Sociotechnical change in British supermarkets: examining the role of labour

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Abstract

When predicting the future of retail work, commentators tend to focus on automation and labour replacement and neglect the continued role played by labour, particularly in food retail. To understand this role, this article draws on both interview and newspaper data to show how the change unfolded in the sector from before to just after the Coronavirus pandemic. Specifically, it shows how increased technology adoption and use in food retail occurred alongside an increased reliance on labour. The availability of a flexible labour pool that was easy to scale and later disband enabled employers to respond to increased consumer demand rapidly. In contrast to futurist predictions of the proliferation of labour-replacing technologies, the analysis shows how food retailers continued to prioritise short-term solutions contingent on human labour rather than investments in longer-term automation programmes, reflecting historical patterns of sociotechnical change within the sector.

Keywords: Retail work, sociotechnical change, labour, Coronavirus, qualitative research, supermarkets, new technology

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Introduction

Retail work has attracted the attention of those predicting significant labour replacement due to technological change (Begley *et al.*, 2019; Davey, 2022; Drenik, 2023). Frey and Osborne (2017) estimated that 97% of retail cashier roles are highly vulnerable to computerisation, prompting the claim that "*retail is one industry in which employment is likely to vanish*" (Oxford Martin School, 2017, p. 3). These assertions are echoed elsewhere, as a dramatic reduction in the quantity of work is expected to emerge from the presumed uptake of robotics, drones and vision-enabled self-service systems (Brynjolfsson and McAfee, 2014; Ford, 2015). However, the deterministic assumptions that underpin much of this mainstream discourse have been critiqued by social shaping of technology (SST) scholars who contest these predictions and argue that the social, political and economic context in which technologies are embedded is likely to shape a future of work that is much more varied and messier than suggested (Wajcman, 2017). Despite this, there is limited empirical work on the evolution of sociotechnical systems in traditional workplaces (Lloyd and Payne, 2021; Howcroft and Taylor, 2023; Joyce *et al.*, 2023), particularly regarding the retail sector (with the exception of Carré et al., 2020) which is surprising given its prominence in wider public discourse and the large number of workers who remain employed in the sector.

Retail work has long been characterised by low pay and insecurity, offering limited opportunities for upskilling and progression (Burt et. al., 2010; Price, 2011; Carré and Tilly, 2017). Some suggest that these conditions have slowed the diffusion of retail technology (Carré et al., 2020) as short-term gains have been prioritised over longer-term investments in labour-saving technology (Basker, 2012). In low-margin sectors characterised by short-termism, like retail, the higher-cost option of long-term investments in technology may be passed over when a cheaper alternative is available (Moody, 2018). Recently, this has been evident in the technological choices of retailers who have opted for systems with 'a documented fast payback' period (e.g. self-checkouts) and avoided the 'daunting upfront costs' of more sophisticated infrastructure (Carré et al., 2020, p. 27).

Thus, before the pandemic, food retailers appeared relatively slow to expand into online markets – largely because of the small margins offered by selling goods online, in addition to customer preferences for seeing produce prior to purchasing and the short lead times associated with physical retailing (Magalhães, 2021). However, during the pandemic, physical restrictions prompted food retailers in particular to expand their provision of non-contact forms of shopping, both online and in stores (Benner *et al.*, 2020; Carré *et al.*, 2020). This led to renewed interest in the sector by the media, with some outlets reporting an "irreversible" shift towards online shopping claimed by industry insiders (Smithers, 2020; Meadows, 2020; BRC, 2021) and echoed by influential management consultants (Fiedler et al., 2020; McKinsey, 2020; Deloitte, 2020).

Such claims received limited attention within academic research but do raise the question of how we view technological change in a time of disruption. This discourse often fails to mention the unpredictability that characterises the outcomes of technologies and exogenous crises (Howcroft and Taylor, 2023). In recognition of this shortcoming, this paper takes the period spanning the Coronavirus pandemic as an important context upon which to interrogate notions of sociotechnical change and the messiness that characterises it. It applies an SST lens, central to which is the rejection of linear models of innovation that omit the continuously evolving context in which technologies are embedded and shape how they are used and experienced by workers (Williams and Edge, 1996; MacKenzie and Wajcman, 1985). Keeping this in mind when analysing the shock of the pandemic, we demonstrate how unforeseen events can derail food firms' priorities with consequences for technology and how labour is organised.

This paper investigates the question: how has sociotechnical change evolved in food retailing in recent years? Although the research commenced prior to the pandemic, the resultant crisis shifted the focus towards one of sociotechnical change over a period of immense, but not necessarily permanent, disruption. As mentioned, the pandemic and resulting lockdowns promoted deterministic narratives. As a corrective to this, we provide an intervention to the debate which challenges the sentiment popularised in the mainstream discourse that the pandemic would bring about permanent radical shifts in work organisation due to accelerated technological change, drawing on the case of food retailing. Our findings suggest that food retailers opted for temporary solutions, such as expanding their online provision, to mitigate financial risk in an uncertain climate. However, several of these fixes were reversed once the peak of the pandemic was over and a cost-of-living crisis ensued. Therefore, this article makes an important contribution by interrogating the relationship between instances of disruption and technological change, drawing on SST as the analytical lens to do so. We show how reliance on low-wage labour persisted in food retailing despite oscillating technological change during a period of crisis, prompting a rethink of how work and technology scholars may view future shocks in a world increasingly characterised by 'permacrisis' (Brown et al., 2023).

The research is presented as a timeline to show how the pandemic unfolded, both at the organisational and the sectoral level, and influenced how food retailers approached the implementation and use of technology. The next section reviews the evolution of shop-floor conditions using historical accounts of retailing and technology adoption from extant literature. Following this historical review, the methodology section expands on the analytical process in more detail. We then draw on an original longitudinal data set comprised of interview and newspaper data, presenting three stages of data collection across two supermarket case studies. This complements the approach of SST scholars who value historically embedded case studies that demonstrate the contingency of technological innovation (Bijker, 1997).

Historical processes of sociotechnical change in food retail

According to SST scholars, drawing on the historical context of a sector is critical to understanding its contemporary manifestation:

"…*the history of technology is a path-dependent history, one in which past events exercise continuing influences"* (MacKenzie and Wajcman, 1999, p. 19).

In the following discussion we outline a brief history of sociotechnical change in food retailing, enabling us to better conceptualise contemporary retailing as an extension of this history.

During the 1950s, a self-service model of food retailing was introduced in the UK which required customers to use shopping trollies to collect pre-packaged goods from supermarket shelves. This represented a new technology of the time (Bowlby, 2000), which led to the re-organisation of retail work, expanding the role of the customer in the labour process (Gregory, 1991). Existing 'personal service functions' (such as the greengrocer, butcher and baker) were no longer required as food items were retrieved by customers themselves (Wrigley and Lowe, 2002). This represented a sociotechnical shift away from traditional retailing practices, which was viewed suspiciously by trade unions who were concerned that jobs would be deskilled and become more easily accessible to women workers (du Gay, 2004). This position reflected the role unions played in the systematic exclusion of women from 'men's work' in order to protect male jobs and prevent pay and conditions from deteriorating (Wajcman, 1991). However, trade union concerns became manifest by the 1970s when the majority of workers in supermarkets were women (Gregory, 1991). During this time, retail fell from one of the highest-paying sectors at the start of the century (Winstanley, 1983) to one of the lowest (Robinson and Wallace, 1974), but men remained in the more highly paid managerial positions (Palm, 2017) as the number of women in low-paid cashier roles grew (MacEwen-Scott, 1994).

Although the diffusion of retail technology has been slow (Carré et al., 2020), predictions of labour replacement have been common for several decades. In the 1970s, retailers believed that innovations such as electronic points of sale (EPOS), universal product codes (UPC) and barcode scanning systems would create task efficiencies which would reduce the volume of work (Basker, 2016; Hopping, 2000) (e.g. via the removal of staff scheduling, stock ordering/management) (McLaughlin, 1999; Freathy and Sparks, 2000). However, in spite of these innovations, retail work was still viewed as the "*new generic form of mass employment*" (Grugulis and Bozkurt, 2011, p. 2) as the number of people working in the sector grew. EPOS systems and bar codes made buying patterns much easier to monitor, further fuelling the consumer cycle as retailers could market products to customers more effectively using the data these technologies generated. As a result, this led to increased sales and, consequently, an increase in demand for labour (Newsome et al. 2013).

This has changed somewhat in recent years. In retail stores where food predominates,[1] the number of people employed has fallen, as has the average number of hours worked weekly by retail sales assistants and cashiers (from 24.4 hours in 2006 to 22.8 hours in 2023) (ONS, 2023). This has occurred parallel to the proliferation of technologies such as self-service checkouts that were viewed as a relatively low-cost labour-saving alternative to human-operated checkout belts (Basker, 2016). However, it would be inaccurate to assume that this reduction in staffing levels and working hours has occurred directly because of the implementation of new technologies. As Howcroft and Taylor (2023, p. 9) state "…*the relationship between computers and humans is not determined by technological capabilities but by the priorities and strategies of organisations that own and operate them*."

Since the 1990s, retailers have taken advantage of opportunities to reduce operating costs and store staff headcounts (Beynon *et al.*, 2002). The strategies adopted have included the flattening of store hierarchies, the centralisation of decision-making and the implementation of lean management (e.g. 'just-in-time' stock control), *inter alia* (Ogbonna and Wilkinson, 1998; Freathy and Sparks, 2000; Hopping, 2000; Grimshaw *et al.*, 2002; Price, 2011; Basker, 2016). Centralised decision-making occurred alongside perpetual delayering across the sector, whereby middle managers, previously responsible for decision-making at the store and regional levels, were made redundant (Grimshaw *et al.*, 2002). However, the focus on cost-cutting has largely occurred at lower levels. As a consequence, low pay, the use of hyper-flexible shifts and the intensification of the working day have all contributed to a reduction in the quality of retailing work (Perrons, 2000; Grugulis and Bozkurt, 2011; Bozkurt, 2015; Hadjisolomou, Newsome and Cunningham, 2017).

This synopsis of sociotechnical change over time shows that technological transformations cannot be disentangled from management strategies to sustain profit margins. Since the entry of women into the sector, retailers have retained a low-cost and flexible approach to labour *and* technology deployment – whereby access to cheap labour has predominated as a service strategy over investment in high capital technology projects. Despite this established history, some have suggested that the pandemic represented a turning point in the trajectory of retailing during which time we would observe an irreversible shift in the organisation of labour and technology (Nott, 2020; Fiedler et al., 2020; McKinsey, 2020; Deloitte, 2020). However, the disruption caused by the pandemic challenged the traditional focus of retailers away from the profit imperative due to competing epidemiological demands causing them to reconfigure work and technology usage. We investigate this in our empirical work, but first we outline the methodology adopted to examine sociotechnical change in food retailing throughout this period.

[1] In 2022, 968,000 people are employed in retail stores where food predominates (70% of whom work part-time). Twenty years prior, 1,361,000 worked in the sector (64% of whom worked part-time) (ONS, 2024a)

Research methodology

In order to examine how sociotechnical change has evolved in food retailing, a qualitative methodology was adopted. Data was collected between September 2019 and March 2023, which captured a pivotal point in the timeline of UK food retailing. Two types of data collection occurred. One included 36 interviews, primarily with workers and managers across two food retailers, the other involved an extensive newspaper analysis.

Initially, two organisational case studies were selected to capture how workers and management in food retail experienced sociotechnical change before and during the pandemic. Retailer A specialises in the sale of food items through local convenience stores (with 2 to 5 workers per shift), often located at the centre of communities. Retailer B primarily sells goods from bigger stores (with 30 to 50 workers per shift) situated outside of town centres and offers a broader range of products, including 'artisanal' food that is prepared (in part) on-site. Interviews were carried out between October 2019 and February 2021. The focus of the study from the start was on sociotechnical change in food retailing and the fieldwork commenced without the foresight of the pandemic's disruptive impact. Nevertheless, the collection of data before the pandemic provided an opportunity to explore how the shocks that followed shaped technology adoption. The first set of interviews focused on issues related to the changing use of technology in the sector and the impact on the labour process. The onset of the pandemic led to a series of further interviews which invited participants to reflect on the experience of work for those on the 'frontline', as well as changes in policy and workplace practice – primarily focused on how technology was used throughout this period (see Table 1 for details of the case studies and interviews). Theoretically informed by SST, the interviews, as detailed in Table 1, sought to understand the role of human and social factors influencing technological change, how technology reinforced existing power dynamics in the workplace, the extent to which technology implementation evolved based on organisational priorities, pressures on management and customer attitudes, and how workers responded to the above. These themes speak to key aspects of SST, namely that technology is shaped by institutional and human choices, and that technology is thus not neutral but socially negotiated (MacKenzie and Wajcman, 1985; Williams and Edge, 1996). Prior to the pandemic, interviews were largely conducted face-to-face in store offices or neutral spaces such as cafes and were accompanied by a site tour, but once lockdown restrictions ensued, interviews were carried out remotely. The interviews lasted between 45-90 minutes and followed a semi-structured format.

Retailer A	**Interview themes**	**Pre-2020**	**Post-2020**
HR Manager	HR policies (inc. working time, contractual arrangements), skills, use of technology, performance management, training, industrial relations, changes in sector over time, perceptions of future challenges	(F)	
HR Manager		(F)	
Senior HR Manager		(F)	
Operations Manager	Operational significance of convenience shopping, technology projects (inc. trial and rollout), prevalence of online, approach to sector cost competition, changes during the pandemic	(F)	
Operations Manager		(F)	
Senior Operations Manager		(F)	(V)
Area Manager	Recruitment and skills, workforce composition, daily running of stores, labour costs, use of technology and training availability, progression, online availability, perception of future challenges	(F)	
Trade Union Officer*	Working conditions and key challenges, industrial relations arrangements, issues/opportunities related to technology, wider sectoral trends, changes in the context of the pandemic	(F)	(V)
Trade Union Officer*		(V)	(V)
National Official*			(V)
Regional Official*		(F)	
Retailer B			
Regional HR Manager	Same as HR manager above, in addition to changes in arrangements during the pandemic (e.g. contracts, hiring, use of technology)	(F)	(V)
Store HR Manager (Union Rep)		(F)	(V)
General Store Manager	Recruitment and skills, workforce composition, running of stores, labour costs, use of technology, training, progression, servicing of online, perception of future challenges, pandemic-related changes to the above	(F)	(V)
Senior Store Manager		(F)	(V)
Supervisor	Daily running of stores, use of technology across sites and training availability, progression, working time arrangements, perception of future challenges	(F)	
Supervisor (Management Trainee)		(F)	
Customer Assistant	Characteristics of the job (inc. contracts, daily tasks, autonomy, training), experience of technology, intensity and skill demands, impact of the pandemic in terms of personal experience at work (inc. epidemiological threat, new tasks, availability of support)	(F)	
Customer Assistant		(F)	
Customer Assistant			(V)
Customer Assistant			(V)
Customer Assistant			(V)
Customer Assistant			(V)
Trade Union Officer*	Same as Trade Union Officer above	(F)	(V)
Additional Interviews			
Trade Body Representative	Changing nature of work in the sector, opportunities for training and progression, use of technology and impact on skills, diversity initiatives, perceptions of future challenges	(V)	
National Trade Union Officer	Working conditions and key challenges, industrial relations arrangements, challenges/opportunities related to the introduction of technology	(V)	
Equalities Officer	Same as above, plus changes in the context of the pandemic and how these were experienced by different demographic groups, and strategies to mitigate these effects		(V)
Equalities Officer			(V)
*with Retailer A or B oversight		**Key**: (F) face-to-face (V) online video call	

Table 1 Interview participants and thematic areas covered

The second element of the research involved the construction of an original dataset of over 400 newspaper articles (March 2020 to March 2023) to gather insights into how sociotechnical change in food retail was developed and presented during the pandemic in the mainstream media. Newspaper analysis is a vital tool for qualitative researchers seeking to investigate periods of disruption because media narratives actively shape public opinion (Altheide and Schneider, 2013). Given the wide range of media coverage devoted to food retailing throughout the pandemic, news outlets (including traditional and social media) played a role in influencing the behaviour of food retail customers (Music and Charlebois, 2022). To ensure a comprehensive analysis of this critical timepoint, data was collected from nine major British newspapers with various political leanings, as well as an industry publication. Relevant articles were identified using the Factiva database that allows for the thematic search of articles related to 'General Labour Issues', 'Labour/Personnel' 'Digitalization' or 'Information Technology'. To capture overarching trends among the largest employers, the top ten UK supermarkets by market share were also included in the search[2].

All of the interview data was transcribed verbatim by the lead author. This presented a valuable opportunity to reflect on the data before it was analysed in NVivo (Davidson, 2009). Initial broad concepts, themes and major events were noted as part of the transcription process before a more systematic round of reflexive thematic coding was undertaken (Braun and Clarke, 2019). Alongside interview and newspaper data, fieldnotes and initial reflections captured immediately after the interviews also informed the coding process. The data was then coded chronologically in order of collection, including the newspaper data, which enabled the mapping of the evolution of sociotechnical change in food retail over time. First-order codes were generated and informed largely by the transcription process and discussions within the research team. These highlighted important components within the context of the study (e.g. re-organisation of work, technological developments, sudden changes in market demands) which were subject to further analysis through a second round of coding. The second-order codes enabled the research team to make sense of the daily intricacies of working in food retail over this period and how they related to the evolving sociotechnical context (e.g. specific changes to terms and conditions, individual experiences of pandemic restrictions, instances of work intensification). The following section discusses the key findings of the study.

Recent evolution of sociotechnical change in food retailing

To demonstrate how emergent social conditions influenced the adoption and implementation of technology, this section presents the findings across three time periods. The first explores the trajectory of sociotechnical change in the period just before the pandemic; here, analysis of case study interviews

[2] Number of articles by retailer: Tesco (150), Sainsbury's (105), Aldi (48), Morrisons (48), Ocado (44), Lidl (38), Asda (36), Waitrose (21), Co-op (11); and publication: The Times (115), The Guardian (85), The Grocer (78), The Telegraph (47), The Mirror (41), Daily Mail (35), The Sun (33), Financial Times (25).

focuses on pressures for work reorganisation intended to maximise efficiency and reduce costs. While technology featured the systems deployed were relatively basic and their use was aimed at achieving cost-cutting. The second timeframe draws on interview and newspaper analysis to reveal how food retailers swiftly altered their approach in response to the demands of the pandemic. This meant expanding their use of existing technologies to widen the provision of contact-free shopping. The final timeframe also draws on newspaper data, to investigate the emergence of a 'new normal' following the lifting of lockdowns and the shift to cost recovery and retrieving market share. Presenting the findings in this manner is intended to provide a counternarrative to the assumptions associated with an acceleration of online shopping and illuminates the complexity of sociotechnical change.

Pre-pandemic: Pressures to re-organise work and reduce costs

Prior to the first lockdown in March 2020, managers signalled that a key priority was enhancing efficiency. Both operations and store managers were tasked with decreasing costs to enable price reductions while maintaining profit margins. While technology comprised part of the response, the methods and tools adopted were often relatively primitive in terms of their technical sophistication and required minimal capital outlay. Instead of investing in costly technologies that would eliminate the need for human labour, food retailers relied heavily on the re-organisation of work and work processes to reduce the number of staff. The findings in this section outline the impact of these processes of rationalisation, and the resultant work intensification effects.

Reducing hours through eliminating daily tasks

In both retailers studied, management was keenly focused on reducing labour costs, measured primarily by looking at the number of hours allocated to stores (how many people were working in a store each week and how many hours each worker was assigned). Although the number of hours allocated to stores had fallen significantly in recent years, operations managers in Retailer A had to prioritise their further reduction. A team of thirty staff was tasked with developing an 'efficiency store operating model' in response to "*…the cost of wages going up"* (Operations Manager 2, Retailer A). Wages were negotiated centrally but were also pushed up by national minimum wage increases, meaning that the managers interviewed had little direct influence over these rates. Therefore, the goal was to reduce the number of daily tasks completed by shopfloor staff, thus reducing the hours allocated to stores and associated costs. One operations manager noted that a similar process of rationalisation occurred in the early 2000s when certain roles that "*did not add value*" (Operations Manager 1, Retailer A) were eliminated, such as bag packers and door-greeters. The team investigating efficiencies analysed the minute details of the daily labour process, including ways to reduce the time-intensive repetition of certain tasks (such as counting change in the tills and checking the temperatures in the fridge/freezer units). Management suggested this would "*make workers' lives easier*", while approaching the changes with caution so employees did not feel that they were "*just taking hours away from them*" (Operations Manager 2, Retailer A).

Nevertheless, this process of hourly cuts continued until the pandemic, with one of Retailer A stores experiencing a 50 per cent reduction in hours over the previous four years.

To support this change programme, Retailer A's operations team procured an all-in-one handset for daily task management (including stock monitoring and work allocation). This illustrates a process that Moody (2018) refers to as 'pen and paper to automation' whereby the digitalised process mirrors the old process, creating a perception of automation despite tasks often requiring the same level of human input. Decisions about the daily management of the shop floor were made centrally and sent through to stores using these handsets, which meant that individual managers were no longer necessary for this level of planning. Headsets were also implemented, which were expected to minimise the amount of time employees spent walking around stores, thereby speeding up the communication process. These new technologies – intended to support rationalisation – eliminated some tasks (e.g. walking to communicate with colleagues) but also enabled workers to do multiple jobs at once, adding to the intensity of the labour process by requiring multi-tasking for both managers and their staff for the remaining paid working hours, as we explore further.

Expansion of multi-tasking

Major food retailers adopted multi-tasking to help facilitate functional and working time flexibility over many years (Penn, 1995; Beynon *et al.*, 2002; Castillo, 2023). As supermarkets became leaner, through the elimination of certain roles and tasks, the scope of the remaining roles increased. Both Retailer A and B offered contracts that contained clauses stating that shop floor employees were expected to carry out "*any reasonable requests*" made by management, implying that multi-tasking was expected. These changes in expectations were explained as follows:

"*…a lot of them that have been here, again, probably 15- to 25-years, they're coming to retirement and they are just happy to just sit there, do the till, do the same job and sometimes they can be very like, "that is not my department" which... I don't like...*" (Senior Manager, Retailer B)

The drive towards multi-tasking helped eliminate downtime, which enabled food retailers to reduce the number of hours allocated to each store, thereby reducing labour costs with limited technological intervention. For example, in Retailer B, store managers outlined plans to extend multi-tasking across all shopfloor departments, including artisanal food counters. In the stores visited during fieldwork, various counters offered customers a range of products that had been prepared on-site (e.g. meats, pizzas, pastries). These counters were originally overseen by workers trained in food preparation. To cut costs, the complexity of counter work was simplified, and food was no longer prepared from scratch. Various shop-floor staff were provided with basic health and safety training which broadened the pool

of those able to work on the food counters. This was not without problems and some tasks still required a more highly trained employee, which was explained as follows:

"*…it's not like someone from the shop can just go onto the counter, but we are going to start looking at that as well… as long as they're health and safety trained, they can still serve, they just can't cut the meat, so we have a lad on produce who will just man and serve, if it needs to be cut then he will call someone down and take the order*..." (Store Manager 1, Retailer B)

As other researchers have argued, the problem with multi-tasking is that deskilling and intensification effects can arise as a result (Price, 2011; Castillo, 2023). In the case of Retailer B, the expectation of multi-tasking extended to workers' mandated breaks thus intensifying their working day. For multi-tasking to be rolled out at a low cost, food preparation tasks were deskilled to avoid the costs associated with extra training. In Retailer A, store managers were expected to 'work remotely' via tablets, so that they could carry out administrative tasks whilst being physically present on the shop floor. One manager explained how they would no longer be "*chained to the desk… drawing them away from the customers*" (Operations Manager 2, Retailer A), which enabled leaner stores where it was common to have only a couple of workers on the shop floor.

Store restructuring and delegation of management tasks

Restructuring has long been used as a mechanism by retailers to reduce staff numbers through the removal of middle management at store level and processes of centralisation (Grimshaw *et al.*, 2002). In the past, major supermarkets had national, regional and local human resource teams, but many of these layers have since been removed. In 2019, managers in Retailer B were preparing to remove the store human resource manager role to reduce costs. In advance of this, a new system was introduced which generated rotas automatically and enabled employees to book their annual leave online, thus reducing the workload of store human resource managers. Consequently, overseeing the rotas was passed down to individual team supervisors. This was elucidated as follows:

"*…it's more accountability of payroll onto team managers, so they're given a budget. They have to put corrections in... Holiday requests will normally go to the [HR] manager, but now they'll go to the team manager... they are basically a mini-HR manager then*." (Senior Manager 2, Retailer B)

Supervisors were encouraged to take on the added responsibility of rota management on the basis that it may lead to future promotions. However, this tactic was criticised by an area union official who viewed this as "*dangling the carrot of progression*" (Area Official 1, Union A). In essence, this extra responsibility involved a large amount of 'chasing', yet no additional remuneration was offered.

In Retailer A, several operations managers outlined plans to roll out a larger programme of delayering to eliminate individual store managers in smaller stores. In urban areas, it was common to find multiple

stores located in proximity, which, in the view of the manager quoted, could be overseen by 'satellite managers':

"...I can't say that we will do that for certain, but I reckon that is where we will end up going… you'd just have store assistant and then maybe your team leaders who then just run the shifts and then a satellite manager to make sure that people are just following the processes." (Operations Manager 1, Retailer A)

This delayering would be made possible by using handsets to transmit daily instructions to individual stores in the absence of the physical presence of a manager. While this restructuring process replaces some of the repetitive delegation work, it reallocates other aspects of work that managers are required to do day-to-day.

This highlights how technology comprises one aspect of a multi-faceted strategy adopted by retailers to reduce the quantity of work required each day on the shop floor in order to increase the amount of value the business could extract at a lower cost.

During the pandemic: Strategies to upscale and increase capacity

As the pandemic took hold, food retailers quickly adapted to meet increases in demand. This meant increasing the number of hours allocated to stores and hiring large numbers of new workers, many of whom were recently unemployed or furloughed. This approach was visible across the sector, with media reports stating that over 100,000 workers were hired to fill supermarket vacancies throughout 2020 (Belger, 2020). As one manager recounted:

"*We put an advert out in the local media and we had something like 600 people turn up which was quite hard to manage because we were all meant to be social distancing... we had a queue from the front of the entrance right around the back of the shop and that was like that probably up until 5 o'clock... from about 8am*." (Senior Manager, Retailer B)

Expanding the technological infrastructure came later, providing support for the expansion of the supermarket workforce. Drawing on interview and newspaper data, the following discussion illustrates how the implementation of new technology throughout this period supported the expansion of work during a time when face-to-face purchasing was being restricted.

The rise of online shopping

At the start of the pandemic, many retailers expanded their online proposition to meet new demands for non-contact shopping. Grocery retailers with well-established online models were able to scale up quickly by hiring temporary workers to carry out the picking and packing. It was reported that Tesco, for example, tripled its online capacity in six weeks (Chambers, 2022). However, for those that did not

have the existing infrastructure in place, such as Retailer B, they looked to external partners to provide support for the delivery of their online offering.

Many retailers entered partnerships with third-party platforms, such as Amazon, Deliveroo and UberEats, that provided labour to fulfil delivery demands. This was relatively widespread, with newspaper data showing that 9 out of 10 of the UK's biggest food retailers opted into third-party partnerships between 2020-2022. This enabled retailers to expand their online presence while avoiding hiring workers directly. In the interviews, several research participants reported on the tensions that arose between shop floor workers and drivers during busy times, as each struggled with time pressures:

"… if you don't complete it in 20-minutes you can just see a driver glaring at you, you can just see them stood there with their arms crossed." (Customer Assistant 7, Retailer B)

Although many food retailers continued their partnership with third-party platform providers after the initial lockdowns, demand fell rapidly once the peak of the pandemic was over (Wall, 2022). As Williams and Edge (1996) pointed out, technological change does not follow a linear upward trajectory but oscillates as management strategies attempt to respond to wider market demands. Nevertheless, retailer use of platform providers enabled them to pursue profit-maximisation while mitigating much of the risk.

Changing nature of multi-tasking

Multi-tasking expanded during the pandemic to facilitate new delivery models, including click-and-collect and online delivery services. In Retailer B, store assistants were required to learn the location of products so they could quickly fulfil orders alongside their other duties, such as working the checkout. Across both cases, in the absence of professional cleaners and security guards, workers were expected to carry out cleaning duties and enforce Coronavirus rules (such as social distancing requirements and limits on product purchases). Expanding the scope of work among customer assistants while allowing food retailers to avoid the additional costs of procuring staff for these roles.

This expansion of work created intensification in a situation which was "*very, very hectic at times*" (Customer Assistant 6, Retailer B). For example, stores that partnered with platform delivery providers increased their sales while employing the same number of staff, as existing employees were required to pick items in addition to their usual workload:

"*You've got like 15- or 20-minutes to go and do the shopping but sometimes you can be starting one and then you get another 2 come through so you've got 15-minutes to do 3 lots of shopping…"* (Customer Assistant 7, Retailer B)

This illustrates how new technology expanded the amount of work required from staff as they were required to take on a dual role, further intensifying the work.

Non-contact shopping (in-person)

Alongside the surge in hiring during the pandemic, many food retailers expanded non-contact forms of shopping, such as self-service tills and scanners (Carré *et al.*, 2020). Rather than risk adopting novel technologies, retailers opted to expand use of their existing technologies. This extended the reconfiguration of the service triangle, passing the labour effort from retail workers onto the customer, with one manager stating that these systems "*pretty much run themselves*" (Store Manager 2, Retailer B). This perspective was at odds with the views of the sales assistants interviewed, who felt that overseeing self-checkouts was particularly demanding, prompting one participant to compare it to being "*like a workout*" (Customer Assistant 2, Retailer B). This sentiment reflected how the number of workers supervising the checkouts rarely increased to support higher volumes:

"*…there is not enough staff on [...] It's getting worse. They keep cutting back [...] On the self-checkouts there should be two people, it's too much for one person and when all of them get blocked up because they need me to do something, the queue gets massive*…" (Customer Assistant 3, Retailer B)

As a result, workers experienced further work intensification and customer waiting times increased. Despite the surge in hiring during the pandemic, the number of retail cashiers and checkout operators fell from 166,800 in March 2020 to 149,500 in March 2021 (ONS, 2024b). Those who remained in these roles commented that the work became increasingly pressurised and dangerous, as one worker described how they felt "*the most unsafe"* (Customer Assistant 4, Retailer B) overseeing the self-checkouts because of the limited space for social distancing.

Our analysis shows that the complexity and contingency of choices made around technological change were dependent on epidemiological requirements combined with a sustained desire on the part of employers to keep costs low. Avoiding costly investment allowed retailers to quickly revert to previous practices when the 'new normal' returned.

Beyond the pandemic: Adapting to unfilled expectations of technological change

After the pandemic peaked, demand for online shopping fell, temporary workers were no longer needed, and new arenas for competition emerged in which technology was seen as critical. However, there was little evidence of large capital investments in new technologies that would extend the technological acceleration narrative beyond the pandemic. This section demonstrates the messiness of technological change, which contrasts with the more deterministic view that new technology adoption follows an upward trajectory.

Contraction of (traditional) online shopping

In 2020, the UK's online-only food retailer, Ocado, was crowned an early 'lockdown-winner' by the media (Wallop, 2020; Jolly, 2020) and featured prominently in the newspaper analysis. However, this quickly changed when restrictions eased and demand for online food shopping contracted. This created significant issues for Ocado, renowned for its lack of physical stores and automated order fulfilment centres, since the construction of warehouses is time-consuming and costly. Consequently, Ocado's capacity to immediately expand its delivery service and capitalise on the online boom was limited. Eventually, the retailer opened two new sites, but by this stage, the demand for online groceries had fallen and Ocado was unable to maintain previous levels of demand (Butler and Kollewe, 2023). By contrast, Tesco and the other major retailers that capitalised on human flexibility scaled back their online provision once demand eased since the online market offered thin margins. Emerging reports suggested that Tesco shed most of the 12,000 pickers hired in the early days of the pandemic (Nott, 2020), avoiding the longer-term commitments made by Ocado. Furthermore, as the cost-of-living crisis ensued, consumer preferences for lower-priced goods purchased in-person boosted the market position of discount retailers that had resisted the move online.

New competitive arenas

Super-fast delivery became an alternative arena for competition immediately after the pandemic. One media outlet described it as a 'tech arms war' (Chambers, 2021) whereby competition in grocery retailing was increasingly centred around the speed of delivery rather than price comparison (in the context of global food price inflation). However, despite the expansion of third-party delivery partnerships, rapid delivery had limited reach beyond London and other major cities. Tesco opted to expand its delivery service through a partnership with the platform Gorilla (in addition to its in-house one-hour delivery provision) (Butler, 2021), yet reports suggested that this struggled to get off the ground (Nott, 2022). Online food delivery has notoriously small margins, prompting press commentators to suggest that "*…there is no miracle technology coming over the hill to solve the grocers' online difficulties, pushing supermarkets to get more creative to boost their dismal digital returns.*" (Chambers, 2021).

Media reporting continued to cover trials for checkout-free stores, perceived as a potential arena of retailer competition. Copy-cat versions of 'Amazon Go' emerged, which mimicked Amazon's bricks-and-mortar stores (launched in 2016) that combined computer vision, data from lasers and generative AI to allow customers to pick items from the shelf and exit the store - without any interaction with a store employee (Frost, 2019). Sainsbury's, Tesco, Co-op, Aldi, and Morrison announced similar ambitions to develop a more sophisticated self-service offer, following in Amazon's footsteps. However, the success of this approach was far from evident. Amazon planned to open 3,000 stores by 2021, but by 2023 this amounted to only 29 stores in the US and 15 in London (Peters, 2019). Although the need for social distancing created ideal conditions for this type of contact-free retailing, Amazon

eventually announced plans to abandon its 'Just Walk Out' technology, citing cost and operational issues (Wayt, 2024). Media hyperbole around the 'end of the checkout' then quietened down, and new concerns surrounding self-checkouts and the rise of shoplifting began to surface.

This discussion serves as a reminder that although state-of-the-art technologies may be available, they do not necessarily deliver their 'intended' effects since management strategies often fail to create the conditions needed for successful outcomes (Barley, 2020). In comparison, the move to increasing the number of traditional self-service checkouts in stores has proved successful, as customers became familiar with these systems during the pandemic. This complemented consumer demand for in-store shopping to help satisfy their cost-cutting priorities.

Discussion and conclusion

This article has examined how sociotechnical change has evolved in food retailing in recent years. The focus of the study was chosen without the foresight of the pandemics disruptive impact, and the collection of data prior to the pandemic provided a fortuitous opportunity to explore how exogenous shocks shaped employer strategies and their approach to technology adoption. As the crisis unfolded, it soon became clear that debates concerning radical shifts in work organisation due to accelerated technological change needed to be explored. By focusing on the food retail sector, this article has shown how employers largely adopted temporary technological solutions to navigate financial uncertainties, many of which were reversed once the peak of the pandemic had passed. The study has demonstrated a continuing reliance on low-wage labour in food retailing, despite periods of rapid technological expansion and contraction, highlighting the complex relationship between work, disruption and technological change.

This article responds to calls for further studies of traditional industries, providing a new dimension to our understanding of new technology and food retailing during a time of disruption (Lloyd and Payne, 2021), which is becoming increasingly relevant in a world characterised by 'permacrisis' (Brown et al., 2023). Drawing on the historical context of the sector and examining sociotechnical change across three timeframes is critical to making sense of contemporary food retailing. Prior to the onset of the pandemic, the sector was considered to be pursuing an upward trajectory of technology adoption (Begley et al., 2019) with associated predictions of labour reduction (Frey and Osborne, 2017). These predictions were accelerated during the pandemic, both by management consultancy firms (see Fiedler, 2020; McKinsey, 2020a; Deloitte, 2020) and mainstream media (see Smithers, 2020; Wallop, 2020), who foresaw a 'big bang' technological transformation. In the absence of empirical research in an area with context-specific dynamics, deterministic narratives gain traction (Joyce et al., 2023) and shape our understanding of technological change in workplace settings. However, our historical overview of new technology in food retailing, complemented by an interrogation of the period leading up to, during and beyond the pandemic, has demonstrated the complexity of technological change.

A key finding concerns the continued role labour has played within the sociotechnical transformation of food retail work, which is absent from much of the 'acceleration' narratives. SST maintains that labour costs are vital to justifying investment in new technology (MacKenzie and Wajcman, 1985), yet outcomes cannot be known in advance, especially in a context rife with uncertainty. By broadening the analytical lens beyond the use of technology, we have demonstrated how the cost and availability of labour remained central in shaping the types of technology implemented in the sector. Before the pandemic, labour hours allocated to stores were falling due to rationalisation strategies and organisational restructuring, rather than the adoption of automating technologies. Consequently, innovation is historically contingent and economic considerations depend on social relations. This finding contributes further empirical evidence in support of Morgan's (2019) theoretical claim that often job losses can be more accurately attributed to non-technological lean management strategies.

Furthermore, although it was assumed that the pandemic would lead to an acceleration of labour-saving technology, our evidence suggests that responses more closely mirrored historical patterns of technology adoption in retail. These patterns reveal a flexible model combining (relatively) inexpensive systems that require human intervention and workers employed at a (relatively) low-cost. The mass availability of human workers (due in part to the furlough scheme) presented retailers with a cost-effective route to increasing capacity by hiring temporary workers. The flexibility of both labour and the chosen technologies enabled employers to scale and descale rapidly while avoiding the costs of long-term investment. Thus, the relationship between new technology and labour is not determined by technological capabilities, but by the priorities and strategies of organisations that own and operate them. As others have argued, technologies such as EPOS systems and bar codes have long been used to increase sales through targeted marketing strategies and consequently demand for labour (Newsome et al., 2013). We also find that technology use during the pandemic increased demand for labour by enabling customers to purchase items more freely in a context where close contact was restricted. This resonates with Spencer's (2018: 8) critique of end-of-work predictions which often "*...fail to see how the growth of work and the progress of technology can go hand-in-hand*".

The analysis has also contributed to the area of SST research that has rejected linear models of innovation (Williams and Edge, 1996; Russell and Williams, 2002) which assume that technology adoption is incessantly growing. We have shown how technology use initially expanded and was later rolled back in response to the fluctuating context of the pandemic. As lockdowns eased, the anticipated adoption of e-commerce in UK food retailing failed to materialise as predicted at the start of the pandemic (McKinsey, 2020b), with online sales plateauing at 3.7 percentage points above pre-pandemic levels (Statista, 2024). This was problematic for online-only food retailers such as Ocado, which invested significantly in extending its permanent operations. By contrast, traditional food retailers swiftly reduced their online offering when restrictions were lifted, thus minimising the impact of the low margins associated with online grocery shopping (Eley and McMorrow, 2020). This response was

possible in part because of outsourcing arrangements with third-party delivery partnerships that were quickly rolled back when market demands changed, but also because many new hires were based on temporary contracts. This finding supports existing contentions that technological implementation does not always result in intended outcomes (Barley, 2020), particularly in cases where the solution is no longer deemed suitable or profitable.

We posit that food retailing, which constitutes a sub-section of the vastly diverse retail sector, has followed a different trajectory than the wider sector, which has sustained a slightly higher uptake in online sales post-pandemic (5 percentage points) (ONS, 2024c). This is partly attributed to consumer preferences for buying food in person (Magalhães, 2021), which goes some way towards explaining why the specific technology of self-service checkouts was sustained beyond the pandemic, as shoppers became more accustomed to using these systems.

While food retailing is neatly positioned for understanding the complexity of sociotechnical change, we recognise that there are unique features to our study. We are in quickly evolving times and future shocks may well have different and unexpected impacts on the organisation of low-wage work relative to technology. Nevertheless, this discussion provides fertile ground for future research on the complex evolution of sociotechnical change post-crisis in bricks-and-mortar retailing, but also across the supply chain more broadly. Furthermore, there remains an increasing need for a critical understanding of how crises (and the recovery from crises) – whether geo-political, economic, epidemiological or ecological – are likely to influence the future of work in traditional industries.

Bibliography

Altheide, D. and Schneider, C. (2013) *Qualitative media analysis.* Los Angeles, CA: SAGE Publications Ltd.

Barley, S. (2020) *Work and Technological Change.* Oxford University Press: Oxford.

Basker, E. (2012) 'Raising the Barcode Scanner: Technology and Productivity in the Retail Sector', *American Economic Journal: Applied Economics*, 4(3), pp. 1-27.

Basker, E. (2016) 'The evolution of technology in the retail sector', in E. Basker (ed.) *Handbook on the Economics of Retailing and Distribution*. Elgar, pp. 38–53.

Begley, S., Hancock, B., Kilroy, T. and Kohli, S. (2019) *Automation in retail: An executive overview for getting ready*, *McKinsey*. https://www.mckinsey.com/industries/retail/our-insights/automation-in-retail-an-executive-overview-for-getting-ready.

Belger, T. (2020) *Coronavirus: UK supermarkets hire 136,000 staff during pandemic*, *Yahoo! Finance UK*. https://uk.finance.yahoo.com/news/coronavirus-supermarket-job-vacancies-hiring-tesco-122732321.html.

Benner, C., Mason, S., Carré, F. and Tilly, C. (2020) 'Delivering Insecurity: E-commerce and the Future of Work in Food Retail', *UC Berkeley Labor Center*. https://laborcenter.berkeley.edu/delivering-insecurity/.

Beynon, H., Grimshaw, D., Rubery, J. and Ward, K. (2002) *Managing Employment Change: The New Realities of Work*, *Managing Employment Change*. Oxford: Oxford University Press.

Bijker, W. E. (1997) *Of Bicycles, Bakelites, and Bulbs: Toward a theory of sociotechnical change*. Cambridge, MA: MIT press.

Bowlby, R. (2000) *Carried away: The invention of modern shopping*. New York: Columbia University Press.

Bozkurt, Ö. (2015) 'The punctuation of mundane jobs with extreme work: Christmas at the supermarket deli counter', *Organization*, 22(4), pp. 476–492.

Braun, V. and Clarke, V. (2019) 'Reflecting on reflexive thematic analysis', *Qualitative Research in Sport, Exercise and Health,* 11(4), pp. 589–597.

BRC (2021) 'A year in pandemic: how technology is driving retail transformation', *British Retail Consortium*. https://brc.org.uk/news/customer/a-year-in-pandemic-how-technology-is-driving-retail-transformation/.

Brown, G., El-Erian, M.A., and Spence, M. (2023) *Permacrisis: A Plan to Fix a Fractured World*, London: Simon and Schuster

Brynjolfsson, E. and McAfee, A. (2014) *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W. W. Norton & Company.

Burt, S., Sparks, L. and Teller, C. (2010) 'Retailing in the United Kingdom - a Synopsis', *European Retail Research*. Eds. P. Schnedlitz et al. Wiesbaden: Gabler Verlag.

Butler, S. (2021) 'Tesco and Gorillas join forces to test 10-minute delivery service', *The Guardian*. https://www.theguardian.com/business/2021/oct/28/tesco-and-gorillas-join-forces-to-test-10-minute-delivery-service.

Butler, S. and Kollewe, J. (2023) 'Ocado pauses building new warehouses as annual losses balloon to £500m', *The Guardian*. https://www.theguardian.com/business/2023/feb/28/ocado-losses-retail-sales-decline-customers-shop.

Carré, F., Tilly, C., Benner, C. and Mason, S. (2020) 'Change and Uncertainty, Not Apocalypse: Technological Change and Store-Based Retail', *UC Berkeley Labor Center*. https://laborcenter.berkeley.edu/change-and-uncertainty-not-apocalypse-technological-change-and-store-based-retail/.

Carré, F. and Tilly, C. (2017) *Where Bad Jobs Are Better: Retail Jobs Across Countries and Companies*. Russell Sage Foundation.

Castillo, A. (2023) 'Regulatory strategies of retail trade unions in the face of socio-technical transformations: the case of functional flexibility schemes in Chilean supermarkets', *8th Conference of the Regulating for Decent Work Network.* July 2023, Geneva: Switzerland.

Chambers, S. (2021) 'Amazon's great grocery grab', *The Times*. https://www.thetimes.co.uk/article/amazons-great-grocery-grab-skfp53w7d.

Chambers, S. (2022) 'Rapid food delivery primed to be the next victim of the "tech wreck"', *The Times*. https://www.thetimes.co.uk/article/rapid-food-delivery-primed-to-be-the-next-victim-of-the-tech-wreck-qxx03mfp8.

Davey, J. (2022) 'Why are more retailers using robots?', *World Economic Forum*. https://www.weforum.org/agenda/2022/12/retailers-artificial-intelligence-robots/.

Davidson, C. (2009) 'Transcription: Imperatives for Qualitative Research', *International Journal of Qualitative Methods*, 8(2), pp.35–52.

Deloitte (2020) 'What retail technology has in store', *Deloitte.* https://www2.deloitte.com/content/dam/Deloitte/us/Documents/consulting/us-what-retail-technology-has-in-store.pdf.

Drenik, G. (2023) 'How Intelligent Automation Is Transforming the Post-Pandemic Retail Experience', *Forbes*. https://www.forbes.com/sites/garydrenik/2023/07/18/how-intelligent-automation-is-transforming-the-post-pandemic-retail-experience/.

Eley, J. and McMorrow, R. (2020) 'Why supermarkets are struggling to profit from the online grocery boom', *The Financial Times.* https://www.ft.com/content/b985249c-1ca1-41a8-96b5-0adcc889d57d.

Fiedler, L., Hazan, E., Ruwadi, B. and Ungerman, K. (2020) 'The reinvention of retail', *McKinsey & Company.* https://www.mckinsey.com/capabilities/growth-marketing-and-sales/solutions/periscope/our-insights/surveys/reinventing-retail.

Ford, M. (2015) *The Rise of the Robots - Technology and the Threat of Mass Unemployment*. London: Oneworld Publications.

Freathy, P. and Sparks, L. (2000) 'The organisation of working time in large UK food retail firms', in *Flexible Working in Food Retailing: A Comparison Between France, Germany, Great Britain and Japan*. Routledge, pp. 83–113.

Frey, C.B. and Osborne, M.A. (2017) 'The future of employment: How susceptible are jobs to computerisation?', *Technological Forecasting and Social Change*, 114, pp. 254–280.

Frost, N. (2019) 'How do Amazon Go stores work?*'*, *Quartz*. https://qz.com/1635952/how-do-amazon-go-stores-work/.

du Gay, P. (2004) 'Self-Service: Retail, Shopping and Personhood', *Consumption Markets & Culture*, 7(2), pp. 149–163.

Gregory, A. (1991) 'Patterns of working hours in large-scale grocery retailing in Britain and France: Convergence after 1992?', *Work, Employment and Society*, 5(4), pp. 497–514.

Grimshaw, D., Beynon, H., Rubery, J. and Ward, K. (2002) 'The Restructuring of Career Paths in Large Service Sector Organizations: "Delayering", Upskilling and Polarisation', *The Sociological Review*, 50(1), pp. 89–115.

Grugulis, I. and Bozkurt, Ö. (2011) 'Why retail demands a closer look', in Ö. Bozkurt and I. Grugulis (eds) *Retail Work*. Hampshire: Palgrave Macmillan UK (Critical Perspectives on Work and Employment).

Hadjisolomou, A., Newsome, K. and Cunningham, I. (2017) '(De) regulation of working time, employer capture, and "forced availability": a comparison between the UK and Cyprus food retail sector', *The International Journal of Human Resource Management*, 28(21), pp. 3047–3064.

Hopping, D. (2000) 'Technology in retail', *Technology in Society*, 22, pp. 63–74.

Howcroft, D. and Taylor, P. (2023) 'Automation and the future of work: A social shaping of technology approach', *New Technology, Work and Employment*, 38(2), pp. 351–370.

Jolly, J. (2020) ‘Ocado plans to raise £1bn as online deliveries boom in the UK’, *The Guardian*. http://www.theguardian.com/money/2020/jun/10/ocado-plans-to-raise-1bn-as-online-deliveries-boom-in-the-uk.

Joyce, S., Umney, C., Whittaker, X. and Stuart, M. (2023) ‘New social relations of digital technology and the future of work: Beyond technological determinism’, *New Technology, Work and Employment*, 38(2), pp. 145–161.

Lloyd, C. and Payne, J. (2019) 'Fewer jobs, better jobs? An international comparative study of robots and 'routine' work in the public sector', *Industrial Relations Journal,* 52, pp.109-124.

MacEwen-Scott, A. (1994) ‘Gender Segregation in the Retail Industry’, in Alison MacEwen-Scott (ed.) *Gender Segregation and Social Change: Men and Women in Changing Labour Markets: men and women in changing labour markets*. Oxford: Oxford University Press, pp. 235–267.

MacKenzie, D. and Wajcman, J. (1985) *The social shaping of technology*. 1st edn. Milton Keynes: Open University Press.

MacKenzie, D. and Wajcman, J. (1999) *The social shaping of technology*. 2nd edn. Milton Keynes: Open University Press.

Magalhães, D. (2021) ‘Analysis of critical factors affecting the final decision-making for online grocery shopping’, *Research in Transport Economics,* 87, pp. 101088.

Meadows, S. (2020) ‘Shift to online grocery shopping is ‘irreversible’, Waitrose boss says as it is embraced by over-55s’, *The Telegraph*. https://www.telegraph.co.uk/news/2020/08/20/shift-online-grocery-shopping-irreversible-waitrose-boss-says/.

McLaughlin, J. (1999) ‘Gendering occupational identities and IT in the retail sector’, *New Technology, Work and Employment*, 14(2), pp. 143–156.

McKinsey (2020) ‘The future of shopping: technology everywhere’, *McKinsey & Company.* https://www.mckinsey.com/featured-insights/the-next-normal/shopping.

Moody, K. (2018) ‘High Tech, Low Growth: Robots and the Future of Work’, *Historical Materialism*, 26(4), pp. 3–34.

Music, J. and Charlebois, S. (2022) ‘Consumer perceptions about food retail and services during the first wave of Covid-19 in Canada: An exploratory study’, *Cogent Social Sciences,* 8(1), 1-15.

Newsome, K., Thompson, P. and Commander, J. (2013) '"You monitor performance at every hour": labour and the management of performance in the supermarket supply chain', *New Technology, Work and Employment*, 28(1), pp. 1–15.

Nott, G. (2020) 'How coronavirus will herald a new era of automation in grocery', *The Grocer*. https://www.thegrocer.co.uk/supermarkets/how-coronavirus-will-herald-a-new-era-of-automation-in-grocery/605200.article.

Nott, G. (2022) 'Will Getir gobble up Gorillas and how rapid grocery delivery is getting gory', *The Grocer*. https://www.thegrocer.co.uk/the-grocer-blog-daily-bread/will-getir-gobble-up-gorillas-and-how-rapid-grocery-delivery-is-getting-gory/672350.article.

Ogbonna, E. and Wilkinson, B. (1998) 'Power relations in the UK grocery supply chain: Developments in the 1990s', *Journal of Retailing and Consumer Services*, 5(2), pp. 77–86.

ONS (2023) 'Earnings and hours worked, occupation by four-digit SOC: ASHE Table 14', *Office for National Statistics*. https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashetable14.

ONS (2024a) 'Annual Business Inquiry', *Nomis - Official Census and Labour Market Statistics*. https://www.nomisweb.co.uk/articles/446.aspx?Session_GUID=%7B4AAA2346-D97C-459A-8634-585F0186FB3C%7D.

ONS (2024b) 'Annual population survey – employment by occupation', *Office for National Statistics.* https://www.nomisweb.co.uk/datasets/aps168.

ONS (2024c) 'Internet sales as a percentage of total retail sales (ratio) (%)', *Office for National Statistics*. https://www.nomisweb.co.uk/articles/446.aspx?Session_GUID=%7B4AAA2346-D97C-459A-8634-585F0186FB3C%7D.

Oxford Martin School (2017) *Technology at Work v3.0: Automating e-Commerce from Click to Pick to Door*. Citi. https://www.oxfordmartin.ox.ac.uk/downloads/CITI%20REPORT%20ADR0N.pdf.

Palm, M. (2017) *Technologies of Consumer Labor: A History of Self-Service*. London: Routledge.

Penn, R. (1995) 'Flexibility, Skill and Technical Change in UK Retailing', *The Service Industries Journal*, 15(3), pp. 229–242.

Perrons, D. (2000) 'Flexible Working and Equal Opportunities in the United Kingdom: A Case Study from Retail', *Environment and Planning A*, 32(10), pp. 1719–1734.

Peters, J. (2019) 'Docs show Amazon planned to open dozens of cashierless Go stores this year — what's the holdup?', *The Verge*. https://www.theverge.com/2019/9/10/20857921/amazon-go-rollout-delay-cashierless-convenience-stores-whole-foods.

Price, R. (2011) 'Technological Change, Work Re-organisation and Retail Workers' Skills in Production-Oriented Supermarket Departments', in I. Grugulis and Ö. Bozkurt (eds) *Retail Work*. Hampshire: Palgrave Macmillan UK, pp. 88–106.

Robinson, O. and Wallace, J. (1974) 'Part-time employment and low pay in retail distribution in Britain', *Industrial Relations Journal*, 5(1), pp. 38–56.

Russell, S. and Williams, R. (2002) 'Social shaping of technology: frameworks, findings and implications for policy', in K. Sørensen and R. Williams (eds) *Shaping technology, guiding policy, concepts, spaces and tools*. Edward Elgar.

Smithers, R. (2020) 'Pandemic prompts doubling of online grocery shoppers in UK', *The Guardian*. https://www.theguardian.com/business/2020/aug/20/pandemic-prompts-doubling-of-online-grocery-shoppers-in-uk.

Spencer, D. (2018) 'Fear and hope in an age of mass automation: Debating the future of work', *New Technology, Work and Employment.* 33(1), pp. 1-12.

Wajcman, J. (1991) 'Patriarchy, Technology, and Conceptions of Skill', *Work and Occupations*, 18(1), pp. 29–45.

Wajcman, J. (2017) 'Automation: is it really different this time?', *The British Journal of Sociology*, 68(1), pp. 119–127.

Wall, T. (2022) 'Bubble bursts for rapid food delivery as UK firms shed workers', *The Observer*. https://www.theguardian.com/business/2022/sep/03/bubble-bursts-for-rapid-food-delivery-as-uk-firms-shed-workers.

Wallop, H. (2020) ''Christmas slots went in five hours': how online supermarket Ocado became a lockdown winner', *The Guardian*. https://www.theguardian.com/business/2020/nov/28/christmas-slots-went-in-five-hours-how-online-supermarket-ocado-became-a-lockdown-winner.

Wayt, T. (2024) *Amazon's Grocery Stores to Drop Just Walk Out Checkout Tech*, *The Information*. https://www.theinformation.com/articles/amazons-grocery-stores-to-drop-just-walk-out-checkout-tech.

Williams, R. and Edge, D. (1996) ‘The social shaping of technology’, *Research Policy*, 25(6), pp. 865–899.

Winstanley, M. (1983) *The Shopkeeper’s World: 1830-1914*. Manchester: Manchester University Press.

Wrigley, N. and Lowe, M.S. (2002) *Reading retail: a geographical perspective on retailing and consumption spaces*. London: Arnold.