idea of metic resistance.

Metic resistance is necessarily political rather than technical. This is what Taylor (1911: 6-8) recognized in workers' ability to regulate the productivity of their work and ratio of effort to wages. Taylor's response was similarly political, as I argued in Chapter 2, but despite the spread of scientific management methods right through to algorithmic management systems, we still see the persistence of metic subversion. We observed this in Chapter 2, in the failure of Uber drivers to 'cooperate' with the app by 'gaming' it (Lee et al, 2015). But whereas Uber relies on a decentralized standing reserve of unpaid would-be workers, along similar lines as Noah and Jamie's food delivery platform, workers in distribution centres are tracked within a productivity system for the large majority of their working hours. In these workplaces, the cunning involved in resistance involves learning (or experimenting with) what the management system (and human managers) can and cannot know; i.e. to gain a 'sense of the opportunities'. As Todd put it when questioned about managers' ability to find out about his purposefully inappropriate swapping of items:

> You gotta remember…because everybody's doing similar sized shops, it's never that one trolley will come in at a time, it'll always be twenty at a time, twenty at a time, so you know they're rushed off their feet loading these up, getting them organized, getting them ready for the first deliveries at 7 o'clock. (Todd)

> They don't have time to check through 160 boxes with the sheet of paper with all of this, so you take advantage of the lack of manpower. (Todd)

> They're too busy, so you take advantage of them running around. (Todd)

Taking advantage of the supervisory reliance on visual checking was similarly reported in Woodcock's (2017c: 107) ethnographic observations of call centre workers resetting a timer to claim extra minutes for their break, but as I discussed in Chapter 4, the managerial reliance on the algorithmic system in

particular sits alongside managerial distantiation and alters the ways managers maintain their 'presence' and control over workers as they work. As I further discussed, such a system appears to require a measure of cooperation from workers, at the very least in terms of proper communication as demanded by devices such as handsets. In Todd's case we see something like informational refusal or subversion, whereby data is given to the system in the correct form but is false or misleading. What we see is that with managers largely absent from the shopfloor, workers instead 'negotiate' with the system, which — programmed to anticipate compliant workers — is unable to respond in comparably cunning ways. This is what Lunghi (2017: 49) calls a "counter-logistical moment".

Contemporary activist responses to the organization of the distribution sector and phenomenon of logistics are often concerned with the question of leverage (Milburn, 2015) — "fault lines and weak points" (TSS Platform, 2017: 9) where workers could concentrate power to tip the balance of control in their favour. The ambition recognizes the fulcrum aspect of logistics within the wider economy, but as a strategy it struggles once the scale of the managerial control operation becomes clear, leading organizers to settle on contractual aspects of working conditions as a predicate for effective future action (Lena, Plan C, 2017a). The issue of leverage is apposite to a discussion of metis — examining applications of the term, Singleton (2014: 108-9) discusses how levers embody metis by intervening in physical circumstances to move greater weights with smaller forces with against apparent probability, drawing upon the ancient Peripatetic text *Mechanica* (Pseudo-Aristotle, 1936). Applied to the workplace, what emerges looks less like workers' power as traditionally conceived, but more like workers' guile: the use of situated wisdom and experiential cunning to seize or subvert, even momentarily, the current of managerial control; "to create and expand the glitches in the system" (TSS Platform, 2017).

Commons

To what extent is it really the case that existing examples of resistance are confined to the practices of individuals? The actions I have covered have seldom arisen from lone ingenuity, and even in cases where that is closer to the truth, workers have relied on confidants and blind eyes to continue practices undetected. While resistance may in one sense take the form of individual acts of refusal, in another sense there is a social situation which provides the conditions of possibility for those actions. This social situation may involve a direct induction into 'tricks' workers can deploy, or ignoring (or learning from) the misbehaviour of a co-worker. In Woodcock's (2017c: 108) ethnography, resistance often involved "glances and mouthing words across the call-centre floor" and being complicit in a covert social code: "reporting the problem [of leads running out] straight away was generally frowned upon as it would take that choice away from others". This is what de Certeau (1984: 26) envisages when he describes how "With the complicity of other workers (who thus defeat the competition the factory tries to instill among them), [the worker deploying *la perruque*] succeeds in 'putting one over' on the established order on its home ground."

Once the range of managerial claims over the work process are taken into account, it is possible for an account of resistance to end up setting out from a negative starting point — i.e. '*what is left*' for resistance when managers have thought of a vast number of ways to discipline, incentivize, control, persuade and curtail workers from all paths but productive compliance? Such a position takes ideal managerial types at their word, and ignores the point that the introduction of a new technology can never be fully planned (Srnicek and Williams, 2015: 146), and from a strategic perspective (Cleaver, 1979: 25) this approach offers vanishingly little in assessing the potential for workers to exercise autonomy, which — as the examples above show — is worked out through use over time. My argument is therefore not to insist on a blind

optimism of the will, but rather to prioritize a basic and common starting principle of successful challenges to the work process: beginning with what is shared by workers as the basis for exploring what might be possible (and how).

As I discussed in the opening chapters, managerial (and indeed governmental) interventions have sought to curtail or control some of the most obvious forms of collective action throughout history, but nonetheless we see the persistence of resistance in the workplace — as I discussed in Chapter 1, through inquiry we see that workers are never fully subsumed (Ferrero et al, 2006: 42 in Fasulo, 2014: 327). While formal modes of collectivism might be elusive, there remains a *commons* present in even individual acts in the form of shared situational understanding and knowledge based on the 'hidden transcript' — the "critique of power spoken behind the back of the dominant" (Scott, 1990: xii) — of the workplace.[118] This is the basis of much everyday resistance, the possibility of communicating with a co-worker 'on a level', and certainly a foundational requirement of any effective collective action. Importantly, an understanding of (and access to) the commons cannot be deduced from sorting through all the formal managerial claims over workers — it necessarily takes time to emerge. It does not merely reside in the gaps between steps in a process, but in a disposition developed within and between workers over time through interaction with one another and with their surroundings. This is the difference between new workers who are scared to deviate from that which is expected, and the worker who knows what they can get away with. It is something which is not readily available to managers, no matter how many gemba walks they take,[119] because it cannot be gleaned from the perspective

[118] It is important to note that the hidden transcript "does not only contain speech acts but a whole range of practices" (Scott, 1990: 14).

[119] As discussed in Chapter 2, gemba walks are sometimes a feature of kaizen management practices. Lauded as a technique by Amazon, they involve managers walking through the productive process on a daily basis in order to identify things to improve.

of an auditor.[120] Moreover, it cannot be researched without inquiring into the daily lives of workers. As an anonymous supermarket worker wrote for Plan C:

> The first few weeks you assume everyone's a jobsworth. You feel watched all the time. But after three months you stop giving a shit and start to slack off. Then you notice other people slacking off in the same way as you. You bump into someone by the bailing machine and give them a knowing smile as you get your phone out. It's never explicit, but after six months you give each other the look; 'I know you've just been doing fuck all for the last half hour, good on you.' Then you get close to people, and try and one up them on how much shit you have or haven't done. 'We once took 40 minutes for a 15 minute break but got fucking dobbed in by Mary'. (Plan C, 2017c)

In laying out the rationale for his *Principles*, Taylor (1911: 8) expressed his concern regarding the transference of resistance tactics from older to younger employees, recognizing the existence of a commons between workers (ranging from traditional knowledge to 'systematic soldiering') which creates the possibility of autonomy (literally, knowledge of and command over the rules of the self).[121] In this sense, one aspect of Taylor's suggestion of breaking down

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[120] Indeed, the fact that the organization of the work process is subject to changes and adjustments over time means managers who were once workers are liable to have their own experiential knowledge surpassed, as their own work flow is different from that of ordinary workers.

[121] And yet Taylorism fails to subsume the commons, in most part because it assumes the possibility of managers obtaining "with absolute uniformity" the "'initiative' of the workmen" (Taylor, 1911: 15). Although Taylor identifies the realm of 'traditional knowledge' which is something of a mystery to managers (to their detriment), his solutions presuppose the content of that 'traditional knowledge' before they gather it. The possibility of the continuous expansion or constant change in the content of knowledge to be gathered is the insight of both Human Relations and TQC/kaizen approaches. These are underdeveloped in distribution workplaces — and in any case fallible — and exist mostly as ideological set-

work tasks and intensifying the work rate is about disrupting the common infrapolitical realm that exists at the level of metis amongst workers. Readings of metis sometimes stress the difficulty or impossibility of transferring the content of metic knowledge across situations (Letiche and Statler, 2005) due to both the situatedness of metic knowledge and the impossibility of codifying something as intangible as a knack. But less is said of the possibility for generalization of metic principles within a *shared situation* across actors, particularly when they share a situation over time and are each able to engage in trial and error. What charges of individualism miss about informal action is that these tricks and tips are often transferred between workers, creating chains of discovery through the workforce. Even where they are not, we can still say some forms of resistance are generalized, in that they are regularly enacted by workers from day to day — they might not be acting 'for the class' but they are still in a sense acting 'as a class' with political significance.

Metic commonality

One challenge of thinking about resistance in terms of metis is that it forces us to think about the situatedness of political action away from ideal types, such as found in the organizer's repertoire. While this may be advantageous to workers (in that it may elide managers), it also presents political and methodological challenges. Where the notion of the commons allows us to think about the social prerequisites for political action (especially in terms of established concepts such as hidden transcripts), the concept of metis encourages us to think about the place and space of the labour process, as well as the forms of social organization and social knowledge arising from the phenomenological reality of working in particular workplaces. Metis also

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pieces. Nonetheless, the presumption of even the most sophisticated algorithmic management infrastructures is that these aspects can more or less be either captured or mediated by computational devices. What we are left with is a management apple picker but workers who are dealing in both apples and oranges.

encourages us to think about the resister as a cunning and intelligent actor, an active agent implicated in the infrapolitical realm. But, furthermore, the lens of 'metic commonality' forces us to think about where collectivity and organization already exist. Woodcock (2017c: 106) documents one example:

> At the start of each three-and-a-half-hour shift there was a buzz session with the supervisors…The length of the buzz session was never officially defined and therefore it was at the discretion of the supervisors. This meant that as long as the games or discussion continued it could be stretched out. This involved a level of informal organisation as one individual worker could extend the session by asking more questions as the supervisors would catch on that they were trying to distract them and therefore cut the buzz session short. A successful extension involved a careful balancing act of feigning interest, posing questions and stimulating discussion. …a collective approach emerged around this. Subtle cues would be exchanged under the gaze of the supervisors, a nod or raise of the eyebrows encouraging others to participate in the process. Although even the best attempts — which were then gleefully relayed to others in the breaks — could delay the start of work by at the most forty-five minutes, it was viewed as a significant victory.

In this case we get a sense of the trial and error of repeated buzz sessions, the shared social understanding between workers, the political desire to reclaim time and have fun, and the metic creativity of inventing reasons to keep the sessions going. In the earlier examples arising from the cases, we can consider the exploitation of menu options to bring about breaks; the stealing and sharing of supervisors' codes or computer log-in details; the use of the knowledge of what supervisors can and can't know, and how busy they will be at a given moment, to amuse oneself and create problems for the stock database; the defiance of the narrow forms of communication demanded by interfaces; the shared experience invoked in slowing down to seventy percent

of productivity, reasserting workers' autonomy over performance; the ingenuity of testing new equipment in order to find new ways to subvert it — and all the lessons passed between workers through these actions, the blind eyes turned, and the sense of empowerment felt. We see confirmed in acts of metic commonality the illusion of the extent of managerial control, a "precarious assemblage" (Woodcock, 2017a) exposed by *workers' guile*.

Within the algorithmically-managed workplace, metic commonality manifests as a sort of tactical shrewdness that savvies the way computational structures intersect with the human dynamics of the work setting.[122] The examples above make use of the way algorithmic management affects work, such as communicational forms and work flow, as well the way it rearranges authority. Managerial distantiation represents a clear opportunity for metic commonality to emerge, and there is also a sense in which it suggests operating under the algorithmic radar, carving out space between tracking and action in the knowledge that managers will first and foremost trust the system. As such, metic commonality brings a different sort of asymmetry to the management interface, which all workers could potentially have access to. Moreover, while this dissertation only raises the idea of metic commonality as a prospective lens for thinking about subversion under algorithmic management, and in particular the methods I have used provide only a limited insight into the realm of the commons in these workplaces, a properly situated workers inquiry could provide the methodological and political framework for both locating forms of metic commonality where they exist and maximizing their potential scope and spread.

[122] Drawing on game studies literature, Allen-Robertson (2017) discusses the example of 'rule discovery' among Uber drivers, as they learn the limits of the algorithmic infrastructure through interaction.

Conclusion: a new spirit of approach

In this chapter I have discussed worker resistance in algorithmically-mediated distribution workplaces. Using examples from interviews, I have shown that workers are instigating resistance despite the claims put upon them via management technologies, and I have argued that the qualities evoked by these forms of resistance offer principles for 'seeing' resistance where it is not immediately obvious. While mitigating aspects of managerial regimes such as productivity calculators, paternalism and the length of work, the workers featured in this chapter also exhibited metis in taking advantage of their digital, physical and social environment in order to advance claims to time, dignity and autonomy, often covertly. They are establishing 'defensive cordons' for themselves, subverting the processes and technologies they find themselves enmeshed within and exercising positive refusal.

By focusing on the situated political action of workers in this sector, I have taken a very different road to that generally taken by trade unions at the moment. Others have noted the difficulty of connecting the realities of workplace resistance to the activities of trade unions (Woodcock, 2017c: 118), and in this chapter I have shown the gulf that exists between the strategies of unions and the tactics of workers. The warehouse workers I spoke to were generally indifferent to their own trade unions, and while the legal battles being fought by unions are significant, their focus covers only a small part of workers' grievances and their irrelevance to large sections of this chapter is indicative of their lack of presence in shopfloor struggles. As it stands, unions lack whole swathes of knowledge of the workplaces they aim to represent, and while they may have largely relinquished claims to the labour process (ibid.: 113), workers in those workplaces have not.

While the technologies of management are intended to curb and direct worker (mis)behaviour and extend control to every corner of the workplace, worker

resistance demonstrates guile against adversity, displaying cunning intelligence to re-thread power and technology against management, to paraphrase Raniero Panzieri (Dyer-Witheford, 1999: 71). In drawing out these qualities of contemporary resistance, I have also drawn attention to the social basis of even 'individual' actions, raising the possibility of thinking about resistance in new managerial regimes through the lens of 'metic commonality' — situated, cunning and social intelligence acquired by workers through interaction with both managerial forms, technical processes, and each other. While metis implies that tactics cannot be readily lifted from one workplace and planted into another, this frame offers a spirit of approach for identifying where to look for resistance, how to 'see' its sociality, and how to identify the claims workers are advancing and glitches they are exploiting and creating.

Conclusion

“Find each other.”

The Invisible Committee (2009: 97)

New directions in algorithmic management

In March 2017, Amazon filed a patent for augmented reality goggles which could be worn by warehouse operatives to assist them in locating items and available shelf space within storage areas (Madan et al, 2018). When the patent application was published in August 2018, the general secretary of the GMB union, Tim Roache, said:

> This sounds like another measure to extract the final pound of flesh from exhausted, insecure workers who are just doing their best to make a living. … Technology in the modern workplace can be used to increase efficiency, make work easier, better and less stressful. Or it can be used like this: big brother bosses spying on their workers every step. (Ellis, 2018)

The patent application describes the goggles as combining both the scanning and instruction functions currently fulfilled by handheld scan guns with a locative system whereby location identifiers (such as QR codes) within the worker's field of vision are able to place the worker within the inventory storage area at any given time, as well as report when they have deviated from an instructed course (Madan et al, 2018; see Figures 7 and 8).

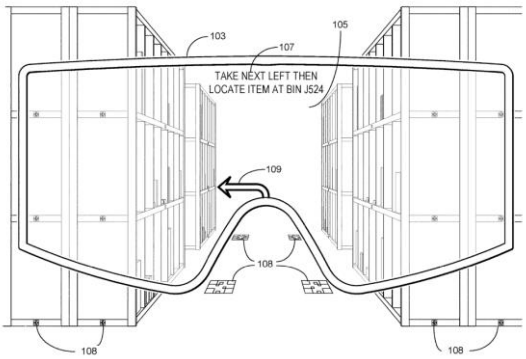

Figure 7. Augmented reality goggle interface showing turn-by-turn directions. "108" denotes location identifiers along floor and shelving.

Source: Madan et al, 2018.

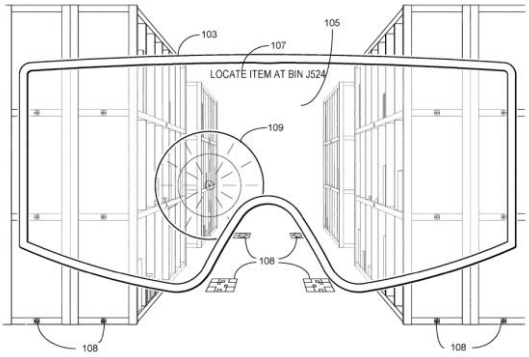

Figure 8. Augmented reality goggle interface showing precise item identification.

Source: (ibid.).

The application refers to a speculative technology, but it is indicative of Amazon's intention to deepen its algorithmic management capability. The publication of the patent filing followed news that Amazon had secured patents for ultrasonic bracelets that track workers' hand gestures and direct their actions by emitting vibrations (Cohn, 2017; Brady, 2018; Boyle, 2018). Integrated as part of a "haptic feedback system" (Brady, 2018), the wristbands build on the algorithmic control of workers' movements through space described in Chapter 4. The designs included with the patents (see Figure 9) are reminiscent of the Gilbreths' early motion studies, but as with handheld or existing wrist-mounted scanners, current trends in algorithmic management in distribution work suggest the motions that workers are 'nudged' into by the wristbands' vibrations are not the sort of thing workers could learn or perfect. Instead, as with augmented reality goggles, haptic feedback bracelets look to extend the kind the "embodied relation" between user and machine noted by Schüll (2012: 174) as technologies of political phenomenology, literally augmenting workers' sense of reality.[123]

[123] For an early exploration of 'location-aware' media see Russell's (1999) *Headmap Manifesto*.

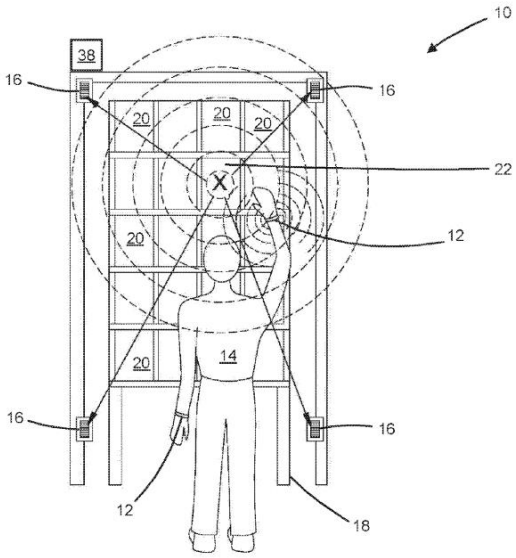

Figure 9. A depiction of a warehouse worker using an ultrasonic bracelet.

Source: Cohn, 2017.

Industry website SupplyChainDigest (2018) argues suggestions (such as GMB's) that the goggles and wristbands amount to "big brother" management are "erroneous" on the grounds that employee tracking has been a feature of distribution management for a long time, and that greater locative tracking is "likely inevitable". It is unclear where the official labour movement stands on the "inevitability" of performance tracking technologies. While GMB, the first UK union to turn its focus to Amazon since Unite over a decade ago, has reacted negatively to the concept designs, its accusation of "big brother bosses" (Ellis, 2018) signals a perception of the relationship between workplace technologies and power relations in a way that is absent from the union's formal demands regarding managerial techniques. Instead, its only demand relating to working conditions is constructed around concerns regarding the short- and long-term health and safety implications of the company's current approach to productivity management (Baker, 2015; GMB Campaigns, n.d.), with one suggestion the union could take Amazon to court over unsafe working practices (Pickard and Ram, 2018).

For its part, Amazon responded to concerns about the augmented reality goggles by saying: “This patent application has nothing to do with surveilling employees. Technology has empowered and enabled workplaces throughout human history” (Hills-Duty, 2018). One is reminded of Marx’s (1976: 563) suggestion that "It would be possible to write a whole history of the inventions made since 1830 for the sole purpose of providing capital with weapons against working-class revolt." This dissertation suggests that even if Amazon has some other aim in mind,[124] it is disingenuous to suggest such new technologies would not be used to control distribution workers more effectively, but it also suggests the proliferation of algorithmic management technologies entails a rearrangement of power relations which is more complex than ‘big brother’. This matters because the politics of distribution workplaces, and indeed the politics of an increasing number of sectors, will be informed by the politics of algorithmic management, from its effect on the experience of work and the authority of supervisors, to the avenues through which workers might exercise their political agency. In short, an understanding of the politics of algorithmic management needs to be at the heart of pro-worker responses to its development.

This dissertation shows the nature of the political struggle unfolding on the terrain of algorithmic management, and shows that everyday struggle is already occurring in algorithmically-managed workplaces, usually quite independent of formal labour organization. A class composition analysis shows that far from algorithmic management being a foregone conclusion, workers are finding ways to navigate their environments tactically in order to push back against or subvert the managerial claims being made against them, demonstrating that a deep knowledge of the techniques of algorithmic management already exists within the workforce. The overarching aim of this

[124] It has been suggested the data generated by human employees using ultrasound wristbands could be used to optimize robot pickers. (Solon, 2018)

thesis has been to reassert workers as political agents at a time when news stories portray workers' destiny as becoming evermore robot-like (Butler, 2018; Wohlsen, 2013; Osborne, 2016b; Beane, 2018; Rhodes and Kaine, 2018). But to do this, it has also been necessary to increase our understanding of the technical composition of algorithmically-managed workplaces and to understand the effects of algorithmic management on the balance of forces within the workplace more broadly.

A recent report by the Institute for Public Policy Research argues the need for greater employer-union partnership in heavily mediated workplaces, in order for workers to share in the benefit of productivity-enhancing technologies (IPPR, 2018: 101-2, 121). The demand echoes the approach of some unions in the distribution sector, such as GMB at Asda distribution and Amazon, or Usdaw at Sainsbury's. But such an approach arguably misunderstands how such technologies make it harder for unions to organize in the first place, and offers little to the workers featured in this dissertation, who are focused on trying to mitigate managerial performance directives on a daily basis, including in workplaces (such as Todd's) where a trade union has already 'negotiated' aspects of the ergonomics.

In the 1960s, Romano Alquati argued new managerial techniques were already digging the ground from under the CGIL union's feet (Wright, 2002: 47) and that labour movement renovation therefore depended on going 'under the hood' of the factories of Piedmont and starting with actual workers. Alongside Raniero Panzieri, Alquati argued the unions' indifference to new management technologies was neglectful of workers and their daily struggles (ibid.: 21, 33, 47). Inspired by those researchers, this dissertation has met a relative (but not absolute) shortage of critical engagement with algorithmic management by providing an initial autonomist response to the algorithmically-mediated techniques found in distribution work. This has taken the form of a class composition analysis inspired by the workers inquiry methodology, an

‘interested’ methodology which foregrounds the standpoint of workers within the work process, both in their experience of algorithmic management and their struggles with it. By enquiring into the ability of workers to exercise political agency in spite of the managerial claims against them, I have shown that workers need not be (to paraphrase Cleaver) ‘spectators to the algorithmic waltz of managers’. On the contrary, I have shown that workers are able to develop guileful techniques to maximize their own interests, often taking advantage of the rearrangement of supervisory authority to do so. In this way, workers have opportunities to flout the rules and develop common cause ‘below the radar’. These ‘misbehaviours’, I have argued, are not ornaments to the realpolitik of unions or policymakers, but are part of workers’ political lives and composition and are therefore critical to the development of a pro-worker orientation on algorithmic management.

From algorithmic anxieties to algorithmic guile

I began this dissertation with a discussion of existing anxieties regarding the reorganization of work along algorithmically-mediated lines, particularly in distribution work both in warehouses and across the so-called gig economy. In particular I highlighted the way that even though labour movement discourses draw a connection between employment insecurity and the technological organization of work, responses to the situation tend to focus on resolving issues of precarity, with far less emphasis on the means by which workplaces are governed. I laid out my intention to enquire into the ‘deeper unrest’ (Goodrich, 1975: 3) which takes place along the frontier of control within algorithmically-managed workplaces, with a view to reclaiming the possibility that workers may still exercise power within workplaces that may appear impervious to resistance.

I laid the groundwork for my inquiry in Chapter 1, where I excavated the persisting labour politics of workplace technology under capitalism, and

Chapter 2, where I took a genealogical view of managerial techniques and politics. In Chapter 1, I argued the tradition of autonomist Marxism presents a unique and worthwhile perspective on technological politics, which has historically been grounded in the actual struggles of workers and has sought a strategic orientation to the prospect of workers' autonomy. In particular, I outlined autonomism's theoretical contribution of *class composition*, a framework which is useful for understanding class politics over time and specifically in relation to changes in the labour process. I also introduced the autonomist (specifically operaista) methodology of the workers inquiry, the absence of which, I argue, has been detrimental to the political applicability of contemporary 'post-autonomist' interventions into the nature of work in contemporary capitalism.

In Chapter 2, I situated algorithmic management as a site of struggle by discussing management as an historical endeavour of capitalist class interests in which organization acts as a technology of control. In particular, I highlighted management's central problem of overcoming the indeterminacy of labour power and enacting effective forms of control within the workplace, both to ensure "certainty of result" (Panzieri, 1976: 8) and as a defence against worker antagonism. To demonstrate the forms this dynamic can take I selected a series of influential ideas and techniques from the history of management, from Taylor's early principles of scientific management to the Japanese idea of kaizen (continuous improvement). Beer's core ideas of cybernetic management provided a way of illustrating a managerial orientation towards performance which, in notions of 'data driven' algorithmic management, is combined with principles of continuous improvement.

Having rooted the dissertation in the political aspects of workplace relations and technology, I moved into an empirical engagement with a series of algorithmically-managed workplaces. Drawing on the philosophy of the workers inquiry, in Chapter 3 I presented a range of cases of distribution work,

responding to contemporary concerns about the current logistics boom which is transforming whole industries, and possibly work and capitalism itself (Moody, 2017: 171; Cowen, 2014: 91-127). The cases I covered bridged warehousing and 'gig economy' delivery, highlighting the shared managerial and technological approaches between them. In presenting the work process from the perspective of labour, I began drawing out the technical composition of the algorithmic working class, highlighting the role of tracking and information transmission in achieving the balance of social forces in algorithmically-managed distribution work.

Chapter 3 introduced the empirical basis for Chapters 4 and 5, in which I conducted my own class composition analysis of algorithmic management. In Chapter 4 I analysed the technical composition of algorithmically-managed distribution work in terms of the balance of forces at play. The chapter contained two substantial sections. The first asked what algorithmic management means for workers and examined the way it reconfigures workers' engagement within the work process. Drawing on different examples from the distribution sector, I showed how algorithmic management can be used to control the labour demand in gig economy contexts, as well as how the use of handheld devices and the regulation of communication can be used to affect workers' relationships to their work, space, and each other. The second turned the focus back onto the managerial endeavour itself, as I assessed the effect of algorithmic management on human supervisors and the supervisory function on the shopfloor. In doing so, I explained how the elevation of the algorithmic 'system' as an authority in its own right permits managerial distantiation, both political and spatial. I also problematized the idea that political distantiation is simply a ploy by highlighting how the authority of the algorithm is also bound up with the epistemological hollowing-out of the figure of the supervisor, who is re-cast in a 'subvisory' role as an auxiliary to the authority of algorithmic management. Finally, I reflected on the nature of the political terrain created by algorithmic management; situating it within the

Taylorist paradigm, I discussed how its central political and informational asymmetry (Rosenblat and Stark, 2016: 3777) presents apparent barriers to the ability of workers to exercise political agency within the work process.

In Chapter 5, I turned from the politics of managerial techniques to questions of workers' own political forms. Breaking with a conception of political composition which focuses only on trade unionism, I elaborated a framework of *refusal*, which extends from formal types of resistance to the everyday "defensive cordon" (Tronti, 1972) established by workers as a means of mitigating the claims of management. In presenting four examples of worker subversion, I drew out tactics used by workers to defend themselves under the conditions created by algorithmic management. Theorizing these activities, I discussed the principles of resistance to algorithmic management in terms of the notion of 'metis' (cunning intelligence) and the commons as an infrapolitical, tactical realm. From here, I proposed the idea of 'metic commonality' as the potential basis of a shopfloor collectivity in which workers might be able to transform their own individual defensive cordons into more collective acts of guile.

An expanded horizon of possibility

This thesis sought to assess the political prospects of workers who contend with algorithmic management. Through a class composition analysis of algorithmic management as observed in a range of distribution work settings, it has uncovered a range of political effects of algorithmic management practices, and it has shone light on how workers are pushing back against new computationally-facilitated logics of control at work.

The thesis has made a number of original contributions. It has provided a class composition analysis of algorithmic management, elaborating both the technical and political composition of algorithmically-managed distribution work

by bringing a range of workplace experiences into contact with one another. Drawing on original empirical engagement, the dissertation has advocated its own political-methodological approach by reasserting the workers inquiry as an important component of class composition analysis. Doing so has enabled the dissertation to make original theoretical contributions that go beyond existing approaches of algorithmic management as either 'automating' or 'supporting' management to include relations of authority and class on the shopfloor, as well as the concept of metic resistance — a principle which the workers inquiry is uniquely placed to excavate. More broadly, this thesis has provided a new lens for 'seeing' the politics of algorithmic management, and has reaffirmed the relevance and political value of autonomist Marxism to understanding technological changes to work.

The research also opens up a number of avenues for further research. Within the parameters set out, further research could adopt a more historical orientation to its empirical engagement, in particular by foregrounding the question of the processes of decomposition and recomposition represented by algorithmic management. Beyond the parameters of consumer-oriented distribution,[125] further research could enquire into other areas of the wider supply chain, even globally (Dyer-Witheford, 2015: 132-8). And beyond the parameters of logistics, this dissertation provides a useful point of reference for class composition analyses into other industries in which employers are turning to algorithmic management, such as journalism (Whittaker, 2018). But in terms of the current critical scholarship in this area, the most pressing direction for further research would be to link this analysis to those studies which have discussed algorithmic management techniques in relation to the economic and legal context of precariousness afflicting the working class today. Doing so, especially as part of a longer and more collaborative 'co-research' agenda,

[125] See Moore and Newsome (2018) for a labour process analysis that extends to the specific role of consumers within distribution work.

would no doubt help connect the discussion of technical and political composition discussed in this dissertation to the corresponding *social composition* (Notes From Below, 2018), especially with regard to migrant and gendered labour, in turn presenting a fuller picture of class composition and the politics of algorithmic management than has been possible in this study.

Combined with the affordances of the contemporary media environment outwith algorithmic management systems, a future co-research project could adopt a workers inquiry methodology more fully than has been possible in this thesis, in that it could be used to encourage, support and evaluate political action in a longitudinal way. Current research on algorithmic management has made reference to the use of online forums (Rosenblat and Stark, 2016) and WhatsApp groups (Waters and Woodcock, 2017) by workers to discuss the 'negotiation' of algorithms and to organize political activity; meanwhile mass online conferencing tools such as Zoom are becoming a popular tool for "big organizing" (Bond and Exley, 2016) within protest movements in both the US and UK. Using these media to offer scholarly reflection and distance to workers' struggles at all stages of their development could help develop resistance to algorithmic management beyond its existing manifestations. However if this methodological mode would amount to something like 'connective action research', we could also envisage a complementary 'collective action research' agenda. Deeper research into the idea of metic commonality, for example, could involve creative methods such as the development of a strategy game along the lines of Plan C's 'social strike' game (2017d); a sort of ludic social hackathon, one could imagine bringing together groups of experienced algorithmic workers with labour movement researchers to play games based on algorithmically-managed workplaces in which they can explore and conceptualize possibilities for resistance, compare judgements and express productive disagreements with a view to learning about and developing shopfloor tactics.

* * *

The announcement of the 2017 UK general election brought the business of the 'future world of work and the rights of workers' inquiry to an abrupt close. Subsequent inquiries of the BEIS committee have focused on the employment status of workers in the gig economy (Business, Energy and Industrial Strategy Committee, 2017b), and the (positive) future of automation (Business, Energy and Industrial Strategy Committee, 2018), but parliamentary scrutiny of the working conditions of workers in the distribution sector has so far been discontinued. On 17th July 2018, Verd.di members at six Amazon distribution centres struck over terms, pay and collective bargaining, as well as the effects of the work upon physical and mental health (The Local, 2018), a frame that has also been adopted by unions in the UK distribution sector to express concerns over high-intensity performance management. Ver.di board member Stefanie Nutzenberger was quoted listing previous wins on health at the company: better ventilation and lighting, and a company 'fruit day'. The union's current demands include risk prevention advice, longer breaks, and company sports (ibid.).

This dissertation argues the future world of work is the future of class struggle, and demonstrates that "behind observable institutional phenomena are the actions of an actually existing working class" (Woodcock, 2014: 498). My approach has been incompatible with purely abstract or economistic — which is to say purely structuralist — ways of thinking about changes to the labour process. At every turn I have been interested in both continuities and contingencies, governing principles and agency, which has meant speaking to workers and bringing their testimonies into conversation with theoretical perspectives. Technical overviews of the labour process and its peculiarities can take us so far, but as with relying on gemba walks to identify improvements, understanding the dynamics of a work process in action requires more than just looking. Understanding how managerial techniques affect workers'

political forms requires closer and more sustained attention, which at the very least means engaging with those workers where possible. This was the original impetus of the workers inquiry within operaismo, which has been a guiding hand throughout this study, a methodological tradition largely lost within autonomist Marxism. This study has raised political and methodological implications for understanding contemporary class struggle in algorithmically-mediated workplaces, and with limited access has demonstrated the value of reincorporating an empirical dimension to the development of class composition analysis. Moreover, this thesis has begun to show what those actions look like, and has made the case for research into algorithmic management and specific engagement with the workers subjected to it. Its wager is that such a research agenda will enhance not only the critical scholarship on the emerging world of work, but also the toolbox of those who seek to assist workers in their struggles and push back against the political will of employers, exposing the contingency of algorithmic management, destroying its 'natural order' and expanding the horizon of possibility.

Interviews

Interview on Greater London supermarket distribution centre with ‘Lorenzo’ (picker-packer).
Conducted in person by C Gent. London. September 2016.

Interview on Yorkshire e-commerce distribution centre with ‘Elaine’ (trade union organizer).
Conducted in person by C Gent. Sheffield. February 2017.

Interview on south coast food delivery platform with ‘Jamie’ and ‘Noah’ (delivery cyclists).
Conducted in person by C Gent. Undisclosed. March 2017.

Interview on Greater London online supermarket delivery with ‘Lorenzo’ (driver).
Conducted in person by C Gent. London. April 2017.

Interview on Hertfordshire e-commerce distribution centre with ‘José’ (packer).
Conducted in person by C Gent. London. April 2017.

Interview on Greater London e-commerce delivery platform with ‘José’ (driver).
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