Unequal Working Futures and Machine Intelligence

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Abstract

Sonya, a participant in this study, talking about technological change, said it is important to *'imagine, remember before*.' From remembering to imagining, I explore workers' imagined working futures as influenced by social positions, drawing on Bourdieu's concepts of capitals and habitus, which offers a relational view of the future of work.

Machine intelligence and the future of work is widely discussed, and workers are talked about as likely or less likely victims of automation. In this thesis, I have brought together Science and Technology Studies' resistance to technological determinism and the sociology of work's concern with social relations and the experience of work. In developing the concept of the sociotechnical imagination, built of sociotechnical imaginaries (Jasonoff, 2015) and Mills' (1959) sociological imagination, I call in experts of everyday experiences of work – workers themselves.

The workers in this study are delineated by class to explore hierarchies of power, including the power to influence the future. The concept of control (Marx, 1930, 1946) is used to differentiate working conditions and denotes class (Braverman, 1974; Friedman, 1977). The research design incorporates three worlds of work, drawing participants from a purposeful sampling based on level of control (or autonomy), proximity to technology development and future focus within their work. The participants worked in knowledge work, AI development and factory work.

The sample of participants includes workers at intersections of class, race and gender to explore how futures constructed by workers are influenced by experiences of work at intersections. Therefore, workers' imagined futures

are treated as sociological artefacts, taking shape in the context of machine intelligence that is always in a state of becoming. I asked workers to talk about their working lives and to project working futures alongside their imagined forms of machine intelligence. Through semi-structured interviews, participants talked about how their work could be reconfigured, the extent to which they could benefit in those imagined futures and how they envisaged machine intelligence and the future of work in society.

Workers' futures alongside machine intelligence are influenced by social positions and forms of capital (Bourdieu, 1984). My research found five orientations to the future, influenced by the sense of agency felt in working lives. The study highlights the elasticity between social position and imagined working futures as well as the sense of potential afforded by a developing technology in the gaps between the past, present and future tenses. Within this space, the concept of machine intelligence capital and its relationship to other forms of capital, particularly amongst workers at intersections of class, gender and race, is developed.

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Chapter 1: Introduction

This thesis is motivated by an absence of workers' voices at the heart of discussions about the future of work with machine intelligence. It challenges the inclination in those discussions to treat articulated imagined futures as uninfluenced by social positions and technology as deterministic. Therefore, this thesis interrogates how structures of power play out in imagined working futures with machine intelligence. The priority is to focus on the voices of workers, the everyday experts of work, and to explore imagined futures as influenced by social inequalities. For too long, futures have been a sociological side project rather than valid sociological artefacts (Beckert and Suckert, 2021). The sociology of work and science and technology studies (STS), as brought together in this thesis, prime working futures for sociological analysis, undetermined and unequal, influenced by social position yet open to reimagination through the talk of workers. The prioritisation of workers who experience work at intersections of class, gender and race in this research, drawing on Bourdieu's concepts of the habitus and forms of capitals (Bourdieu, 1984), maintains a view of working experiences and imagined futures with machine intelligence through structural inequalities.

This chapter aims to justify why the research topic of this thesis is worthy of investigation in the way that I have investigated it. It offers context for how the thesis contributes to knowledge by positioning machine intelligence laden working futures as open, exploring possibilities for the reimagination of work through the talk of workers themselves.

The next section will set out how the future of work alongside machine intelligence is most discussed, by whom, and will argue that such discussion requires a sociological reset centring on workers' voices. It will discuss inequalities and argue that futures are connected to social position, highlighting an urgent need to understand how social inequalities, including at intersections, impact futures alongside machine intelligence. The subsequent section will focus on the developments of machine intelligence, to illustrate the pervasiveness of its uses and the government response to encourage development and protect public trust.

1.1 Unequal Futures

> 'In losing their work… they can only experience the free time that is left to them as dead time, purposeless and meaningless. If time seems to be annihilated, this is because employment is the support, if not the source, of most interests, expectations, demands, hopes and investments in the present, and also in the future or the past that it implies, in short, one of the major foundations of *illusio* in the sense of involvement in the game of life…' (Bourdieu, 2000: 222)

Over the past decade there has been renewed interest in how Artificial Intelligence (AI) or robotics (here, machine intelligence) may change human work, as though how we live is determined by technology. Envisaged consequences are significant, including exacerbated social inequalities. This is not a ground-breaking notion in sociology, which has a history of connecting work and technological change to societal structure. In the quote above, Bourdieu swiftly connects how workers think about their futures to their current experiences of work – or lack thereof. For Marx (1930, 1946), technology contributed to the creation of a reserve army of the unemployed to keep wages low.

Science and technology studies (STS) influenced my thesis through the argument that society and technology are mutually shaping, laying the basis for asking how this relationship with technology, work and futures might be influenced by social inequalities. A single form of inequality is insufficient to understand this question, calling for the intersectional lens (Collins and Bilge,

2020) on social inequalities to position futures as open, contested and unequal. This thesis focuses on class, gender and race and a considerate, yet practical limitation is that it does not encompass more forms of social inequalities.

Technology experts, commentators, policy makers and corporations have been grappling with the matter of how to get ahead of, or at least keep up with, what appears to be on the horizon. Meanwhile, working in the present, technology developers and workers continue to develop and to work alongside and with new forms of technology. Cheng et al (2019) briefly touch on employee sentiment towards robots in their paper on the rise of robots in China but broadly, future of work literature maintains a central debate between augmentation and automation (Raisch, Krakowski, 2021). So far in these discussions, there is a lack of consideration of the relationships between the social positions, particularly at intersections, and the futures that are articulated and designed. Kelan (2022) argues for an intersectional approach to the future of work to see new perspectives on the topic and discussion of augmentation through social and emotional skills considering race, gender and class. The Centre for Data Ethics and Innovation's (2020) review on algorithmic bias recommends the collecting of demographic data but thus far its tracker about public attitudes about AI does not apply intersectional analysis, offering data for ethnicity, gender or class but not at the intersections.

The dominant narrative of work and machine intelligence is that of widespread job replacement. A widely cited and critiqued (Wacjman, 2017) report predicted 35% of jobs in the UK, mostly low-skilled, are likely to be automated (Frey, Osbourne, 2014). The authors modelled US Department of Labor data to classify jobs according to the requirement of skills which are identified as obstacles to automation: perception and manipulation;

creativity; and social intelligence. Similarly, PwC used machine learning techniques and OECD data on task structures of occupations to predict that up to 30% of UK jobs will be replaced. Workers with GCSE or lower qualifications are expected to be most at risk (PwC, 2018). While technological unemployment is not a new idea (Keynes, 1930), historic rises in income inequalities (Dorling, 2015; Piketty, 2014; The Equality Trust, 2019; Mijs, 2021) form the backdrop to the machine intelligence narrative.

There are longer-standing calls for a break between work and income to maintain sufficient livelihoods for all (Gorz, 1999; Levitas, 2001). Alternative options discussed range from a balance of state guaranteed minimum income with a mix of paid and voluntary work (Strangleman, 2007), reducing the retirement age, increased leisure time, positive discrimination in favour of humans (Marchant et al, 2014) and a 'robot tax' to fund human worker re-training (Schiller, 2017). Automation, amongst other social issues, has stimulated renewed discourse about the end of capitalism (Mason, 2015; Srnicek and Williams, 2016) and has been linked to political due to economic hardship (Ross, 2016). In this context, machine intelligence is expected to further polarise workers with a highly educated and paid minority doing 'abstract' tasks and a majority on low wages carrying out 'manual' tasks (Autor, 2015: 12). This technologically deterministic view is reminiscent of Braverman's (1974) Marxist analysis, in which the capitalist mode of production shapes relationships with technology through the division of labour. Only a minority maintain knowledge in their work and experience autonomy – thus, setting up the experience of work and control as a site of inequality.

Research on technology change and work is varied, including increased specialisation and a move away from manual labour (Erikson and Goldthorpe, 1992; Iversen and Cusack, 2000) and vulnerability to automation researched as an occupational risk (Thewissen and Rueda, 2019). Overall, there has been focus on the implications of AI and robots in the labour markets (Caro-Burnett and Kaneko, 2022) but these focus on topics such as firm level data on robot adoption (Acemoglu, Lelarge, Restrepo, 2020), skills effected by technological change (Autor, Levy, Murnane, 2003), whether robots should be taxed (Guerreiro, Rebelo, & Teles, 2017; Acemoglu, Restrepo, 2018) or task based probability of job replacement (Frey and Osborne, 2017).

Technological determinism dominates the literature, limiting opportunities to interrogate nuanced and changing relationships between workers and technology, and in particular technology which appears to perform cognitive functions through means that are not fully understood by workers (Brynjolfsson and McAfee, 2014). For example, MacKenzie et al (2015) report a direct link between workers, technology, the language used to describe it and identity in their study of telecoms engineers working with 'black boxes' (14). By contrast, the orthodox economic perspective encapsulated by Autor (2015) assumes technology is an external force, which transforms labour demand and it is accepted that some workers will benefit more than others. Inequity is explained by a form of human capital theory, which sees wage differences reflect the need for employers to select employees based on skills and qualifications (Becker, 1964, 2008; Fleming, 2017). Skill biased technological change theory explains rising wage inequality as a result of the disproportionate increase in the productivity of highly skilled workers (Autor et al, 2003; Card & DiNardo, 2002).

The theory that machine intelligence will impact demand for workers depending on their skills and tasks (Autor, 2015) encourages policy focusing on education, re-skilling and lifelong learning (Autor et al, 2003; Autor, 2015; Cowen, 2013; Parliament, 2016) to maintain a productive human workforce. This precludes consideration of structural issues that may impact social inequalities and workers' likelihood to benefit from machine intelligence. The present study adopts the view that socio-economic status or occupation as key dimension of social class indicating capital (Clayton and Macdonald, 2013) shapes use and ability to benefit from technology at work. I apply the Bourdieusian concepts of capital and habitus to consider how social position influenced by the past and present also influence future. Crucially, some people play more of a role than others in determining what being productive means. While machine intelligence has been framed as something that could be used for the greater good with benefits that could be felt equally, the actual futures themselves, the capacity and space to imagine, articulate and share is relatively closed off to workers, remaining in the realm of experts, policymakers, developers and designers. This thesis positions working futures as a site of inequalities which can be explored by addressing the gap of workers' own projections of futures at intersections of class, gender and race.

Since my fieldwork in 2018, there has been a global pandemic with untold implications for societies across the world. This thesis is cognisant of how work has been impacted, from job losses to changes in ways of working and potential for long term implications for the experience of work (Vyas, 2022). Organisations responded at speed to lockdowns, making use of technology to maintain productivity (Dwivedi et al, 2020; Richter, 2020; Carroll and Conboy, 2020). For those workers who shifted to fully remote work, there has been an increase in technology that can be used to track employees (Laker et al, 2020) and reports of workers' countering tactics to avoid management surveillance at home through other technological means (Christian, 2020). By 2022, the ONS reported an increase in the proportion of workers planning to spend most of their work time at home, with higher earners more likely to do so while lower earners were less likely to be able to do work from home (ONS, 2022).

However, impacts of Covid vary across gender (Zhou, 2020) and ethnicity (Keys et al, 2020) but crucially, at intersections of socioeconomic, ethnic, and geographical inequalities (Bambra et al, 2020) and gender and class (Warren et al, 2021). As the pandemic unfolded against the backdrop of existing inequalities in non-communicable diseases and inequalities in social determinants of health, Bambra et al (2020) argue that 'for the most disadvantaged communities, COVID-19 is experienced as a syndemic—a co-occurring, synergistic pandemic that interacts with and exacerbates their existing NCDs and social conditions' (965). For example, socio-economically disadvantaged neighbourhoods and minority ethnic groups are more likely to have higher rates of almost all underlying risk factors for Covid-19 (such as hypertension and diabetes). Lower-paid workers, where ethnic minority groups are over-represented, were also more likely to be keyworkers, required to commute to work, thereby increasing their risk. From this burgeoning literature, the concept of a 'syndemic pandemic' (Bambra et al, 2020: 964) in which existing inequalities are interacted with and exacerbated in relation to health inequalities is broadly reflected in how inequalities are interacted with in working futures alongside machine intelligence. An intersectional lens, including race, is crucial in exploring inequalities in work.

Following the murder of George Floyd in Minneapolis on 25th May 2020 by a police officer, protests took place that summer across the world, including in the UK during Covid-19. In June 2020, Reni-Eddo Lodge became the first British black author to top the UK book charts with her 2017 title *Why I'm No Longer Talking to White People About Race* (Flood, 2020). In January 2021, the BBC broadcast 'I Can't Breathe: Black and Dead in Custody,' a Panorama investigation into 'why black men in the UK are more likely than white men to have force used on them by police and to die in police custody' (Panorama, 2021). My interviews which discussed race took place before this moment in which racism and 'white privilege' (DiAngelo, 2019; Saad, 2020) was rendered visible, a topic to learn about, a reality to be dismantled (Kendi, 2019). A report into racial and ethnic disparities in the UK (Commission on Race and Ethnic Disparities, 2021), which critics labelled ‘gaslighting’ (Parker, 2021), was swiftly followed by the Inclusive Britain Action Plan (Race Disparity Unit, 2022), which responded to The Commission's recommended actions 72-74 to apply the Equality Act and address potential racial bias in algorithmic decision-making. Meanwhile, actions 16-17 promise to investigate causes of existing ethnic pay disparities in workplaces. If the interviews were conducted today, in the context of the anti-racist language and tools that have developed, they may have been different.

This section has summarised how the future of work alongside machine intelligence has been widely discussed, and how common it has been for the workers’ own futures to not be heard. The next section summarizes developments in machine intelligence.

1.2 Machine Intelligence Futures: Great Promises

To explain why this is a topic worth researching, this section illustrates the pervasiveness of machine intelligence and the way in which workers voices are drowned out by other interested parties, often driven by profit, with a strategic need to balance public trust to encourage adoption, which in turn encourages innovation. Machine intelligence, encapsulating forms of Artificial Intelligence (AI) and robotics, is a group of technology that is consistently in a state of becoming, with researchers and investors endlessly pursuing more functionality. Such a summary is limited to being snapshot in time of the landscape of the technology and its users. The thesis asks whether proximity to the development, design or otherwise in the involvement of machine intelligence is an advantage. However, influence does not dictate how that technology is used because capitalism does not determine technology trajectories but rather influences which technologies are backed.

Machine intelligence is widely discussed by experts, academics, investors and governments rather than the workers who might be working alongside machine intelligence now or in the future. The UK's AI National Strategy vision is to 'remain an AI and science superpower fit for the next decade' (Department for Business, Energy and Industrial Strategy, 2021) competing with America and China. Cheng et al (2019) found that sentiment towards robots is more positive in China than in other countries, for reasons including policy, subsidies, and media coverage, where reports related to industrial robots, even in relation to job replacement, were broadly positive.

A perfunctory glance at the developments in machine intelligence in the public eye over the past few years would cover an increasing number of domains, from transportation towards autonomous cars (Stilgoe, 2021), to robots replacing human workers building Apple devices (Bolton, 2016) or alongside workers in Amazon warehouses (Amazon, 2022), the landmark AlphaGo by DeepMind which beat a human player at the game Go, big data and algorithms for financial markets and products (O'Neill, 2016), weaponized robots warned against by robot manufacturers (Boston Dynamics, 2022), big data and behaviour modification (Zuboff, 2019), smart homes (Goulden, 2021), imaging in healthcare (NHS England, 2021) and much more. Facebook was implicated in the Cambridge Analytica scandal where users' data was collected without consent and used for political advertising (Wong, 2019). In 2021, Microsoft and OpenAI launched GitHub Copilot which uses AI to write code as a pair programmer with developers. In 2022, DeepMind said their AI system AlphaCode can code at a competitive level (Li et al, 2022) compared to human coders. A leading AI agency, OpenAI states on their website that their 'mission is to ensure that artificial general intelligence benefits all of humanity' (OpenAI, 2022). In 2022, they released an advanced chatbot to the public, which is a Large Language Model (LLM) trained on books, articles and internet content and uses statistical probability to answer questions. Its 'dialogue format makes it possible for ChatGPT (OpenAI, 2022) to answer follow up questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests' (OpenAI, 2022). ChatGPT is different to previous models mainly because of the way human AI trainers were used to finetune the model's data collection.

The most recent development is the release of generative AI to the public, where previously it was limited for testing (Chow and Perrigo, 2023). ChatGPT is currently open for the public to try for free to gather feedback and a subscription tier of $20 a month was introduced in February 2023. There has been concern that AI generated essay answers are likely to be submitted more widely by students (Sample, 2023). ChatGPT has been trained to reject inappropriate questions and cannot answer questions beyond 2021 as it has not been trained in data after that point. In 2021, OpenAI released Dall-E which creates images from text captions and it was released for public use in September 2022. The following year, AI art generator Midjourney, which also uses text to create images, was used to create an image which went on to win first prize in the digital category at the Colorado State Fair. In March 2023, an image of the Pope wearing a puffer coat created using Midjourney caught the attention of media as an example of the potential for misinformation through realistic generative AI. In January 2023, Microsoft invested $10 billion into OpenAI and the following month previewed their Bing search engine with ChatGPT integration while Google retaliated with Bard, their conversational-AI-assisted search, motivated by the British startup, Stability AI releasing a text-to-image tool straight to the public to gather more data from users (Chow and Perrigo, February 2023). Bard is currently restricted to users over the age of 18. Meanwhile, ChatGPT was temporarily banned in Italy by the Data Protection Authority over privacy fears (Pollina, Mukherjee, 2023). Despite these recent developments, there have been significant efforts to prepare for more powerful machine intelligence over the past decade.

My Masters dissertation examined the (predominantly economic or technology expert) narratives around AI and robotics, using Corpus Linguistics to analyse the language in the submissions to Select Committee inquiry of robotics and Artificial Intelligence (Parliament, 2016). The purpose of the parliamentary inquiry was to prepare for technology perceived to be quickly progressing. It looked at implications for the future of work in the UK, social and economic opportunities, the research and innovation landscape and social, legal and ethical issues. The Alan Turing Institute founded in 2015 for data science added Artificial Intelligence to the remit at government recommendation in 2017. The Institute's mission is to use data and artificial intelligence research 'to change the world for the better' (Alan Turing Institute, 2022). In 2018 there was a £1 billion government support package in the AI Sector Deal (Department for Business and Trade et al, 2019) focused on making Britain 'a global AI superpower' to drive 'growth, ensure everyone can benefit from AI; and to apply AI to help solve global challenges like climate change.' The Office for Artificial Intelligence (part of DCMS and BEIS) was also set up in 2019. The AI Council first met in September 2019 and among other themes, discussed how to move the 'conversation around AI away from the extremes to focus on a more balanced narrative' (Artificial Intelligence Council, 2019).

More recently, the Centre for Data Ethics and Innovation (CDEI, 2020) conducted a survey on public attitudes to data and AI in the UK. So far, the CDEI reports a general positivity towards AI in terms of increasing efficiency of tasks and access to healthcare for example. However, it reported 'potential negative impacts of AI, for example in producing unfair outcomes or reducing job opportunities,' with significant differences across demographics, pointing to an underlying belief that AI positives may not be distributed equally. Those who offered at least a partial explanation of AI were found to be less likely to believe job outcomes will be positive. Younger respondents were found to be generally more likely to believe in the positive benefits of AI for how fairly people are treated in society and the availability of job opportunities. Those identifying as of Asian ethnicity, compared to those identifying as White ethnicity were more likely to believe the impacts of AI will be positive across all outcomes (except for healthcare). The survey also found a difference between social grades, highlighting that those from lower social grade (C2DE) were less likely to believe in positive AI outcomes. Males were more likely than females to believe AI would lead to positive outcomes on fairness and job opportunities. In 2020, the CDEI published a review into bias in algorithmic decision-making reporting 'the urgent need for the world to do better in using algorithms in the right way: to promote fairness, not undermine it.' There is currently work underway to explore how to increase the collection of demographic data to identify potential bias in decision making (CDEI, 2022). While this is important, this thesis would want to overlay structures of power and an intersectional lens to understand differences in attitudes. Social position and job roles influence how much a worker can benefit from or be empowered by 'appropriate use of technology within a society in which they do not dictate what is 'useful' (Clayton and MacDonald, 2013: 949).

Class, gender and ethnicity are three social categories that influence social positions and capital. An intersectional view must be embedded within this research because the development of machine intelligence futures requires consideration in the context of power relations. To consider how futures as much as other temporal zones are shaped by social inequalities, this research is focused on interrogating the social relations and intersections of class, gender and ethnicity which gain meaning from one another (Bilge and Collins). Through interrogation of working futures alongside machine intelligence through an intersectional lens, it is possible to render visible how the status quo reinforces and reproduces inequalities.

This section has shown the developments in machine intelligence to the extent that it will – or has potential- to impact most aspects of life and as such, many workplaces and workers. The considerable effort from government departments to encourage and invest in machine intelligence reflects its perceived value. Despite this, workers are not leading the discussion and there is no sustained effort to make space for workers' futures. Furthermore, the overt determinism in the way machine intelligence is discussed may discourage conversations about how social inequalities influence how workers think about their futures. In contrast, this thesis centres workers' imaginings, reclaiming working futures from those deemed worthy of contribution to the discussion.

The next section will provide an overview of the research questions and scope.

1.3 Research questions, scope

This thesis answers one main research question. This question has three sub-questions that guide the research design and manage the scope of the research.

Research questions:

1. How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?
    a) How do workers perceive their working conditions, control and their social position in the workplace?
    b) What are the imagined working futures and configurations of work for workers using machine intelligence?
    c) How do workers describe machine intelligence, its development and potential for socially beneficial consequences?

The scope of the research is to study the talk of workers to better understand how social positions influence their articulations for their own and general working futures alongside machine intelligence. I recruited three groups of workers to take part in semi-structured interviews, based on differences in working conditions, specifically control as denoting social class, proximity to and relationship with technology development and the likelihood of future orientation in their jobs. The fieldwork took place in 2018. I will argue that the way workers imagine and articulate working futures alongside machine intelligence is influenced by experiences of social divisions in current working lives and proximity to machine intelligence development. In this thesis, workers' futures alongside machine intelligence become (thus far under-researched) precious sociological artefacts demanding attention. I will argue that social position influences workers' futures and how they relate to machine intelligence, however they perceive it, is embedded and influenced by already established and intersecting social inequalities. I conceptualise machine intelligence capital as influenced by other forms of capital and mutable. Machine intelligence capital here is made up of three factors: the worker's knowledge about machine intelligence, their confidence that they can learn use the technology and finally, their capacity to articulate imagined machine intelligence forms in the future.

Through the analysis of the talk of workers' imagined working futures with machine intelligence, this research finds five distinct orientations towards those futures in Chapter Five. The thesis does this through the operationalization of the sociotechnical imagination, formed from the sociolotechnical imaginaries in STS and Mills' sociological imagination (1959). The sociotechnical imagination as conceived of here, opens up working futures alongside machine intelligence as anchored in workers' talk, so that these imaginings are sociological artefacts connecting the public issue of the development of machine intelligence to personal working experiences of it, the future to present social positions, experiences of social inequalities to how we imagine work.

The next chapter provides the literature supporting this thesis. It begins by discussing how Bourdieu's concepts of habitus and capital can be employed to reveal how some articulated futures are more powerful than others - that working futures are unequal and are worthy of analysis. The chapter then offers a discussion of the struggle to control in work, which is used as a proxy for class. Before moving onto the research design and methods in Chapter Three, the next chapter develops the sociotechnical imagination, a concept formed at the intersection of Sociology and STS, seeing workers' imagined futures with machine intelligence as sociological artefacts.

Chapter 2: Thinking Relationally About Machine Intelligence Working Futures

2.0 Introduction

The idea for this research originated around the time of the publication of a number of books about the future of work and artificial intelligence (AI) or robotics (Frey and Osbourne, 2013; Susskind and Susskind, 2015; Ford, 2015; Bostrom, 2014; Brynjolfsson and McAfee, 2014; Mason, 2015). There was also an open letter entitled ‘Research Priorities for Robust and Beneficial Artificial Intelligence’ (Future of Life Institute, 2015) with signatories including Stephen Hawking, Elon Musk, the founders of Google’s Deepmind, Steve Wozniak and hundreds of AI technology experts. The open letter states progress in AI has the potential to deliver enormous benefits to society: ‘the eradication of disease and poverty are not unfathomable’ (Future of Life Institute, 2015). However, realising these benefits, the letter argued, depends on stepping away from a view of technology development as neutral and towards interdisciplinary research, proactively working to maximise societal benefits and avoiding potential pitfalls of an increasingly automated society. The underlying point is that when technology is being developed foremost for profit, it is unlikely to deliver the most benefits for society.

Eight years later, The Future of Life Institute published another open letter, this time following generative AI such as ChatGPT, discussed in Chapter 1. The authors call for a six month pause in training powerful AI so that experts, policy makers, researchers and developers can agree a set of protocols for powerful AI ‘that no one – not even their creators – can understand, predict, or reliably control systems’ (Future of Life Institute, 2023). There are renewed concerns about job replacement, this time with generative AI completing creative tasks. While this illustrates the topic is significant, these futures are not new.

In December 2015, the Foundation for Responsible Robotics (FRR) was formed by a group of 20 multidisciplinary technology academics and researchers. The press release highlighted reports from the Bank of England and the Bank of America that warned of automation-induced mass unemployment. In the absence of satisfactorily informed policy makers and regulators, the FRR calls for scientists, researchers and manufacturers to be socially responsible in their work. In this context, the view of workers was absent and futures were narrowly focused on those envisaged by individuals and institutions closest to technology. Warnings and prophecies about machine intelligence and work, as discussed in the opening chapter, were not being interrogated as shaped by and shaping society, influenced by social positions and structures of power in the present. It was as though those futures were neutral, unproblematic. Calls for technology developers and regulators to be more socially responsible were becoming louder. The exacerbation of social inequalities was highlighted as a key risk of automation through machine intelligence and job replacement. However, the visions and articulations of working futures came from and belonged to ‘experts’, social positions obscured as though irrelevant to those futures. The lack of engagement with machine intelligence laden working futures as connected to everyday experiences of work motivated this research to explore how workers’ talk of their working futures are influenced by the social positions and experiences of social inequalities in the present.

This chapter sets out the literature that underpins the thesis, bringing together often separated topics to situate machine intelligence and futures of work (FOW). I explore how structures of power and social positions play out in working futures alongside machine intelligence. I consider multiple angles through the combination of sociology of work and STS, and an intersectional lens to dismantle and frame the topic as a personal and public issue (Mills, 1959) requiring urgent sociological attention.

The chapter begins by exploring literature that brings the future into focus through an intersectional lens on present social positions, drawing on Bourdieu’s relational theory and concepts of habitus and capital. This brings to the fore ideas of temporality and social positions together, setting the direction of the thesis with an understanding of how experiences of social inequalities in the present influence articulated futures of work. The literature provides the grounding for the thesis specifically in dismantling technological determinism and the dualism of structure and agency, instead offering a view of technology as socially shaped and shaping, and structure as both internal and external to individuals. Together, this makes space to reimagine both technology and structures of power, framing futures as important and contested.

2.1 Symbolic capital: designing the future

> ‘Symbolic power, which can manipulate hopes and expectations, especially through a more or less inspired and uplifting performative evocation of the future – prophesy, forecast or predication – can introduce a degree of play into the correspondence between expectations and chances and open up a space of freedom through the more or less voluntarist positing of more or less improbable possible – utopia, project, programme or plan – which the pure logic of probabilities would lead one to regard as practically excluded.’ (Bourdieu, 2000: 234)

The first part of this chapter sets out Bourdieu’s concepts of habitus and capital that see structures of society as internalised within the characteristics of an agent. These concepts together support the thesis’ goal to understand how workers’ talk of their working futures alongside machine intelligence are influenced by their social positions and experiences of social inequalities.

2.1.1 Habitus and possible futures

In Bourdieu's relational philosophy, actions are the result of relations between personal dispositions of an agent (habitus) and social position (culmination of forms of capital held by the agent) within the current social space (field) (Bourdieu, 2000). For Bourdieu, an individual's habitus holds expectations, hopes and dispositions which 'govern their whole relation to the world, in particular their perception and appreciation of the position' (Bourdieu, 1997, 2000: 155). Habitus describes the way in which an agent's background and present social conditions are incorporated as dispositions, characteristics and ways of being. It ensures that expectations of the future adjust to chances of fulfilling those expectations. The habitus is the basis of 'the realistic relation to what is possible, founded on and therefore limited by power' (Bourdieu, 1980, 1990: 65). Habitus is inscribed in the body, shaped by personal trajectory and the field. Structured by past and present circumstances and conditions such as family, education, habitus informs choices and the possibilities we see or cannot see in the future (Bourdieu, 2010). Habitus is connected to time and space, present, past and futures and as such, it is an invaluable concept here for consideration of how futures are envisaged, shaped and lived in the present. Habitus opens up futures to analysis, as a means to explore social position and experiences of social inequalities in the present influencing and shaping futures that workers articulate. As a concept, it emphasises the temporality of lived experience and the interplay between the tenses – deployed in this thesis to argue that the past and present, and inequalities experienced therein, influence imagined futures. As such, imagined futures are opened up as artefacts for sociological analysis. Imagined futures here are as much an expression of habitus as the bodily dispositions that are seen in the way a person walks or the characteristics that are heard when they speak (Bourdieu, 2010).

Habitus overcomes the dualism between structure and agency, resisting theories of determinism, a fundamental shared with STS. The habitus is the source of the extent to which an individual shares reverence for the symbolic capital of another group, and to what extent the individual will tolerate being dominated. Agents 'as socialized bodies, are endowed with a set of dispositions implying both the propensity and aptitude to enter into the game and to play it with more or less success' (Bourdieu, 1997, 2000: 155). Therefore, in each individual, through the habitus, 'there is something of the collective' (156), the 'objective structures' (155) which are embodied. The creation and conservation of symbolic power, the dominant over the dominated, occurs in the ways in which actors are defined, or classified, how they relate to one another in terms of volume of capital, and finally how they remain faithful to their alliances, or unquestioning adherence to the doxa (that which is seen as natural in the social world and not challenged) of their field (Bourdieu, 2000, 2010). The concept of the habitus overcomes the dualism of agency and structure because the habitus connects them, interwoven so that the structure of society is embodied within each individual's habitus, which then is socialised to recognise that structure of society to some extent.

Habitus is not a new concept and Nash (1999) traces its development as habit in Aristotle through to Durkheim, Mauss and Merleau-Ponty (Nash, 1999). There has been some criticism of the circular interdependence of these concepts: the habitus shapes the field which in turn shapes the habitus (King, 2000; Skeggs, 2015). Arguably, this gives little opportunity for social change as habitus and field, agent and structure, continue to reinforce one another, mirroring each other. However, Bourdieu insisted that the habitus exists in flux, changing with new experiences. He argued against the readings of determinism of habitus. The notion of hysteresis describes a time lag between habitus and field, a crisis driven change for the habitus (Bourdieu, 2000). The hysteresis effect could also occur at a collective level during generational conflict for example, when the habitus have been developed in different 'conditions of existence' which lead to one group to find practices or aspirations as reasonable while another group finds them ‘unthinkable or scandalous’ (Bourdieu, 1997, 2005). Therefore, while individual habitus exists with limits on what is perceived to be possible or impossible, habitus is far from fixed, shifting with the field and the conditions therein. Habitus is restructured through individual’s experiences in the world (Di Maggio, 1979 in Reay, 2004).

> ‘The range of possibilities inscribed in a habitus can be envisaged as a continuum. At one end, habitus can be replicated through encountering a field that reproduces its dispositions. At the other end of the continuum, habitus can be transformed through a process that either raises or lowers an individual’s expectations. Implicit in the concept is the possibility of a social trajectory that enables conditions of living that are very different from initial ones.’ (Reay, 2004: 435)

Structure being shaped by the individual – only acting as a structure because the individual recognises it to be so – as much as the individual is shaped by the structure mirrors the mutually shaping relationship of science, technology and society. They exist within one another and cannot be separated – a latent rejection of determinism through a merging of agency and structure. The structures of power are created and reinforced through a social process which renders visible and, in contrast to a deterministic view, opens up those structures to the possibility of reimagination. Similarly, technology is created through a social process and the understanding of the relationship between society and technology encourages and opens up the potential to reimagine technology development. Through these ideas, removing the notion of determinism both for individuals and technology, futures are imbued with social meaning. The possibility to reimagine, to restructure, to change means that futures matter.

The contribution of the concept of habitus to this thesis is therefore twofold. Firstly, in guiding the research question itself and subsequent design of the research applying an understanding of the future as shaped by past and present lived experiences. Secondly, in embedding a view of structure and agency as mutually shaping (neither neutral or determined) as society and technology, meaning that past and present experiences of inequalities could come to shape power relations in the future. The next section introduces another Bourdieusian concept, capital and particularly symbolic capital, which points to futures as a form of power.

2.1.2 Forms of capital

> 'One of the most unequal of all distributions, and probably, in any case, the most cruel, is the distribution of symbolic capital, that is, of social importance and of reasons for living.' (Bourdieu, 2000: 241)

The unequal distribution of forms of capital are ultimately recognised as symbolic capital, formed in the arbitrary elevation of one social group's tastes, values and lifestyles over another group's. Bourdieu designates three forms of capital in his theory of social reproduction: economic, social and cultural. Economic capital is the 'dominant type' of capital (Bourdieu in Richardson, 1986: 20) and is wealth by means of property or profits which return and grow further. Cultural capital allows consideration of resources with benefits that are not only monetary. Cultural capital is acquired yet embodied through investment of time for example in education. It is closely tied to the habitus and cannot be spent in the same instantaneous way as economic capital. Social capital is access to a network of connections, invested in over time. The amount of social capital depends upon the amount of economic and cultural capital held by the person and each of the connections in their network.

Bourdieu further distinguishes objectified cultural capital as cultural goods, material goods including machines that can be appropriated for economic profit:

> 'Thus cultural goods can be appropriated both materially—which presupposes economic capital—and symbolically—which presupposes cultural capital. It follows that the owner of the means of production must find a way of appropriating either the embodied capital which is the precondition of specific appropriation or the services of the holders of this capital. To possess the machines, he only needs economic capital; to appropriate them and use them in accordance with their specific purpose (defined by the cultural capital, of scientific or technical type, incorporated in them), he must have access to embodied cultural capital, either in person or by proxy.' (Bourdieu, in Richardson, 1986: 20)

Bourdieu delineates dominated workers ('engineers') who hold the cultural capital and make a profit by selling it, using the machines owned by others and those who use forms of capital that belong to others to make a profit who are the dominant. As cultural capital becomes part of the cultural good – 'incorporated in the means of production' (20)- those who hold the cultural capital are prevented from increasing collective strength by the dominant who use economic capital to set them in competition with one another, weakening collective strength. At this point, it is worth considering how class and other divisions fit with Bourdieu's forms of capital.

2.1.3 An intersectional lens on symbolic capital

Inequalities have been widening (Piketty, 2014; Mijs, 2021) through 'inequality regimes' in capitalism (within workplaces, Acker, 2006) which Piketty defines as 'discourses and institutional arrangements intended to justify and structure the economic, social, and political inequalities of a given society' (Piketty, 2020: 2). Meritocracy suggests success is a consequence of choices made by people within a system in which everyone has equal access to wealth 'and automatically benefits from the wealth accumulated by the wealthiest individuals, who are also the most enterprising, deserving, and useful' (Piketty, 2020:1). Mijs (2021) found that the greater the inequality in a country, the more likely people explain it through the meritocratic (such as hard work) rather than structural factors. A meritocratic narrative used to justify inequality is insufficient in this thesis.

Class, defined as economic inequality, is legitimized through class practices such as paying wages and hierarchical structures of management, which are central to the capitalist system (Acker, 2006). As such, class *is* inequality because class equality cannot occur within the capitalist system. The existence of class is subject to fraught discussions. For Bourdieu, 'theoretical classes' compete with other categories such as ethnicity, nationality or local communities (Bourdieu, 1987: 7). Bourdieu denies the existence of class as objective groups made up of economically and socially stratified individuals. Instead, he explains how classes may be formed through differentiation which occurs within a 'social space'. It is the task of social science to examine how individuals are differentiated, to explain and predict by discovering the forms of capital (Bourdieu, 1984) that are successful in securing the scarce resources of that social world. The social world is structured by the distribution of capital which gives strength within it. This leads to questions about how forms of capital held by an individual are influenced by interacting discriminations.

Bourdieu argues that theoretical groups appear to be real groups that exist in reality, in and of themselves. However, the existence of a class, could be 'social, sexual, ethnic or otherwise' (Bourdieu, 1987: 15). It is worth noting here this quote from Bourdieu does not reflect a view of simultaneously occurring forms of inequality as denoted by the 'or otherwise' rather than an 'and'. This will be discussed further later in the current section.

Returning to Bourdieu's conceptualization of class, it has two dependencies:

- the formation of a group by ‘agents capable of imposing themselves as authorized to speak and to act in its place and in its name’ (Bourdieu, 1987: 15)
- those who become the dominated who must accept those spokespeople as speaking for them.

In seeing themselves as members of the class, agents create that class. That is, according to Bourdieu (1987) to be a member of an actual class, which is otherwise only a word, individuals must be dispossessed and dominated depending on their position within their social space and power must be conferred. The creation and conservation of this symbolic power occurs in the ways in which actors are defined, or classified, how they relate to one another in terms of volume of capital and how they remain faithful to their alliances, or unquestioning adherence to the doxa of their field (Bourdieu, 2000, 2010).

The forming of classes then is to bestow power, to hand over (or create) symbolic capital, from those more likely to accept being dominated to those more likely to expect to dominate. This leads on to the question of how the categories of ethnicity and gender, which Bourdieu does not exclude from also being a type of class, shapes the symbolic power, both for the givers and receivers.

Symbolic capital is not a different form of capital but rather:

> ‘a transformed and thereby disguised form of physical ‘economic’ capital, produces its proper effect inasmuch, and only inasmuch as it conceals the fact that it originates in ‘material’ forms of capital…’ (Bourdieu, 1997, 2005: 183)

This form of capital provides social importance and purpose. According to Bourdieu the distribution of symbolic capital is the cruelest, with the ‘stigmatised pariah’ for which he offers as examples ‘the black in the ghetto or the Arab or Turk in the working-class suburbs of European cities' who have 'the curse of negative symbolic capital' (1997, 2000: 241). It is significant that Bourdieu's agents with 'negative symbolic capital' are working class ethnic minorities with the position of 'pariah.' It is also worth noting that symbolic capital can be below zero for those in certain groups. As such, symbolic capital gives meaning and elevates the value of some human lives over others but it is the product of capital. Bourdieu paints a hopeless picture, of 'the losers in the symbolic struggle for recognition, for access to a socially recognized social being, in a word, to humanity' (241). Symbolic capital is power that is given to the person who holds it from those who have the habitus, or disposition, to perceive it and recognize it as such, rescuing those with symbolic capital from 'insignificance, the absence of important and of meaning.' (242).

Bourdieu's relational lens suggests agents are trapped in their social positions with designated symbolic capital. Bourdieu looks to the field of power rather than the dominant class and applies a relational lens to subvert the distinction between structure and agency. Bourdieu connects the two by seeing power as coming from the actions of individuals who with their habitus and position on a social field, struggle to maintain their position which then keeps the structures, and social divisions, in place. Instead of asking where power comes from or where it resides, Bourdieu sees power distributed relationally:

> 'I speak of the 'field of power' rather than of the dominant class, the latter being a realist concept designating an actual population of holders of this tangible reality that we call power. By field of power, I mean the relations of force that obtain between the social positions which guarantee their occupants a quantum of social force, or of capital, such that they are able to enter into the struggles over the monopoly of power, of which struggles over the definition of the legitimate form of power are a crucial dimension.' (Bourdieu and Wacquant, 1992: 229-30)

Relationality of social positions is core to the usefulness of Bourdieu concepts as it allows for consideration of experiences of inequalities as experienced at intersections, which Bourdieu himself falls short of encapsulating. For Skeggs (1997), Bourdieu's 'metaphors of capital' offer a framework to understand how access, resources and legitimation contribute to class formation through social positions and relations (1997:16). As such, habitus and capitals require finessing to understand how the social positions associated with gender, class and race interplay with capitals to create and reproduce inequalities, delegitimizing some forms of capital, such as femininity:

> 'Gender, class and race are not capitals as such, rather they provide the relations in which capitals come to be organized and valued. Masculinity and Whiteness, for instance, are valued (and normalized) forms of cultural capital. Our social locations influence our movement and relations to other social positions and hence our ability to capitalize further on the assets we already have…It is the symbolic struggles that enable inequalities in capital to be reproduced. Analysing access and legitimation of cultural formations enables us to see how cultural capital is or is not converted into symbolic capital and hence how inequalities are generated and systematic disempowerment engendered. Femininity, for instance, can be seen as a form of cultural capital. It is the discursive position available through gender relations that women are encouraged to inhabit and use. Its use will be informed by the network of social positions of class, gender, sexuality, region, age and race which ensure that it will be taken up (and resisted) in different ways. Whereas it is possible to trade masculinity more readily and for greater reward in the labour market (men still hold the majority of jobs in the primary labour market, for instance), the ability to capitalize on femininity is restricted. It provides only restricted access to potential forms of power.' (Skeggs, 1997: 17)

Skeggs' criticism of Bourdieu's concepts lead to a more nuanced understanding of them: capitals are shaped and as such based on social positions themselves shaped by what she considers cultural capitals including gender, class, race. This differs from interpretations of Bourdieu which sees gender, class and race as forming the agent's social position (Erel, Ryan, 2019) which makes it more difficult to see how these different discriminations interact. Skeggs' contribution to Bourdieu's habitus and capitals is an understanding of inequalities being reproduced through the forms of cultural capital held by someone, with certain forms of cultural capital easier to convert into symbolic capital, or power. Bourdieu's capitals and habitus fall short of providing the tools required to understand how inequalities are reproduced in futures because they do not offer a systematic framework which encourages consideration of how race, gender and class together inform how cultural capital becomes symbolic capital.

To understand how inequalities are reproduced, the intersectional lens allows for analysis of the field of power which is determined by the access to symbolic capital due to the form of cultural capital held. Therefore, an intersectional lens on Bourdieu's concepts of capital and habitus is needed to analyse how inequalities are produced through 'intersecting power relations' (Collins and Bilge, 2020: 225). To draw out the differences in experiences of work, I have designed this research to include participants who have experienced simultaneous discriminations of gender, race and class. This offers the current study a view of working lives at intersections, from those who have more or less access to transform their cultural capital into symbolic capital.

Intersectionality emerged in the self-mobilisation of black women in the attempt to gain recognition in law and scholarship (Crenshaw, 1991). The initial methodological focus of intersectionality was on the inclusivity of voices at the margins. This was in response to the urgent need in society to stop ignoring black women and conflating with all women, or all people of colour. Categories of race and gender are lived in boxes that exist in society not just as theoretical or analytic concepts. Intersectionality is a means to understand how categories of race and gender interact to reveal how power is organized through structural processes (Choo and Ferree, 2010).

Social constructionists offer an understanding of intersectionality based on the view of the self-creation of agent as a political subject situated in a field of power relations (Yuval-Davis, 2006). This perspective draws categories as infused with movement – shifting the focus to how categories are produced rather than the categories themselves:

> '…dynamic forces more than categories- racialization more than race, economic exploitation more than classes, gendering and gender performance rather than genders- and recognize how power operates across particular institutional fields' (Choo and Ferree, 2010: 134).

Intersectionality confronts the pressure to prioritise one inequality over another, providing recourse to take the position that lived experiences of gender, race and class cannot be neatly separated as they are not only linked but occurring simultaneously (Brewer 1993; King, 1988; Espiritu 2000) and experienced simultaneously. This intersectional lens is essential in making Bourdieu's concepts of habitus and capital relevant to this thesis, which is limited to considering the inequalities of race, class and gender.

The next section takes symbolic capital and the relational view of dynamic forces that produce categories of class, race and gender and reproduces social inequalities to STS and designing futures.

2.1.4 Symbolic capital and futures

Bourdieu sees all forms of capital functioning overall as symbolic capital, or power, 'recognized as legitimate' (Bourdieu, 1997, 2000: 242). The habitus (itself formed in interplay between past, present and future) determines the extent to which an individual shares the same reverence for the symbolic capital of another group, and to what extent the individual will tolerate being dominated or controlled. Therefore, symbolic capital is not seen or is not recognized without a matched habitus. The creation and conservation of symbolic power, the dominant over the dominated occurs in the ways in which actors are defined, or classified, how they relate to one another in terms of volume of capital and finally how they remain faithful to their alliances, or adherence to the doxa of their field (Bourdieu, 2000, 2010).

Agents have unequal power, as per Skeggs in the section above, based on the ease with which the form of cultural capital held by the agent can be transformed into symbolic capital. This creates unequal chances of cultural and symbolic profit – or unequal access to capitalize on the cultural capital such as Skeggs' example of 'femininity' capital. Meanwhile, the habitus ensures that an individual's expectations are adjusted to their chances, which in turn decide how much investment of time, money and work to put into various fields e.g. education. Objective chances are the same as the disposition in the habitus that are adjusted to them: the habitus is the bodily inscription of the future. Uncertainty about one's future is a reflection of uncertainty about one's 'identity' and the certainty one has to one's future varies with one's power (Bourdieu, 2000: 239).

> 'One is always surprised to see how much people's wills adjust to their possibilities, their desires to the capacity to satisfy them'. Bourdieu, 2000: 216).

Atkinson (2013) found three orientations to the future: controllable, reasonably controllable and uncontrollable, with the level of perceived control corresponding to capital of the individual. This adjustment of expectations to chances is, according to Bourdieu, a significant factor in the preservation of the dominant but this is a circle that can be broken. There are frequent mismatches between expectations and chances due to the insecurity of work and education, which Bourdieu argues has led to a discrepancy in the qualifications gained, jobs hoped for and the jobs eventually obtained. Symbolic power can perform futures, such as through prediction and in so doing, add flexibility to the otherwise auto-adjusting relationship between expectations and chances.

In the final pages of Pascalian Meditations (2000) Bourdieu talks of the future as rooted in present structures but also as open, carving out from his theory of habitus, which he says is the future inscribed 'in people's bodies' (235) and the 'circle of expectations and chances' (234) a 'margin of freedom for political action aimed at reopening the space of possible.' (234). While symbolic power and actions are dependent on the pre-existing dispositions (habitus), Bourdieu leaves space for the possibility to:

> '…transgress the limits imposed, in particular the most inflexible ones, those which are set in people's minds….attentive to the real chances of transforming the power relation, they are able to work to raise expectations beyond the objective chances on which they spontaneously tend to be aligned.' (Bourdieu, 2000: 236).

Crucially, the structure of power must be in crisis, a 'state of uncertainty and crisis that favours uncertainty about them and an awakening of critical consciousness of their arbitrariness and fragility' (236). As such, he rejects *amor fati* (fatalism) (Fowler, 2020) and offers a view of imagined futures as both related to social position and the power relation as much as a potential artefact of 'transgression', able to partially bypass the inscriptions of habitus.

> 'Only in imaginary experience (in the folk tale, for example), which neutralizes the sense of social realities, does the social world take the

> form of a universe of possibles equally possible for any possible subject.' (Bourdieu, 1990: 64)

The future that Bourdieu conceives of governs both the dispositions that are internalised by agents as well as their present actions (Bourdieu, 1980, 1990). In other words, our view of the future shapes who we are and what we do but that view of the future is shaped by our social positions and internalised dispositions. The epigraph above is taken from a passage in which Bourdieu develops the future as the projection of present power relations, in which an agent's aspirations are matched to their chances provided by society. Futures then are an essential sociological artefact to understand power relations, which is substantively recognised by STS.

STS forefronts technology and the future in approaches to understanding and reconfiguring structures of society. STS insists on the co-constitution of technology and society (Mackenzie and Wajcman, 1999). This ensures it is primed to face 'creatures of the future' (Selin, 2008: 1883) as the development of technology is closely tied up with the envisioning and enacting of futures (Urry, 2016). However, these futures are not transparent to society. To address this issue, the Anticipatory Governance framework advances the democratic deliberation of technology development (Barben et al, 2007; Guston, 2014) while foresight capacity building (Davies et al, 2015; Selin, 2014, 2015; Selin et al, 2016) aims for wider and better participation in the shaping of futures. These ideas take shape in digital sociology and anthropology through methods for engaging with futures and emerging technologies with futures as change-making (Akama et al, 2018) and multi-disciplinary future oriented research as crucial to social studies (Pink, 2019).

Studies of technology development have repeatedly shown the significance of futures as envisaged by designers (Winner, 1980; Akrich, 1992; Grint and

Woolgar, 1997). 'The future arrives sooner here' encapsulates a view from Silicon Valley, where technology designers have a 'mandate to enact the future that others will subsequently live' (Suchman, 2011: 2). Machine intelligence designers are working 'for the future' as the technology they create reflect futures they envisage (Lanzeni, Ardevol, 2017: 119). Much of what has been written about novel technologies is based on future projections presented by those with a vested interest in technology (Kinsley, 2012). However, these systems have intended and unintended consequences, and complexity makes it impossible to predict the future (Urry, 2017). Furthermore, technology companies under-represent women, ethnic minorities and over 40s and this lack of diversity limits the potential value of technology created (Wajcman, 2017; Stilgoe, 2015) for social change or for those groups to benefit directly or indirectly from that technology, often in contrast to the view of socially transformative digital technology posited by those with symbolic power, such as governments.

> 'Much has been made of the potential for digital technology to catalyse social mobility and address inequality, an idea regularly repeated in government policies since the turn of the millennium.' (Fussey and Roth, 2020)

While there is insufficient space here to consider how everyday experiences of the internet and digital technologies might influence how workers imagine their futures, it is important to interrogate what *appears* to be a shift in the balance between 'engineer' (Bourdieu, in Richardson, 1986: 20) and user on the surface because fundamentally, as much potential as internet fueled innovations have to offer opportunities, it has developed within existing fields of power. The opportunities to be entrepreneurial through digital means have contributed to a 'hustle culture' (Burgess et al, 2022: 903) with younger people feeling pressured to be productive at all times (Caluzzi et al, 2021). A Generation Z participant in Burgess et al's study says:

> '…we have it so ingrained in us that everything we do has to have like a productive outcome...you have to be constantly looking forward.' (911)

In this quote, the future is a constant pressure to be working towards a productive outcome. Internet-based platforms with expansive user bases seemingly ripe for the entrepreneur appear to blur the lines between those who create technology and those who eventually use it:

> 'They're drop shipping, Amazon reselling, flipping designer sneakers, spread betting, investing in crypto and NFTs. They're inventing their own cosmetic lines for TikTok, or selling homemade teeth grills on Instagram. They want to be famous on social media not just because it feels good but because they can monetise it in shrewd ways.' (Parker, *The Guardian*, 2022)

Generational differences as discussed in the above article – or age is a limitation of this thesis which focuses on class, gender and race. However, just as it is not possible to consider all forms of social division simultaneously, it is not possible to do justice to the work of Digital Sociology which was coined in 2009 but has a longer history (Fussey and Roth, 2020) and now as a discipline contains rich literature of sociological analysis and theorizing of digital society, contesting simplified hyperbolic articulations of the transformative potential of technology. The promise, or hope, of increased control over work which will be the focus of the next section is one example of the illusion in the marketing of entrepreneurship and autonomy: multiple streams of income but in reality worker insecurity, work in short time bursts and low wages (Ravenelle et al, 2021).

Technology and users *become* their relationship to each (Grint and Woolgar, 1997). Grint and Woolgar's analysis of the emergence, development and manufacturing of new technology made the case against essentialism associated with the understanding of technology at that time. Using the metaphor of text and readers, the authors emphasise that users interpret the technology, despite their configuration by developers to ‘respond to the technology in sanctionably appropriate ways’ (93). At a time when talk of technology was largely deterministic, ‘Configuring the User’ was a step forward in conceptualizing the conjunction of the technical and non-technical – that it is artificial ‘to separate ‘the technology’ from some ‘social group’ (93) in the development of technology. Two decades on from ‘Configuring the User’, user researchers are employed by technology developing entities to ensure, amongst other things, that the technology meets users needs. Users are now seen through the collection of data reflecting every minutiae of their online activities and behaviour allowing manipulation and exploitation (Zuboff, 2019), often without accountability.

To some extent the creation of The Online Safety Bill accounts for the potential for harm to users from other users of internet services (Parliamentary Bills, 2023). Once passed, the Bill will authorize Ofcom to regulate to address harmful and illegal content on social media, search providers and pornographic content providers. It is not simply that internet providers impact users but that users are part of a society that includes users who can cause harm to other users. Social media aside, the internet itself is in and of itself, social. A core STS text, *The Social Construction of Technological Systems (Bijker et al, 1989)* predates the World Wide Web which Tim Berners Lee proposed to make the internet easier to use only in 1989 - where the user can both consume and create. The divide between ‘the inventors and innovators’ (Bijker et al, 1989: 13) and ‘actors’ (13) weakened as more people became able to contribute to or create content in code. An estimated 31 million people are developers (Developer Nation, 2022), almost 65% are under 35, 17% are women and 65% claim to be self-taught.

Perhaps more than any other form of technology, the internet, through learnable programming languages and the steady supply of 'emerging areas of interest' (Developer Nation, 2022) such as AI and robotics, captures the social construction of technology with social relations and inequalities as embedded. Section 2.1.2 on forms of capital discussed Bourdieu's objectified cultural capital as cultural goods which an 'engineer' may hold but their ability to benefit from is limited by those who yield economic capital. Walby (2009, in Choo and Ferree, 2010) draws on feedback systems in computer science and environment system interactions from biology to conceptualise the interaction effects of inequalities as integral to stratification processes. By employing the concept of 'doing intersectionality' (Lutz 2014 in De Vita et al, 2016), technology is a category of discrimination as well as a site of the socio-material construction of inequalities. As such, the end goal is not the study of the 'main effect' of inequalities but the de-centred study of interactions, fixed only in the patterns at those moments in those locations.

Fundamental to seeing inequalities and divisions interact is seeing those interactions in technology users, adding complexity to the strategy of broadening potential benefits of society by focusing attention on users. Users are not a homogeneous group, and it is not possible to consider one group of users without potentially excluding others. Ruha Benjamin (2015) points out that users are likely to be consumers, paying customers and as such, reflect a privileged proportion of the population. Benjamin describes discriminatory design in biotechnology and argues that the 'customer' is not always right but by meeting the needs of only the affluent more harm is done by design. It is critical that more voices are heard for innovation to become more inclusive, as much as it is critical to see that futures are open:

> 'There are multiple futures in front of us and where we end up really is going to be shaped by who we are consulting, who is participating, who is thought important to get us there. It's very possible if we only

> leave it to technical experts, that we will have a future that is more unequal than our present. This is really not just a matter of some people moving ahead and some people being left behind. This is about the very definition of progress being questioned because many depictions of the future are one in which we see a whitewashed reality, a sterile reality, an artificially perfect reality. In place of idealizing sterility what I want to suggest is that we work towards sociality, that we get our hands dirty in trying to create a material and social world that includes everyone.' (Benjamin (2015) 'From park bench to lab bench – what kind of future are we designing?' TEDX Talk: 19:00)

The notion that some people will be considered 'important to get us there' encapsulates the selectivity of the work of designing futures. Those given authority to create and share their visions of the future that then shape futures (Wajcman, 2017; Urry, 2017) have 'symbolic capital' (Bourdieu, 2010). Being 'important' enough to imagine and design the future through means of machine intelligence emerges as symbolic capital.

Later on in this chapter, the unequal access to futures will be considered in relation to the future of work and machine intelligence. First, the following section provides an overview of literature concerning the control of workers.

2.2 The struggle to control

This section sets out various methods and experiences of control and autonomy in working lives. In this thesis, control in work is used as a proxy for class, which is a contested concept, and the level of control a worker experienced is seen as an indication of their class position.

2.2.1 The Capitalist Controls

In *Capital* (1867, 1930) Marx describes the organisation of production as the attempt to control the labour process consisting of three elements: 1) the purposive activities (the act of labour); 2) the subject matter; and 3) the instruments ‘which the worker interposes between himself and the subject matter of his labour’ (170). The distinguishing feature of capitalism is that the individual labour power or capacity to work is commodified and workers become wage-slaves selling labour to survive. The capitalist who buys the labour-power and who acts as though legitimately owning it and its product, consumes it by setting the worker to work under controlled conditions to limit waste and maximise efficiency. In principle, this is a choice and a free exchange rather than coercion. Surplus value is value added by the worker in unpaid work or exploitation, and this depends on success of control methods in the labour process. The capitalist is predisposed to control workers due to the variability of human labour power. For example, the ‘less attractive’ a worker finds work, the more he needs to concentrate on that work (Marx, 1930: 170). Marx argues that productivity increases (forms of control) in the labour process are the basis of economic class struggle.

Compared to industrial manufacturing jobs, service work generally involves selling a service directly to others. Therefore, service workers may need to manage their emotions according to social expectation. Hochschild describes the ‘commoditization of feeling’ by the air stewardess who sells passengers her ‘quasi-genuine reassuring warmth’ and suggests the labour power aspect is ‘deep acting’ (1979: 558). The management of emotion is more likely to be seen by the worker as part of the job rather than part of the self. Hochschild asks whether the flight attendant’s deep acting in appearing upbeat has a more positive impact on the airline’s profit than her inner being (1979: 573). Deep acting is a result of coercion and an instance of alienation from the product of labour (in this case, the acted emotion) as described by Marx in his early, philosophical writing:

> ‘Firstly, the fact that labour is *external* to the worker, i.e. does not belong to his essential being; that in his work; that he therefore does not confirm himself in his work, but denies himself, feels miserable

> and not happy, does not develop free mental and physical energy but mortifies his flesh and ruins his mind. Hence the worker feels himself only when he is not working; when he is working he does not feel himself. He is at home when he is not working, and not at home when he is working. His labour is therefore not voluntary but forced, it is *forced labour*. It is therefore not the satisfaction of a need but a mere means to satisfy needs outside itself. Its alien character is clearly demonstrated by the fact that as soon as no physical or other compulsion exists it is shunned like the plague. External labour, labour in which man alienates himself, is a labour of self-sacrifice, of mortification. Finally, the external character of labour for the worker is demonstrated by the fact that it belongs not to him but to another, and that in it he belongs not to himself but to another…it is a loss of his self.' (*Philosophic and Economic Manuscripts of 1844*, 1992: 326)

The form of appropriation, or *estrangement* (1844, 1992: 324) described in the above quote is within the relationship of the worker to the *act of production* (327) in wage-labour. The airline stewardess, to go back to Hochschild's example, is coerced to act 'outside herself' to fulfil the expectations of customers rather than herself and to add value for her employer: in being controlled she loses her sense of self in an act to sell her labour. Marx devises human nature as made up of relationships and looking at the relationship between the worker and production, details the alienation at the core of wage-labour. Marx describes another aspect of alienation, located in the relationship of the worker and the object they produce, which is an alien and 'autonomous power' (324), that is the objectification of labour. From these forms of estranged labour, Marx derives a third characteristic (327) which is the estrangement from social relationships: 'it also estranges man from his *species'* (328). The human essence, alienated by wage-labour mediates the workers' relationship to themselves, the object of their labour and to all others:

> 'For in the first place labour, *life activity, productive* life itself appears to man only as a means for the satisfaction of a need, the need to preserve physical existence. But productive life is a species-life. It is life-producing life. The whole character of a species, its species-

> character, resides in the nature of its life activity, and free conscious activity constitutes the species-character of man. Life itself appears only as a *means of life*…[…]…In tearing away the object of his production from man, estranged labour therefore tears away from him his species life, his true species-objectively, and transforms his advantage over animals into the disadvantage that his inorganic body, nature, is taken from him…species-life becomes a means for him.' (Marx, 1844, 1992: 328)

The species-being is the essence of humanity and its character is made of production – life activity. Through estranged labour, the social relationships between the worker, other workers and the capitalist are produced and reproduced, preventing the worker from relating fully to themselves, to one another, to the species. The next section introduces other forms of control in work.

2.2.2 Forms of control

There are different forms of control in the workplace as well as variance in the level of autonomy workers can experience. On the one hand the concept of 'control' is used to refer to those in control (capitalists and managers who are acting on the capitalists' behalf) and on the other to the control workers have over the labour process. Friedman (1977) insists that while the managers maintain authority over work activities and the capitalists still own the product of the workers' labour, there is the possibility that workers can influence changes in the labour process. Examples of changes that would benefit workers are the reduction of monotony and increase in worker autonomy. Friedman (1977) argues that worker resistance, which may not be forceful enough to overthrow the capitalist mode of production, does impact it and the development of the capitalist system. Friedman distinguishes between changes in the labour process led by managers which could aim to suppress labour movements, and those that are a consequence of worker resistance. Friedman offers two managerial strategies used to reduce worker resistance and increase control over the labour process:

Direct control strategy

Managers separate the conception of tasks from their execution with only a few responsible for conception. The direct control strategy aims to treat humans like machines to limit variability in labour-power through mechanisation and division of labour. Managerial authority is sustained through supervision and financial incentives. For example, Taylor motivated some workers with higher wages than 'ordinary workers' (Friedman 1977: 50). Wage is used as a form of control based on the Taylorian view of workers as *homo economicus.* The spectrum of control measures goes some way to illustrate the unequal status and conditions of workers, itself a symptom on a startlingly unequal society (Dorling, 2015; Piketty, 2014). Despite the chasm between those workers experiencing opposite ends of the control strategy spectrum, the purpose of control strategies remains largely the same today as for capitalists observed by Marx: to deliver profits and the survival of that organisation (and in doing so to some extent, protecting and creating jobs).

Responsible autonomy

Managers aim to persuade workers to share goals of the company. Workers are allowed some discretion in their work with minimal supervision and are given 'status, authority, responsibility' to win loyalty (Friedman, 1977: 49). Variability of the worker is harnessed for the managers' ends through a mixture of overt manipulation and distraction from problems that may otherwise result in resistance. A high level of responsible autonomy will only suppress the effects of capitalism on the worker and persuade them that the labour process reflects their needs rather than feeling managed for profit. However, experiences of work for those who have responsible autonomy compares starkly with factory workers, still likely to experience more 'direct control' strategies of close supervision, discipline and the threat of replacement.

2.2.3 Technical control

Edwards (1979) breaks forms of control into three types: 1) 'simple control' through which, like 19th century businesses the capitalists exercise power 'openly, arbitrarily and personally' (92); 2) technical control where mechanisms are embedded in technology and 3) bureaucratic control in processes 'contrived social organisation of production at the point of production' (93). Technical and bureaucratic control are structural, 'institutionalised' and so 'impersonal.'

Edwards describes simple control as arbitrary and personal, a 'tyranny' and points to the ease of replacement e.g. the reserve army (94) for any workers who rebelled. A ready supply of workers, visible to existing workers, are used to control by provoking fear of job loss and a general sense of insecurity. In the simple control model, a head workman figure conducts performance reviews, disciplines, rewards and directs labour. Bosses specify what work is to be done and by whom. Simple control is more likely in less developed industries.

In his description of technical control Edwards is careful to distinguish it from mechanisation which may bring with it an element of technical (structural control). Mechanisation might change the pace of labour, for example by building production pace into technology, an established method of gaining control of the labour process for an individual worker or a specific group of workers. However, mechanisation does not change the social organisation. Technical control on the other hand does and occurs when a large part of the production process depends on a technology, which both sets the pace and directs labour.

Edwards (1979) describes the Ford assembly line as technical control at its fullest potential: by 1913, cars were built by workers who added limited parts to the product which was passed on to another team. Edwards notes the craftsmanship fell away from these jobs due to technical control. Workers were confronted by the work which arrived through technical means (the conveyor, for example) and the pace of work was set without having to involve managers. The division of labour was directed and fixed by the form of the technology although there could have been other ways in which that work was organised – in different orders, by different workers. Technology now mediated class conflict in workplaces. Workers were 'hemmed in' by the line (102) and people were dismissed from their jobs if they did not keep up with the speed of that line. The process of mechanisation allowed skills to become redundant and work to be homogenised. Edwards writes that technical control engendered resistance and the rise of industrial unionism is described as a response to it and a limit to it (106). Kristal (2013) found that computerisation is a cause of the decline in organised labour (which increases worker power generally as well as in response to technical control) in three ways: 1) reduction of unionised manufacturing jobs, (2) increased intensity of management anti-union actions, and (3) skill polarisation of the workforce that undermines worker solidarity (368). Skill polarisation has increased as a result of computer technologies with skilled workers being up-skilled, while many manufacturing workers experienced de-skilling (Burris 1998; Vallas and Beck 1996 in Kristal, 2013). Edwards (1979) critiqued Braverman's theory of de-skilling, arguing that new products and technology result in reskilling as well as deskilling. Hanley (2014) also found that development of workplace technologies emerged from the aim of weakening unions and preventing its service sector growth.

In 2021, twenty five Uber drivers took their case to the UK Supreme Court to decide on the central question of the definition of work rights as employees or as independent contractors, and whether that work would actually be taking place when the workers were logged into the Uber app, ready to accept jobs, or only when they were driving paying passengers. The judgement found that the drivers were wrongly classified as 'independent contractors' and should be treated as 'workers' with rights such as national minimum wage, paid leave, rest breaks, and discrimination protection (Supreme Court, 2021; Wired, 2021). Until then, the promise of autonomy and flexibility of being a contractor was not realized for the Uber drivers, controlled and yet not workers and according to Uber, not working when undertaking work tasks through their work applications on their devices:

> 'Capital employs machinery, rather, only to the extent that it enables the worker to work a larger part of his time for capital, to relate to a larger part of his time as time which does not belong to him, to work longer for another. Through this process, the amount of labour necessary for the production of a given object is indeed reduced to a minimum, but only in order to realize a maximum of labour in the maximum number of such objects. The first aspect is important, because capital here – quite unintentionally – reduces human labour, expenditure of energy, to a minimum. This will redound to the benefit of emancipated labour, and is the condition of its emancipation.' (Marx, 'fragment on a machine' in the Grundisse, 1973: 712)

Marx describes the machine as a weapon used by capitalists to exploit and alienate the worker from the work. However, while machines are implemented by capitalists intending to control workers and increase productivity, research indicates this is not the sole result. The worker-machine relationship itself cannot be determined by the capitalist's goals, just as the worker's own mind cannot be controlled whilst working. For example, a study of a computer-controlled grocery distribution facility showed that IT is being used by management to gain more control over labour but that the workers utilised their increased performance data to turn work into a game (Eliot and Long, 2016). While workplace technology primarily serves a capitalist purpose, this is not the only consequence of its existence or the only input into its design (Callon, 1986).

In *Capital*, Marx describes the difference between mechanisation and modern industry as being the switch from subjective to objective, from the worker controlling the tool to the machine controlling the worker. In modern industry, machines beget machines and have endless capacity for improvement, compared to humans, allowing constant cost-cutting innovations. As the implements of capitalists, each modification is an attempt to diminish existing human jobs, deskill and reduce the need for skilled workers (Matthewman, 2011). Despite readings of Marx as a technological determinist, in which he is suspected of representing technology as the source of social ills, Marx consistently defines social relations during the production process as the basis of social and political consciousness, with class struggles arising as result. As such, the implication is that technology could be used for other purposes than those of a capitalist system but only if technology was developed outside a capitalist system.

Technology in the workplace can change working practices and control workers, even if it is implemented by a worker who is self-employed and is therefore controlling their own labour-power. For example, in their study of robotic dairy farming, Butler and Holloway (2015) found that the introduction of automatic milking technologies led to the renegotiation of human-animal-technology relationships. The study conceptualises 'hybrid capital' that is formed through the human dairy farmer, the cows and the robot each contributing individual capital and challenging Bourdieusian anthropocentrism. Butler and Holloway describe a shift in the power relations in the field of dairy farming as the human farmer is no longer the central figure in the milking process once the responsibility shifts to the robot and the robot manufacturer. However, the farmer is self-employed and as the owner of the technology, is the capitalist first and foremost. Although the farmer is under pressure to sell the products of his labour, unlike the workers who are separated from the product of their labour, the farmer owns the products created through the hybrid capital: the farmer owns both the robot and the cows. While these dairy farmers experience a change in the nature of their work due to the robots, for example in their working patterns in having to respond to the machine's alarm at any time if there is a problem or in the amount of data they are provided by the machines which may change their work tasks and inform their strategies, it is largely their choice to implement the technology. A worker put to work on the other hand is required to cooperate with machines that are not of their own choosing. Although neither the alienated worker or the capital owning dairy farmer have control over the design and development of the technology, the difference in their ability to input into the implementation of technology reflects the gap in working conditions between those whose labour-power is controlled and those in a position to control their own labour-power.

2.2.4 Inequalities in Control

The level of control experienced by a worker indicates their class position within a capitalist system. Knowledge producers are likely to have individual terms with the employer, control their own labour process and have some control over their own working conditions. Castells (1996) argues that the rise in these types of employer/employee relationships have eroded class structures compared to industrial society in the sense that those individual workers are more like the employer capitalist with both investing in the market and depending on it. The differentiation could be in the extent to which workers have a choice about selling their labour. For example, an elite workforce could be made up of those workers who themselves have economic capital invested in the same way as capitalists and who may be choosing to work but could survive without working. This is an aspect of the social inequalities caused by an economy where wealth grows faster than economic output: $r > g$, where r is the rate or return on wealth and g is economic growth rate (Piketty, 2014). It is arguable whether the existence of such workers would erode class structure or simply cause a restructure with labourers becoming the global working class and the rest living off the profits of capital wealth.

Castells writes that the blending of the knowledge producer and the capitalist classes is the result of shifts in economic policy and political ideology towards neo-liberalism and the emphasis on market-based activities. He argues that this has increased private enterprise and reduced state intervention in the logic of the competitive market. Castells' knowledge producers appear to enjoy the same privileges as traditional economic capitalists: relaxed regulation coupled with the logic of accumulation to gain wealth for shareholders plus the increased financialisation (profit-making being more likely to come from the buying and selling of intangible financial products more than goods and services (Krippner 2005, in Watson, 2012)). Castell's view of these workers is that they are less likely to suffer at the hand of capitalist control strategies than the generic workers who are easily replaced either by low cost human labour or machines.

Aroles et al (2019) synthesise themes in new and changing ways of work including precarious work classed as zero-hour contracts, crowd-based businesses and co-working. The authors find that 'power and control have somehow been left aside in mainstream approaches to the study of new technologies and work' (291). The review concludes that all workers are more or less controlled by management, even on digital platforms. Newer forms of control include surveillance technology for those working remotely, which are situated within the wider context of surveillance capitalism (Zuboff, 2019) and pressures on remote workers set in competition with those in the office due to monitoring and cultures of overworking. The review draws the 'paradoxical relation that binds together independence/flexibility and control' as present in forms of working outside of an organisation e.g. freelancing because all these workers are reliant on markets:

> 'The same goes for digital nomadism: behind the glossy image of travelling, success and leisure lies a somehow darker picture, that of individuals engaged in a variety of professional endeavours and heavily reliant on short-term contracts and assignments.' (Aroles, 2019: 293)

In Aroles et al's (2019) synthesis, a view of social inequalities is conspicuous by its absence. Instead the review falls into the division of workers in 'low skilled' and 'highly skilled' (293) workers and their comparative futures of work as articulated not by workers themselves.

Spreitzer et al (2017) looks at the differences in flexibility of alternative work arrangements driven by the financialization of the global economy (476) for the same two groups of workers (low and highly skilled) and has two visions for workers, which are fundamentally about the level of autonomy, or agency they have in their working lives. The highly skilled are expected to be fought over:

> 'Their high skill is a source of power that allows them to shape the work conditions they desire. This includes having some level of choice about when, where, and how to work, including rejecting jobs when their schedule is heavy or when the work fails to be interesting or developmental' (Spreitzer, 2017: 485)

Meanwhile, low-skilled workers are expected to experience flexibility not out of choice but exploitation, multiple jobs rather than a single full-time job, lowered wages and discrimination. Spreitzer further differentiates the experiences in the level of autonomy available to these two groups of workers referring to Alamgir and Cairns' (2015) study on Bangladeshi mill workers, which found short term work 'perpetuates discrimination and exacerbates economic inequality' (485) and Standing's (2011) labelling of these workers as the precariat who do not other options for their livelihood (Spreitzer, 2017: 485).

The forming of groups into classes which intersect and experience intersecting forms of oppression, are shaped by and exist within capitalist structures. Race and gender are ‘embedded in, working through, and determining the organization of ownership, profit and commodification of labor, for example, by fixing which types of work and types of people enter the market at all’ (Choo and Ferree, 2010; 135). Structures of capitalism recreate and sustain the inequality that embeds race and gender within a regime to maximise profits, increase growth, protect the ‘advantage’ of some that is both felt deserved and difficult to give up (Acker, 2006). The ways in which capitalism develops changes class relations and the resulting inequality regimes. For example, platform capitalism which allows consumers to purchase labour through apps is creating a new ‘servant economy’ (Schor et al, 2017) in which lower paid workers are carrying out everyday tasks for the more advantaged. The gig economy has disrupted traditional understanding of work and made workers more ‘disposable’ (Duggan et al, 2020:115), commonly classing workers as self-employed or independent contractors. The promises of autonomy, money and work-time flexibility are not realised by the gig economy at present and more focus is needed on the gendered experiences of work-life balance within the gig economy (Warren, 2021; James, 2022).

Despite a number of anti-discriminatory laws and the Equality Act 2010, gender and race discrimination is widespread in workplaces because these categories are embedded in class processes. Acker’s conceptualisation of ‘inequality regimes’ as ‘patterns that produce patterns of complex inequalities’ (459) supports the view of inequalities as institutionally dynamic, produced, sustained, and complex. Inequalities in workplaces are systematic gaps in power between workers which results in differences in 'control over goals, resources, and outcomes; workplace decisions such as how to organize work; opportunities for promotion and interesting work; security in employment and benefits; pay and other monetary rewards; respect; and pleasures in work and work relations' (443). While it is feasible to not use an intersectional lens, it allows a clearer view of the lived experiences of people who face multiple oppressions. Applying an intersectional sensitivity does not dilute an understanding of class but crystallises the varieties of class discrimination experienced.

2.2.5 Towards unequal working futures with machine intelligence

Futures of work alongside machine intelligence require urgent sociological attention to dismantle and challenge sociotechnical imaginaries which are embedded in and influenced by the distribution of symbolic capital, the form of capital which gives meaning to human life. This section discusses human work involved in machine intelligence and the cyborg relationship between humans and machines, bringing an intersectional lens to the field to prioritise a view of inequality in working futures.

Fundamentally, futures of work alongside machine intelligence brings to the fore a question of what it means to be human:

> 'As well as providing a tangible focus for continuing debates about the uniqueness of man, technology may act as a catalyst for changing conceptions of the nature of man.' (Woolgar in Bijker et al, 1989: 312)

Woolgar's chapter in in *The Social Construction of Technological Systems* (Bijker et al, 1989) argues that sociological critiques of cognitivism (that human behaviour is explainable by mental states) such as Coulter (1983) fails to question why it is necessary to designate some actions as 'cognitive' and other as social. He argues that debates about the characteristics of 'intelligent machines' (326) and what they can do is 'part of a process of reconstructing the essential qualities of human behaviour' (326). Beneath technical definitions of AI, here 'machine intelligence', there is the idea of imitating and surpassing human intelligence. It is:

> 'the name given to a collection of programming and computing techniques that attempt to simulate, and in many cases exceed, aspects of human-level perception, learning and analysis.' (Policy@Manchester, 2018 quoted in Lewis and Bell (2018))

AI is a field which includes different methods and approaches to develop 'machines with intelligence' (Mitchell, 2019: 8). Deep learning, one approach through which multi-layered neural networks are trained with data has taken on the meaning of AI in the media. The most used approach in deep learning is convolutional neural networks. Although this thesis is not attempting to develop, review or categorize understanding of the field of AI or its subsets, within this area of knowledge, it is worth briefly discussing how humans have used human intelligence as inspiration to create machines. The roots and development of intelligent machines shows, at least at present, that the intelligence of machines are based on the intelligent systems of humans. In this light, the idea of technological determinism is suspended as the systems within deep learning at least, as a subset of the field of AI, has the human visual system at its core. Therefore, the development of deep learning as a method, and the mirroring of 'living' brains is an example of humans shaping of technology, not only in design and intent but in the very structure of it.

ConvNets are based on the human brain's visual system, particularly the organization of the visual cortex in the brain being arranged in multiple layers of neurons. Mitchell (2019) describes Hubel and Wiesel's Nobel Prize winning discovery of the hierarchical organization in visual systems of cats and primates, including humans (73) as a source of inspiration for Fukushima's early deep neural networks in the 1970s, which later developed to be known as the neocognitron and became inspiration for today's ConvNets. The neurons within the layers are activated when we 'see' something, and each layer's neurons respond through a hierarchy:

> '…neurons at initial layers become active (that is, fire at a higher rate) in response to edges; their activation feeds into layers of neurons that respond to simple shapes made up of these edges; and so on, up through more complex shapes and finally entire objects and specific faces' (Mitchell, 2019: 75)

Mitchell draws attention to the more feed-backward flow of information that take place in the visual cortex rather than the feed-forward flow described in the quote above. These feed-backward flows are less well understood by neuroscientists 'although it is well established that our prior knowledge and expectations, presumably stored in higher brain layer, strongly influence what we perceive' (78). This does not equate to machines learning independently of humans as the ConvNets require humans to know how to 'tune' them. The human work of teaching the system by collecting, curating and labelling the data as well as designing the actual system are all essential in order for any learning to take place, any system to exist (Mitchell, 2019: 110). Creating and selling off the shelf training data sets to other companies building AI at scale is the purpose of businesses such as Appen. However, an intelligent machine may continue to learn, independent from the original dataset provided by humans to begin the teaching. Throughout her account of ConvNets, Mitchell points to similarities with the brain, which both helps her explain to those without the technical understanding how the system works but also highlights genuine mirroring.

The human work involved in creating machine intelligence includes tasks that are 'easy' but 'too hard for computers' (Mitchell, 2019: 93). Much work for AI research is today found and paid for via Mechanical Turk owned by Amazon.

While technology continues to improve, there are still many things that human beings can do much more effectively than computers, such as moderating content, performing data deduplication, or research. Traditionally, tasks like this have been accomplished by hiring a large temporary workforce, which is time consuming, expensive and difficult to scale, or have gone undone. Crowdsourcing is a good way to break down a manual, time-consuming project into smaller, more manageable tasks to be completed by distributed workers over the Internet (also known as microtasks).

Machine intelligence laden working futures, from the onset of investment in research and development, design and manufacturing, sales and marketing to the purchasing and consumption, implementation and eventual human-machine working relationship, is a site of struggle and stratification. Firstly, not all workers are equal in their ability to contribute to technological dialogue and decisions that change their working lives. Secondly, existing inequality is likely to shape the way technologies, co-constructed by society (MacKenzie and Wajcman, 1999) are adopted, which groups in society benefit the most, how they influence the performance of gender (Wajcman, 2007) and the potential fulfilment of the technologies' societal benefit. Workers closer to the design, development and marketing of machine intelligence products are more likely as individual workers to have power over the aims and purposes of those technologies, and are more likely to have a role in creating futures. For example, a prototype which tests a concept encapsulates an idea which attempts to meet a user need and brings a different future into view. The power of those who envisage technological futures and play a role in creating them will be compared to those who may or may not envisage futures but are unlikely to create technologies. In this sense at least, being on the inside of technology development, particularly within a powerful technology institution, is social advantage.

However, technology developers are also workers, paid a wage and controlled to some extent by managers. Technology is not simply another discrimination but part of a complex system upheld by and upholding modern capitalist power relations (Acker, 2006; De Vita et al, 2016). Power in shaping the future, or the unequal distribution of power in the ability (or capacity, Selin et al, 2015) to envisage, articulate and be heard, and create representations of futures, is influenced by social division.

This prompts contemplation of what it means to be human, to do human work, in the context of programs that could meet or even supersede (Bostrom, 2014) human intelligence. This is not new, as discussed by Woolgar (1989) who describes a long human history of interest in artificial devices from prosthetic devices to AI, and the consistent need to justify human uniqueness in the face of technological scope creep into assumed irreplaceable characteristics and capabilities of humans. Humans and artificial intelligence are committed in a cyborg relationship - there is not one without the other.

The individual worker’s voice and social position matters in the introduction of new technology in work. IT is not the same as AI and robotics which lead to new forms of human and machine collaboration, decision making and analysis. AI is widespread in workplaces (Mirbabaie et al, 2022) and comes with a threat to workers’ identity. Mirbabaie et al (2020) found workers who worked with Virtual Assistants and identified themselves with a virtual team were more likely to also to identify with technology they used in work, which was conceptualised as ‘virtually extended identification’ (32), calling for future research to understand how workers identify with AI. This builds on research which found largely negative physiological, cognitive and emotional impacts on participants separated from their iPhones (Clayton et al, 2015). Within the context of control at work as discussed in the section above, the level of identification a worker has with AI, when it is perceived as a collaborator, results in business value (Mirbabaie, 2022: 76).

How workers relate to technology is part of how they relate to one another and the social world, one and the same. If machine intelligence in all its forms can do human work, what does it mean to be a human and what does it mean to do human work? Identification with AI may also impact job performance (Alahmad and Robert, 2020 in Mirbabaie, 2022) suggesting there are predictors which increase AI identification and reduces the risk of AI identity threat. Machine intelligence enables machines to do tasks traditionally undertaken by humans and as such, provides a lens to see the future of human work as contested, open and as a site of power struggle.

However, the question of human uniqueness is longstanding and not the focus of this thesis. Instead, machine intelligence in my study is a lens through which to consider the future of human work, how that may be shaped by inequalities and how workers imagine it could be reconfigured and transformed. At the same time, resisting deterministic narratives of technology, machine intelligence in this study is a tool to encourage workers to talk of tensions and relationships between humans and technology mirroring humans.

The next section will develop a concept combining the sociological focus on voices and everyday experiences with power relations that shape futures through technology development to set the foundation for asking how inequalities influence working futures with machine intelligence.

2.3 The Sociotechnical Imagination

> *"Remember to imagine and craft the worlds you cannot live without, just as you dismantle the ones you cannot live within."*
>
> *— Ruha Benjamin, (ruhabenjamin.com)*

> *"Sociologists cannot help making Utopias; though they avoid the word, though they deny the idea with passion, their very silences shape a Utopia" (H.G. Wells, 1907: 367–8 in Levitas, 2010: 537)*

Part 3 brings together two core concepts within sociology – the sociological imagination, and STS – sociotechnical imaginaries – to underpin my attempt to investigate the influence of inequalities on futures articulated by workers. This first section sets out the contribution of the sociological imagination to this thesis, connecting the private to the public. The following section will discuss the sociotechnical imaginaries that analyse the political.

The future of work (FOW) and machine intelligence has long been considered a policy priority in terms of preparation and experts have long been giving their visions of working futures alongside machine intelligence. However, to date, research of the FOW alongside machine intelligence has rarely been approached as a subject to understand the influence of past and present social inequalities of gender, race and class on workers' articulations of working futures. Machine intelligence, and technology more broadly, is predominantly framed as a policy or economic issue rather than a personal one (Smallman, 2018, 2020; Mills, 1959). As such, there is a taking for granted of working futures alongside machine intelligence, as though these visions should be shaped by experts and those in positions of power within society – those with symbolic capital (Bourdieu, 1984). There is a persistently neglected battle ensuing over futures – who articulates their visions, whose visions have the most influence, who shapes futures of work alongside machine intelligence?

The next section begins to account for this limitation in the literature by drawing on Mills to assert the future of work alongside machine intelligence as a topic requiring viewpoints from workers with different social positions, and machine intelligence as part of and representative of an 'institution' (Mills, 1959: 134). It asserts that technology deserves the attention of social scientists (beyond STS) to understand the structure of society.

2.3.1 The sociological imagination: a public issue is a personal trouble

The FOW in the context of emerging technology is a 'public issue' (Mills, 1959). Machine intelligence in this thesis is a means through which to stimulate imaginings of working futures but it also represents the ideas that we collectively and individually hold about what technology could do or become. However, as much as it can be a portal to the imaginings of the future, it is rooted in the context of the past and present, in history and biography (Mills, 1959). In this thesis, machine intelligence is a subject that helps transform 'metaphysical problems into problems that can be treated scientifically and therefore politically' (Bourdieu, 1993 in Webb et al, 2002: 66). This is a process that working futures alongside machine intelligence needs so that they can be opened up to see power relations within. Mill's sociological imagination connects the personal to the public - a function of all classic sociological work.

> 'Neither the life of an individual nor the history of a society can be understood without understanding both. Yet men do not usually define the troubles they endure in terms of historical change and institutional contradiction. The well-being they enjoy, they do not usually impute to the big ups and downs of the societies in which they live.' (Mills, 1959: 3)

Watson (2009) calls for sociologists of work to apply Mill's sociological imagination to reinvigorate the discipline. While Mills distinguishes between 'issues' (which take place, impact and require resolution from the wider public beyond the individual) and 'troubles' (which are personal to the individual) and highlights the need to connect the two, he also has a limited opinion of the reflexivity or perceptiveness of 'ordinary men':

> 'They do not possess the quality of mind essential to grasp the interplay of man and society, of biography and history, of self and world. They cannot cope with their personal troubles in such ways as to control the structural transformations that usually lie behind them.' (Mills, 1959: 4)

Mills' answer to the limitation he perceived was the 'sociological imagination,' which sociologists use to understand history, biography and their relationships. Mills' sociological imagination therefore, is a defence of a discipline, perceived to be for the sociologist and the social sciences. If social science is the study of history and biography and the issues that arise at the intersections of those (Mills, 1959: 134), its tools should be used to study machine intelligence and the FOW as both a personal trouble and public issue. Workers' individual stories and futures – their personal trouble – are required to understand how existing structures of inequality and power play out in machine intelligence working futures- a public issue.

The following section explores the concepts of sociotechnical imaginaries which are collective and used by those in power to articulate the end goals.

2.3.2 Sociotechnical imaginaries: articulating end goals

Jasonoff and Kim (2009) introduced the concept of collective sociotechnical imaginaries to fill a gap in STS in attention to the relationship between science, technology and political power. Sociotechnical imaginaries look at the promotion and reception of science and technology by non-scientific actors and institutions with a focus on national imaginaries, nationhood and policies. The concept of sociotechnical imaginaries builds in part on the growing recognition that the capacity to imagine futures is a crucial constitutive element in social and political life.

> ‘Imagination is no longer seen as mere fantasy or illusion (Sarewitz 1996), but as an important cultural resource that enables new forms of life by projecting positive goals and seeking to attain them. Nor is imagination understood as simply residing in individual minds in the form of aesthetic considerations. Rather, imagination helps produce systems of meaning that enable collective interpretations of social reality (Castoriadis 1987); it forms the basis for a shared sense of belonging and attachment to a political community (Anderson 1991); it provides the gaze through which ‘‘the Other’’ is constructed and represented (Said 1978); and it guides the simplification and standardization of human subjects so as to govern them more efficiently (Foucault 1979; Bowker and Star 2000; Scott 1998). In short, imagination, viewed as ‘‘an organized field of social practices,’’ serves as a key ingredient in making social order (Appadurai 1996; Taylor 2004).’ (Jasonoff and Kim, 2009: 122)

Sociotechnical imaginaries, for Jasonoff and Kim are not political agendas or master narratives (for example, that science equals progress). Instead, imaginaries express futures that are worth aiming for or avoiding. The concept of sociotechnical imaginaries is operationalised by Jasonoff and Kim to see the connection between imagination and action. Imagination is a cultural resource and imaginaries have the power to state what should be the end goal. Focusing on the connection between science and technology and political power, collective imaginaries highlight the power of the imagination (of some people’s imagination) to lead to policy and investment actions which influence the development of technology.

Imaginations and imaginaries, therefore, matter but some matter more than others. Smallman (2018: 668) found ‘an elite imaginary’ of ‘science to the rescue’ shared by scientists and policymakers, which is resilient to and shapes interpretations of alternative views. Smallman (2020) states that this view is perpetuated by both ‘soft’ (592) mechanisms such as the norms and practices of policy making and ‘hard’ mechanisms (602) within in the process and system of policy making such as decision-making processes that only allows certain forms of scientific evidence, defining public views as ‘non-technical’ (599). Within the processes of policy making, social and ethical issues are detached from the science and technology and within those processes, there is no space for alternative views.

Rather than public perspectives being ignored or outcompeted by other evidence or priorities relating to the technoscientific viewpoint, the machinery of government shapes how public perspectives can be heard and accommodated in policy. In the context of a policy-making system shaped around the ‘science to the rescue’ imaginary, nuanced arguments that leave issues open and see risks or uncertainties as inherent to new technologies and unknowable are obscured, interpreted as opposition, or otherwise impossible to consider (Smallman, 2020: 602).

Apart from closing down the discussion around technoscience policy, it has been shown that there are risks in not including public perspectives as they can also offer expertise. Wynne’s (1989) case study of Cumbrian sheep farmers impacted by Chernobyl found that scientific experts lacked credibility because they failed to acknowledge the expertise of the farmers which should have been integrated with the scientific advice for a more effective response to the disaster. Similar to the assumed weaknesses of public knowledge found by Smallman (2020), Wynne found: ‘a deeply embedded scientific assumption-amounting to a general stereotype-about lay people is that they cannot handle uncertainty and risk and thus need to have technical information’ (1989: 37). In the case of the future of work alongside machine intelligence, this thesis argues that workers are the public expert.

The various forms of economic, social and cultural capital (Bourdieu 1997) individuals bring to technology in terms of their own socio-economic positions and internalized dispositions or habitus, is key in influencing the way in which technology might (or might not) be used, as well as perceptions of benefits gained. This requires a consideration of not only finances, but the forms of cultural and social capital available, which are also shaped by processes and patterns of disadvantage.

Meanwhile, the sociological imagination works to understand the relationship between biography and history, private trouble and public issues. Rather than the collective view which opens up power structures within the language of imaginaries, Mills' sociological imagination shifts focus across different perspectives, building up a view of society as a whole (Watson (2009: 863). Taken alone, the sociotechnical imaginaries concept would encourage analysis of policy and the futures articulated by experts - it exposes the power relations within imaginaries of science and technology. Mills' sociological imagination encourages sociology to link personal troubles with public issues. Together, the sociological imagination and sociotechnical imaginaries can be deployed to understand how social inequalities influence how workers imagine their working futures alongside machine intelligence.

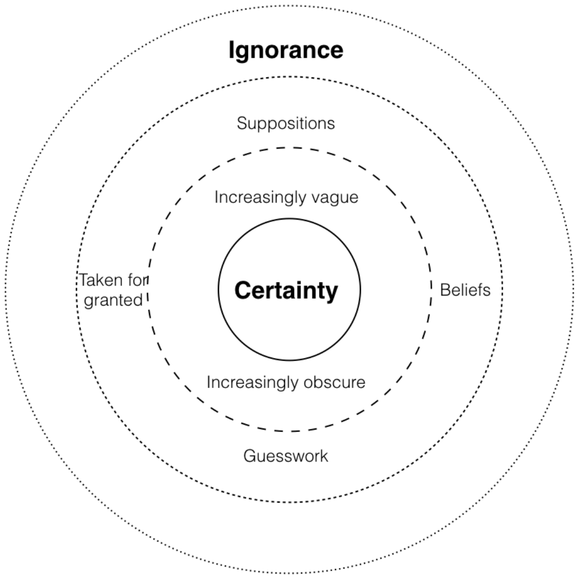
2.3.3 From the Sociological Imagination and Sociotechnical Imaginaries to The Sociotechnical Imagination

The previous two sections have considered two concepts – Mills' sociological imagination and STS' sociotechnical imaginaries that separately fall short of connecting the areas of sociology of work, intersectional inequalities and machine intelligence working futures. This section will discuss how these concepts together offer a lens through which to see the research question.

My research is interested in the how workers' talk of working lives in the past, present and future alongside machine intelligence connects to wider public issues and structures of society. Here, the construct of the sociotechnical imagination brings together machine intelligence with the future of work and social inequalities, encapsulated in workers' futures, which are sociological artefacts worthy of investigation. Seeing the connection between imagination and action highlights the inequalities within futures, which then must be positioned as both a public issue and a personal trouble to understand how the experiences of inequalities shape the way workers imagine their futures. Futures are made of present and past experiences and the sociotechnical imagination facilitates consideration of the well-trodden subject of the future of work, as discussed in Chapter One, through workers' talk of their everyday working lives. The sociotechnical imagination demands space for those who are not considered expert enough or invested enough to offer their future imaginings, which are made up of all they know at present.

Bourdieu's notion of future expectations as a reflection on present conditions (1984) is predated by Schutz in his essay '*Tiresias, or our knowledge of future events'* (1959). Schutz considers the ways in which anticipations of future events in everyday life are formed. These anticipations are personal to the person who envisages, drawing on and reflecting their hopes and fears. The projection depends on the structure of the 'stock of knowledge at hand' (76) at any one time in combination with the individual's interest in the event being anticipated. This knowledge is made up of and by past experiences, interprets both past and present experiences as well as determining the anticipation of events. The knowledge we have in *lebenswelt* is 'socially derived' (76) as it includes the knowledge accumulated through the experiences shared by others. Schutz's depiction of the structure of this knowledge is visualised below, with the kernel of certainty at the centre surrounded by layers of increasing vagueness, obscurity, beliefs, guesswork and eventually, on the outskirts, ignorance (78).

Figure 2-1. Depiction of Schutz's Structure of Knowledge for Anticipation (1959)



The structure depends on the problem with which we are concerned and its relevance to our biographical situation, what is known versus what is less known. The point in time at which the projection is made is the 'now', itself is not a specific instant but rather 'a specious present' (Schutz, 1959: 86) which connects past experiences to future expectations. Schutz points out that experiences in the present contain a level of indeterminacy because we experience that present based on a future that is always indeterminable to some extent. Anticipations, therefore, do not refer to future events in their future setting or context but instead to the future event's typicality, which corresponds to the typicality in the knowledge used at the point of anticipation.

The sociotechnical imagination, by connecting the sociological interest in public and private issues with the imaginaries of technoscience, and insisting that futures are made up of existing social conditions, unpicks structures of power through the talk of workers talking about everyday working lives, from their stock of knowledge (Schutz. 1959).

2.4 Conclusion

This chapter has brought together multiple strands of literature to provide a foundation to think relationally about machine intelligence and the future of work. Using Bourdieu's habitus and symbolic capital, with an intersectional lens, the future of work alongside machine intelligence is primed for sociological analysis as a field of power to be analysed through the imaginings of workers who have different forms and amounts capital. Social divisions in the experiences of control in work continue as a theme into the working futures which are influenced by those existing inequalities. The habitus overcomes the agency and structure dualism mirroring a fundamental theoretical contribution of STS against technological determinism and through these, the future of work alongside machine intelligence is opened up as a topic of sociological importance applying the sociological imagination to see the public in the personal. The contribution of STS' sociotechnical imaginaries is to highlight the symbolic capital with which those imaginaries are imbued, the significance of articulating futures. Within the context of socially shaping and shaped technology, the agent's position and habitus is influenced by and influences machine intelligence development at work.

The next chapter takes the literature and concepts covered in this chapter into the research design and methods, from the conceptual framework and philosophical stance to the participants and data analysis.

Chapter 3: Research Design and Methods

3.0 Introduction

This chapter describes and justifies the work undertaken to answer the research questions. My research questions are interested in the experiences and talk of workers, who therefore, are the participants of this research. This is a study formed of and at intersections, bringing together long-established disciplines of sociology of work and STS to investigate how workers, including those who experience multiple forms of social inequality, articulate their working futures, shaped by and shaping machine intelligence. The ontological position of the study is constructivism which sees social phenomena as produced and reproduced through social interactions. The research design is rooted in the hermeneutic-phenomenological tradition, and it takes an interpretative stance. This chapter details the ways in which the research design incorporates workers from three distinct worlds of work and how concepts identified in previous chapters were operationalised. It begins with a recap of this conceptual framework and research questions.

3.1 Research questions, conceptual framework and philosophical stance

This section offers an overview of the concepts and theories that have been operationalised in the research design. This main research questions has three sub-questions used to guide and manage the scope of the research:

Research questions:

1. How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?
    a) How do workers perceive their working conditions, control and their social position in the workplace?
    b) What are the imagined working futures and configurations of work for workers using machine intelligence?

c) How do workers describe machine intelligence, its development and potential for socially beneficial consequences?

The epistemological approach of the study is rooted in the hermeneutic-phenomenological tradition. It combines a concern with how workers make sense of the world through thought objects or 'constructs' with an empathic understanding of human actions (Schutz, 1959; Bryman, 2016). Therefore, it will prioritise interpretation and meanings of everyday actions and the social world from the point of view of workers who participate in the research. It will take an interpretative stance and attempt to understand how participants interpret the world and put those interpretations into a sociological frame (Bryman, 2016). The data is descriptive with rich details of lived experiences of participants to help understand how people construct their social realities and representations of the self:

> 'We have no direct access to this world, we only experience and study its representations. A reflexive sociology studies society as a dramaturgical production.' (Denzin, 2012: 339)

The ontological position of the study is constructivism which sees social phenomena, including social divisions and inequalities, as produced and reproduced through social interactions, including the researchers' own accounts, which creates a need for reflexivity as part of writing and analysis. This means that, in contrast to the positivist paradigm this research does not set out to uncover a truth or reality as existing independently of that reality which is interpreted (Guba and Lincoln, 2005).

However, the constructivist position is not relativism and does not accept all truths as equally valid but rather attempts to assess the truth claims (Grint and Woolgar, 1997). Rooted in STS approaches to examining technology development as co-constructed and in so doing, deconstructing generalising and deterministic views of technology (Wajcman, 2007), this study shares STS' focus on exploring meanings rather than explaining causes and seeing the macro-level structures in micro-level actions (Sismondo, 2010).

Meaning making is explored in projections of working futures. Drawing on the work of Schutz (1959) who was heavily influenced by Husserl, this thesis interprets anticipations of two forms of events: those which the person who is anticipating has no control over and those which that individual could bring into being or avoid. As described in the previous chapter, the research undertaken here encourages the sociotechnical imagination, asking workers to articulate their working futures alongside machine intelligence. It asks whether the vantage point of workers, including knowledge gained through proximity to technology development, influences perceived control over working futures and how hopes or fears reflect forms of social inequalities.

To reflect this epistemological and ontological position, I use qualitative and interpretative methods to engage workers directly and understand the ways in which they perceive the future of work with machine intelligence. Qualitative research is flexible in design, which gives space to not know what you do not know and to learn which questions to ask, and how, as fieldwork progresses (Brown, 2010). Data analysis is inductive and based on immersion and engagement with the data with a view of constructing underlying stories across patterns and themes interpreted in the data (Braun and Clarke, 2006). Using the notion of a structure of knowledge underpinning any anticipation (Schutz), mirrored in the concept of the habitus (Bourdieu, 2010), the analysis of futures is seen as part of the interpretation of present and pasts shared by participants.

The prioritisation of meaning and interpretation is balanced with a view of reflexivity as being an 'always-on' feature in this study. As such, field notes play an important role in the research design, binding reflexivity to data collection to remain aware of my own biases and reflect on my preconceptions. Data garnered through interviews can only be taken as partial and situated knowledge (Richardson, 1990) through representations of a version of the self (Denzin, 2012) and field notes increase awareness of preconceptions, biases and experiences effecting the interview and interpretations (Ellis and Berger, 2003). My field notes include descriptions of thoughts on access, interview data, pre- and post-interview conversations with participants that might influence my interpretation of the interview, locations, travel, my positionality or interview approach, and so on. These notes are used to help elucidate interpretations of data. This chapter includes reflexivity throughout the sections to maintain the immediacy and centrality of reflexivity as a methodological process contributing to the ethics of the research (Edwards and Mauthner, 2012).

The rest of this section summarises how the theoretical underpinnings of the research developed in the previous chapter play out in the research design of this study.

3.1.1 Control in working lives

As discussed in Chapter Two, workers and social inequalities are established within the structures of capitalism and the concept of control (Marx, 1867, 1930) is used to differentiate working conditions. Unequal working conditions reflect underlying social inequalities which are claimed to be at risk of exacerbation due to machine intelligence implementation (Ford, 2015; Frey and Osborne, 2013).

The capitalist organisation of production is the attempt to control the labour process (Marx, 1867, 1930). In modern Britain, capitalist structures continue to result in unequal distribution of 'autonomy, esteem and capacities for self-expression' in addition to material rewards (Crompton, 2010: 22). Control foregrounds consideration of the unequal experiences of work and working conditions with inequality regimes embedded in institutions (Acker, 2006). Workers are controlled to manage the variability of human labour (Marx, 1930: 170). To reflect the complexity of relationships between class, race and gender within capitalism, an intersectional understanding of social inequalities is applied in this study to analyse working lives and futures (Collins and Bilge, 2020).

My research avoids a deterministic view of technology and is based on the idea of mutual shaping society and technology, which provides opportunities to interrogate nuanced and changing relationships between workers and technological futures. STS opens up technological futures as a site that could be more equally distributed, more democratically developed. Unequal distribution of power in the ability (or capacity, Selin et al, 2015; Groves, 2017) to envisage, articulate and be heard, create representations of futures and express a sense of control of those futures (Bourdieu, 1984), is understood to also be influenced by social division. The next section builds on the Chapter Two's introduction to symbolic capital in futures, incorporating that concept within the research design.

3.1.2 Symbolic capital and unequal futures

Technological futures, shaped by technologists, are understood as reproducing existing gender, sexual and racial inequalities (Kember, 2016; Coleman, Tutton, 2017). Responsible Research and Innovation is an example of an intervention that implicitly acknowledges anticipatory capabilities are not distributed evenly. The Anticipatory Governance framework advances the democratic deliberation of technology development (Barben et al, 2007; Guston, 2014) while foresight capacity building (Davies et al, 2015; Selin, 2014, 2015; Selin et al, 2016) aims for wider and better participation in the shaping of futures. Machine intelligence laden working futures is problematised as a site of struggle and stratification. Furthermore, capitalist class processes of inequalities are highlighted in discourses about machine intelligence and mass job replacement which are imbued with visions of futures (Spencer, 2018) performed by those with some form of symbolic capital (Bourdieu, 1984).

Bourdieu's relational theory and his concept of unequally distributed symbolic capital, habitus and field are used here as analytical tools to study the relationships between the micro (here, workers' experiences and perceptions of working futures) and macro levels (here, structural inequalities created and sustained by capitalism) (Bourdieu, 1984). The application of Bourdieu's concept of symbolic capital to experiences and perceptions of work and working futures alongside machine intelligence, at once differentiates workers in their proximity to machine intelligence development, capacity to participate in anticipating technological futures (Selin, 2015) and in their sense of confidence, or control, in their working futures.

Symbolic capital is one form of capital that exists only with the habitus of those who yield to it and those who wield it. The habitus is the embodiment of the agent's past and present circumstances such as upbringing and education (Bourdieu, 1984, 2010). In the philosophy of knowledge, as discussed in Chapter Two, expanded on in the following section, Schutz employs the concept of a 'specious present' and 'a stock of knowledge at hand' (Schutz, 1959:76) during anticipation to draw together the past and present as actively shaping and interpreting futures. As such, this thesis' exploration of futures is tied to the pasts and presents of participants.

The power of those who envisage technological futures and play a role in creating them will be compared to those who may or may not envisage futures but are unlikely to create technologies. In this sense at least, proximity to technology development is an advantage. Using symbolic capital as an analytical tool, my research considers whether, in terms of machine intelligence and work, the act of performing and shaping futures is restricted to certain groups in society. The next section describes how control as a proxy for class, proximity to technology development and future gaze in daily work are embedded within the sampling of the participants.

3.2 The Participants

This section describes the participants of this study, introduces the cases and details the interview population. Sampling is often overlooked as a necessary procedure in research rather than a collection of choices. This thesis is interpretivist and is designed to explore the topic from a range of workers' vantage points to understand how gender, class and ethnicity intersect and influence experiences and expectations of work alongside machine intelligence. Therefore, interest in inequalities is incorporated in a sampling frame to include some majority voice participants, in this case British white males but skews female, working class, non-British or British ethnic minorities.

It is impossible for any intersectional study to be complete, to integrate the full range of voices required for a whole story (McBride et al, 2015). In this sense, it is important to draw the boundaries of gender, class and ethnicity and clarify that there are other important categories for this topic such as age, disability, sexuality that are not within the scope of this study. The sampling frame has been designed to include a range of voices and to compare capacity to articulate working futures alongside machine intelligence across worlds of work. It allows consideration of how proximity to machine intelligence as a developer becomes a form of symbolic capital.

My selection of cases is founded on:

1) differences in working conditions, specifically control as denoting social class
2) proximity to and relationship with technology development
3) likelihood of future orientation in their jobs

The three cases, overall, offer perspectives from those who are likely to have worked with or be replaced by robots (factory workers), those who are adjusting to workplaces implementing new AI driven technologies including data analysis (knowledge workers) and those who labour to create some form of machine intelligence (AI workers). Brief summaries of each case will follow.

Case 1: Food factory workers

The first case consists of participants who have routine manual roles in the food manufacturing industry. They are paid an hourly wage, experience very little control in work and have experienced work with technology that automates tasks. The participants in this case have roles such as food handlers or food packers and their duties do not require them to maintain a future gaze. This case provides the opportunity to get close to the overall research question in talking to workers with intersectional experiences of gender, ethnicity and class inequalities. As such, the sample skews working class, female and ethnic minorities.

Case 2: Futures oriented knowledge workers

The second case consists of knowledge workers selected for their experience of high autonomy in work. The group of workers are drawn from media, entertainment and the creative industries. They have various roles but are largely senior in their organisation. Every member of this group is university educated and experiences high autonomy at work. In contrast to case 1 workers, these workers are paid a yearly salary. As this research is interested in the capacity to project futures, the workers in this case were selected due to the future orientation of their work. Roles which require future orientation are those in which workers would imagine or build an understanding of a different version of their world as part of doing their job, for example in technology development, policy or strategy.

Case 3: AI developers

The final case is those who are working in machine intelligence development either as self-employed/employers or as employed. They have been selected as workers with proximity to technology development, high autonomy and a futures orientation in their work. In this case, those also employed in an academic capacity, for example as professors or lecturers have not been included as their positions as workers in the labour market are not the same as those who are working, selling their labour, by developing machine intelligence. For example, the working conditions and rewards of those employed by an academic institution are not necessarily dependent on the selling of their machine intelligence development labour. Crucially, the study's interest in the symbolic capital of proximity to machine intelligence development and technology futures would become blurred through the inclusion of those also holding academic positions and titles which are distinctive forms of symbolic capital (Bourdieu, 1984). Therefore, the study focuses on workers who sell their labour of developing machine intelligence without also holding academic positions.

The interview population is detailed in the tables 3 -1 and 3 -2 below.

Table 3-1. Breakdown of participants at class, gender and ethnicity intersections

Total	**Female**	**Male**	**Total**
Total Working class	7	1	8
Total ethnic minority (inc. non-British White)	7	8	15
Working class & ethnic minority (inc. non-British White)	5	1	6
Non-working class & British White	4	3	7
Total	**13**	**11**	**24**

Table 3-2. Participants by case, job title, gender, ethnicity and age group

Pseudonym	Case	Job title	Gender	Ethnicity	Age
Roly	AI	Founder and CEO	M	Asian	40-45
David	AI	Co-founder and CEO	M	White	50-55
Philip	AI	Researcher	M	White	25-30
William	AI	Co-founder and CEO	M	British White	30-35
Will	AI	Research Engineer	M	British White	30-35
Jun	AI	Machine Learning Engineer	M	Chinese	35-40
Malik	AI	Researcher	M	Middle Eastern-British	25-30
Lucy	AI	Research Engineer	F	British White	20-25
Paul	Knowledge	Head of Research	M	British White	40-45
Alabi	Knowledge	Head of Business Development	M	Black British	40-45
Antar	Knowledge	Strategy Manager	M	British Asian	35-40
Alice	Knowledge	Managing Director	F	White	50-55

Pseudonym	Case	Job title	Gender	Ethnicity	Age
Sara	Knowledge	Communication Manager	F	British White	25-30
Jacqui	Knowledge	Policy Manager	F	British Chinese	35-40
Catherine	Knowledge	Head of Policy	F	British White	30-35
Antonia	Knowledge	Partnerships Manager	F	British White	35-40
Cat	Factory	Food handler	F	British White	40-45
Ela	Factory	Food handler	F	Middle Eastern-British	25-30
Matt	Factory	Driver	M	Polish	25-30
Sonya	Factory	Food handler	F	Asian	50-55
Radha	Factory	Food handler	F	Asian	60-65
Patricia	Factory	Food handler	F	British White	50-55
Lakshmi	Factory	Food handler	F	Asian	30-35
Ida	Factory	Food handler	F	Polish	30-35

The following section will focus on ethical considerations of the study before moving onto discussion of the interview method.

3.3 Ethical model and considerations

The British Sociological Association's ethical guidelines guides the research. It adheres to the University of Nottingham's Code of Research Conduct and Research Ethics and the Policy for Ethical Review. As the research is funded by the ESRC, it also follows the ESRC's framework for research ethics. The Research Ethics Officer of the School of Sociology and Social Policy, University of Nottingham approved the research (Appendix 3) after an amendment to the original application as detailed below.

The first tangible outputs of ethical consideration were the information sheet and consent form (see Appendix 4 and Appendix 5) given to participants to gain informed consent. However, as ethical dilemmas arise throughout the research process, before and after contact with an ethics committee, these papers offer an important but limited contribution to the ethics of the research. The purpose of ethics is to consider how to respond to conflict or ambivalence rather than eliminating it (Edwards and Mauthner, 2012). As such, as in everyday life, moral choices and reflection such as on what is right, for whom and why often shape the flow of social research. Hammersley and Traianou (2012) write that the forms of argument used in daily life to make or reflect on ethical judgements are the same as those that may need to be used by researchers.

Research codes provide a starting point in ethical consideration, laying out abstract and universal principles to ensure those who take part in the research are protected and that rights are respected. This is the bare minimum of ethical consideration. As Hammersley and Traianau (2015) point out, there is a risk that ethics is interpreted as a process that can be completed, indicating false start and end points. As such, the presence of ethics in this research is not primarily in the current section but instead scattered throughout the thesis. This section aims to set out the ethical model (Kvale, 1996, 2008), which is most identified with and drawn upon in this research.

Hammersley and Traianou's (2015) attempt to clarify the meaning of 'ethics' locates social research ethics in philosophical models of duty, morality and epistemology as they weigh up hugely contrasting positions and ideas in ethics. The authors acknowledge their own position – that principles must be situationally interpreted and that often those principles may conflict with one another. In making or understanding ethical choices, researchers can be guided by broad frameworks or ethical models.

Kvale (1996, 2008) draws up three ethical models. The first is the deontological model which prioritises duty. In this model actions are governed by universal principles, judged on the intent of those actions rather than their consequences. The actions are evaluated on their closeness to universal rules about what is 'right' (Hammersley and Traianou, 2015; Edwards and Mauthner, 2012). The second model is the utilitarian ethics of consequences in which actions are evaluated in terms of their outcome rather than their intent. The final model is the virtue ethics of skills model which stresses the situation and context. In so doing, this model questions the application of abstract principles to guide researchers and instead sees the researcher 'internalising moral values' (Kvale, 1996: 122).

Edwards and Mauthner (2012) trace the history of feminist writing on ethics, which broadly emphasizes care and responsibility. Maynard's (1994) second wave contribution to feminist ethics was focused on the rejection of power hierarchies between researchers and the researched and critiquing the 'value-free' approaches to conducting research. Porter (1999) offered a value-based feminist model which accounted for the interaction between personal experience (shaped by gender, class and ethnicity which, as contexts, impact ethical dilemmas), nurturant relationships and context. Drawing on such models, which as care-based ethical systems acknowledge and allow room to process the unavoidable personal involvement of the researcher, this thesis's interpretative stance prioritises situation and engages in analysis of power relations in the research. Emotion and partiality are acknowledged as part of the research aim of understanding workers lived experiences through empathy. At the same time, the research is based on the understanding that it is not possible or desirable to simply take another individual's perspective (Young, 1997 in Edwards and Mauthner, 2012). Relations are understood to be asymmetrical, again pointing to the importance of analysing power relations and acknowledging any sense of increased empathy or identification with the stories of certain workers. Dialogue is used as a tool to increase understanding without attempting to reverse perspectives or place oneself in another's position.

Overall, this research is guided by an ethical model that places emotionality and empathy, context and analysis of power relations as central to ethical choices (Edwards and Mauthner, 2012). The following sections discuss specific ethical dilemmas.

3.3.1 Paying participants

The first ethical dilemma relates to access which is discussed in detail in 3.5. My initial recruitment plan included offering £10 vouchers to the participants in the factory case, who receive an hourly wage and could otherwise use the time given for the interview to do other paid work. The practice of paying participants to take part in research is debated and requires further research attention itself (Head, 2009; Ripley, 2016). The University's Research Ethics Committee highlighted that it would be ethically problematic to advertise the voucher in recruitment efforts because doing so would negatively impact participants ability to rationally decide whether to take part. The Committee also noted that advertising this amount risked blurring voluntary, informed consent, particularly because it was for relatively underpaid workers. The Committee stated it would be fair to compensate these participants once they had taken part in the interview having given informed consent without the expectation of a payment.

However, once fieldwork began, it became clear that everyone who took part in the study from the factory case knew others who had taken part. Therefore, if I compensated the first participant who then became mediated contact with others, I would not have control over whether the information about the voucher would be shared with potential participants. Unlike the other two cases in which participants do not necessarily know each other, this case is made up of workers who might talk to others in the workplace about the experience of being interviewed. There did not seem to be a way to compensate without that compensation becoming expected by those recruited, and thereby acting as a potential inducement, blurring the possibility of genuine informed consent. As such, I decided not to compensate any participants with any form of payment. I believe this ethical decision could have affected recruitment within the factory.

3.3.2 Confidentiality and anonymity

On approaching participants, I explained the topic of my study and my overall aims to potential participants. In this initial communication, usually over email or phone, I offered potential participants a brief description of the groups of workers I am studying to explain why I am inviting them. Before arranging interviews I informed participants that they will need to sign a consent form so that I can record the interview. I assured participants that the utmost will be done to protect their confidentiality.

Pseudonyms are used in transcripts and any identifiable details changed in such a way as to not impact interpretation of their interview, as suggested in Bryman (2016: 133). The consequences of this lie in the dilution of detailed information and the additional choices I make as a researcher in deciding how best to balance the detail with anonymity. It has been important in the analysis stage to consider to what extent my knowledge of the original interview, non-anonymised - has impacted on my interpretation of the data. That is, the identifiable data no longer being present in the transcript does not always mean that it is not present in my interpretation of what is said. This issue is reflected on in the following chapters.

All participants were given an information sheet about the research and were asked to sign consent forms. Those taking part over video call (which will be discussed in more detail below) signed the form electronically. For all interviews, face to face and on video call, participants are asked before I start recording if they are happy to have their interviews recorded.

3.3.3 Personal contacts as participants

Kvale (2006) describes the power asymmetry of interviews and usually being one sided in favour of the interviewer but also points out that interviewees have ‘counter control’ options (485), such as not answering or deflecting. Before beginning the interview, I told participants that they do not need to answer a question if they do not want to and that they can stop the recording or the interview at any time. It is important to note that most of the participants were accessed through my own network (as detailed in the section 3.5 on Access). This may have contributed to an element of trust that participants who were complete strangers may not have felt, which consequently could have led to more data being shared than would otherwise have been with an unknown interviewer. Conversely, care must be taken that any preconceptions of participants are reflected upon in analysis and while they cannot be suspended, they must be acknowledged if likely to impact on my interpretation of the data. The next section considers the interview as a method in more detail.

3.4 Interviews

Interviews are well suited to research involving well defined questions and groups with a range of participants and settings which makes participant observation not feasible (Taylor et al, 2015). The semi-structured interview allows flexibility to gather data around specific ideas through an interview guide while allowing the required emphasis on the participant's point of view (Bryman, 2016). Structure is required to encourage talk about the relationships with the technologies that workers co-constitute, and how we might imagine working with technology in the future (Selin, 2015). A framework is helpful to create a distance from familiar technology and to encourage foresight of unfamiliar technology in the future. This is important in a study which includes workers who may interpret and talk about work and technology in very different ways. It also offers flexibility to provide space for participants to share unexpected information.

3.4.1 The interview as a performance

The structure prevents the interview from being a conversation. As Denzin (2012) writes, the question-answer format maintains order so that only one person speaks at a time (even more important when recording interviews for detailed transcription and analysis to ensure clarity), while the structure of the interview, written beforehand by the interviewer, includes a beginning, middle and an end. This turns interviews into 'orderly dramaturgical accomplishments' (Denzin, 2012: 342) that also have the pressure of living up to expectations of being a 'competent conversation' (Denzin, 2012: 343). As a verbal account, the interview relies on what the participant says to understand what they experience, feel or think.

> 'There is no inner, or deep self that is accessed by the interview or narrative method. There are only different interpretive (and performative) versions of who the person is.' (Denzin, 2012: 344)

In the reflexive interview, the version of the self that is constructed and narrated by the participant is then interpreted by the version of the self that is acting as a researcher (Brown et al, 2010). Denzin (2012: 343) groups semi-structured interviews with structured interviews as 'an objectively neutral format' (Denzin, 2012: 343) in which the researcher uses questions to gather information, attempting to not influence the stories told. However, it is neither possible to suspend all researcher preconceptions biases (Ritchie, Lewis, Nicholls, & Ormston, 2013) or to build theories using only the spoken data that is collected while ignoring the gaps (DeVault, 1995). In this light, I used my reflexive field notes alongside analysis of the transcript to give a full understanding of interview performances. Furthermore, the processes and networks followed during recruitment of participants is discussed in detail in Section 3.5 because it is considered as an integral aspect of the research, contributing to the production of knowledge.

3.4.2 Power asymmetries in interviews

The researcher is likely to have more control over the interview as an 'active participant' who ultimately decides which paths to follow, and which to avoid (Silverman, 2001: 119). However, I would not say that this opportunity to control by referring back to the interview guide or restating the purposes of the interview, determines power distribution in an interview. For example, it is possible for senior, highly articulate and self-assured participants who are more powerful than the researcher to maintain that throughout the interview.

Elites are those who have ‘close proximity to power’ (Lilleker, 2003: 207) or with expert knowledge (Burnham et al., 2004). This includes corporate, political and professional elites such as medics (Becker, 1995; Morris, 2009). My study included senior managers from corporations across the AI and knowledge worker cases. However, I had the same approach to recruiting all participants regardless of status. I explained the goals of my study (Ostrander, 1995) emphasising how their work is relevant to the topic (Laurila, 1997). Although I followed a similar process for all participants, I was conscious of speaking positively about AI development and the implications for the future of work for one particularly technologically evangelical elite participant in the AI case.

Overall, the AI case consisted of experts who were addressing me as a non-expert in their speciality. This created a power imbalance, and I avoided using terminology or attempts to understand the technology itself because I did not want my assumed understanding to impact the data or trigger long technical explanations that were not relevant to my questions. My position as an outsider to AI development may have had some impact on the willingness to share contact details for other potential participants (as discussed below in section 3.5 on Access).

Mikecz (2012) argues that researcher positionality can be managed to rebalance the status of researcher in interviews with the powerful. The researcher conducting the interviews is an instrument of research (Hammersley and Atkinson, 1995). According to Pezalla et al the interview practices, including specific characteristics of the interviewer, create ‘unique conversational spaces' unique to each interview (2012: 168). The authors consider how different interviewer characteristics, such as the use of energetic or affirming phrases in response to participants' answers, impacted the data collected. My approach may have differed depending on the participant. For example, for the less responsive participants I attempted to follow their interest areas.

Kvale (2006) argues that the humanistic, consensus building and empathetic interviews which are conceptualised as dialogues are simply not dialogues. He sets out alternative interview approaches that include active confrontation, used by Bourdieu (1999) with 'aiding explanations to propose and not to impose' (Kvale, 2006: 487). This was one approach that I took, using prompts and scenarios of the future to act as additional levers on questions rather than telling participants what they are saying. I used rapport that I built in interviews as much as my position as an outsider to be able to challenge or delve into positions taken by participants without seeming to be confrontational because they were positioned as the experts of the topic (their own working lives and futures). The next section offers and reflects on the process of accessing the participants, which ultimately differed according my relative position to the each participant.

3.5 Access

The processes of sampling and access are core elements of this study's research design which seeks to broaden the range of workers typically contributing to the topic, as set out in the first chapter. This section provides a summary of the access processes, discusses the tactic of 'snowballing' in terms of assumed and played out power asymmetries, considers why the AI case did not result in any participant referrals, and highlights differences in the experiences of access by case. This section applies the reflexive practices, which are central to the underpinning philosophy of knowledge as being constructed, to recruitment processes and draws on literature which calls for more reflexivity and critical engagement with recruitment in qualitative research.

While the target populations embody the research question and intersectional lens, the ways in which they were accessed and approached also contribute knowledge. The siphoning of recruitment processes and efforts into separate, factual sections in research articles, scant details or advice in well cited qualitative textbooks and the misconception that this integral part of the research is either technical or lacking in theoretical or methodological interest has been highlighted as a hindrance to qualitative research (Noy, 2008; Kristensen and Ravn, 2015; Geddes et al, 2018).

I employed purposive sampling to access workers across the three cases following the criteria set out in Section 3.2. I found participants in the four ways:

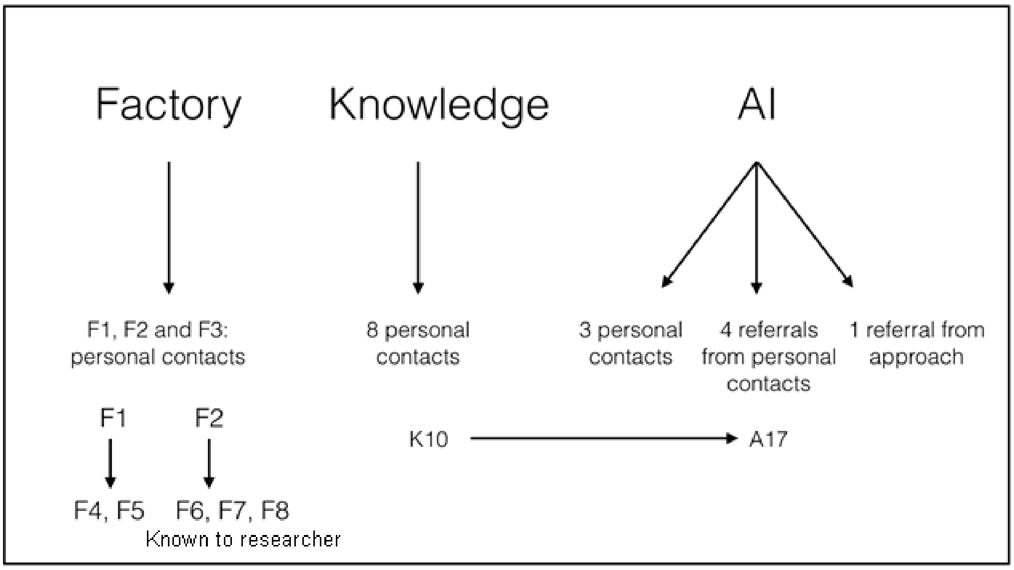
1. Personal contacts
2. Referrals from personal contacts
3. Referrals from personal contacts-participants
4. Direct approach

From the outset, personal contacts were expected to be the basis of the sampling strategy (especially for the knowledge worker case) while I expected referrals from participants as a supplementary option. It is important to reflect on this hierarchy of recruitment methods because it blurs the line between an active decision and passive acceptance of the unpredictable flow of the recruitment process (Geddes et al, 2018; Kristensen and Ravn, 2015).

Snowballing, where original participants refer the next generation who in turn share contacts for the next and so on, is prevalent in studies of hidden or hard to reach populations (Noy, 2008) discussing sensitive topics (Heckathorn and Cameron, 2017). At this point, it is worth noting that the target population for my study is broadly accessible. Although the factory workers are harder to reach, they were not within a public institution such as care homes (Groger et al, 1999) where gatekeepers control approaches. Also, the research topic is not considered taboo, invasive or personally sensitive (Waters, 2015). As such, there were always other options for recruitment. For example, beyond the use of personal networks and approaching potential participants via email, I could have used social media groups or approached people on the street as they left work.

Therefore, the processes and networks activated in sampling were more horizontal than the vertical depth from snowballing. The benefits of horizontal networking, such as breadth of sample rather than increased risk of sample bias through layer upon layer of snowballing, are discussed by Geddes et al (2018) who suggest the two methods could be complementary. Figure 3-1 below follows the example given by Noy (2008) to visualise the horizontal sampling schemata. Demographic details have been omitted to prevent any identification of participants through networking sites.

Figure 3-1. Horizontal sampling schemata



As Figure 3-1 shows, participant referrals led to six further interviews and this tactic was particularly useful in the case of the factory workers. However, it is important to note that I had met F6, F7 and F8 participants, friends of personal contacts, socially in the past. The access strategy for knowledge workers, who were all former colleagues, was to contact them via email to arrange a call to discuss in more detail. The assistants who I was asked to contact to arrange the interviews were not gatekeepers or mediators because the participants had already agreed and the role of the assistant was to set up a date for interviews. As such, the horizontal network is one in which my social capital (Bourdieu, 1984) is employed across all three worlds of work (implications for the interview discussed in section 3.7). Although this is unsurprising as the research proposal was inspired by the work experiences and observations of myself and those within my network, the activation of this network for research purposes requires a constant element of reflexivity throughout on behalf of the researcher. For example, in terms of recruitment, it is likely that participants F6, F7 and F8 were more likely to agree to take part having met me before. I expand on this point and the perceived gaps between researcher and researched below in my discussion of recruitment in the factory case and AI case.

Waters (2015) and Geddes et al (2018) explore factors contributing to the failure of a snowballing tactic to gain momentum. Although my plan was to use personal contacts, I expected more referrals would be forthcoming from participants for the factory and AI case. It is on this point that I will reflect in the next part of this section.

3.5.1 The hesitant snowball

As stated above, the snowballing option was supplementary in the case of not being able to find participants through horizontal networks. Referral was important in the factory case where two personal contacts acted as mediators to recruit other participants. Waters (2015) states that one factor in the success of snowballing is the time and effort invested in building trust to gain referrals. Kristensen and Ravn (2015) describe the persistence required by the researcher to recruit participants to chase, remind, follow up and sell the project to strangers. Seeking participants primarily through referrals reduces the burden on the researcher, or shifts it to some extent onto participants as they are asked to take on the recruitment steps of identifying potential participants, approaching them and motivating them to take part (Kristensen and Ravn, 2015). Geddes et al (2018) suggest that horizontal networking is more time-consuming and labour intensive (356) for the researcher than snowballing.

In snowballing tactics, participants are asked to draw on their networks but the ability to which they can do this depends on the level of social capital in the relevant target population. As Waters (2015) states, the strength of their ties in the network is one factor in the success of snowballing. In my study the three participants who did refer had strong ties to me and to those who they referred. This meant that the participants were able to gauge which of their contacts would be ‘good’ or interested in an interview, or which worked in the relevant areas. Perhaps there is also an element of personal favours and wanting to help out a friend. Recruitment processes here are social networks in action. On reflection, I was hesitant to proactively request, persist and expect contacts from participants with whom I had weaker or no ties.

Snowballing, or actively seeking referrals from participants requires asking more of participants than simply taking part in an interview, giving up their time and sharing their stories with an acquaintance or, in some cases, a stranger. Asking for their contacts could potentially alter the dynamic of the relationship between the researcher and the participants with unknown implications for the research. It pushes the focus of the interaction outwards, towards others, rather than maintaining the focus on the participant and in so doing, it encourages them to process the interview from the perspective of those in their social network, to imagine who would find it interesting, to imagine how others would respond. Regardless of when the participant is asked for contact details, doing so builds on and reflects power asymmetries in research, perhaps as much as the interview itself.

At the end of interviews, I asked many of the participants to let me know if they think of anyone else who might be interested in taking part in the interview. After the interview I did not make further contact to ask for any referrals. I planned to use those participants as back up in case I did not reach enough participants through horizontal networks. Also, I did not consider asking for participants' contacts face to face after the interview because they would need to first gain agreement from that contact (based on their understanding of the research as experienced in their own interview) to avoid privacy issues for those contacts. This is in stark contrast to the language used by Noy (2008) and Geddes et al (2018) to describe experiences of snowballing:

> 'I vividly recall how, toward the interviews' conclusion, I observed several key informants punching on two or three cellular phones simultaneously, retrieving the contact information they agreed to supply.' (Noy, 2008: 336)

> 'However, promises of information from among those five [participants] never materialised, despite multiple requests, and as a result further snowball chain-building stalled.' (Geddes et al, 2018: 352)

Participants had 'agreed to supply' or made 'promises.' It is questionable whether these negotiations had significant impact on the research but Noy

(2008) discusses the issue of power and research authority during the interview, as well as suggesting that some participants may have less power to resist the requests of researchers.

Noy's (2008) reflection on the social capital (Bourdieu, 1984) that participants perform and embody when sharing their contacts with the researcher illuminates this process of gaining referrals as imbued with potentially significant power relations between researcher and the researched. He notes the element of competition in the sample in his study on backpackers attempting to out do each others' story telling, which worked to the researcher's benefit in easing recruitment. In contrast, he suggests implications for female research participants in patriarchal systems:

> 'From this respect, the number of referrals an interviewee supplies is likely to be related to weaker social standings, which, in patriarchal systems, usually correspond with women's positions. Oftentimes women are 'better' informants not because they are 'naturally' more cooperative and verbal, but also because the degree to which they can resist the research(er)'s authority is lesser.' (Noy, 2008: 336)

This gendered perspective incorporates references to structural conditions of society in terms of 'patriarchal systems' but it is a simplification for a number of reasons including the following: 1) it omits the effects of the gender of the researcher; 2) it fails to acknowledge class or ethnicity of either participant or researcher; 3) it suggests women are 'naturally' something while implying men, against whom they are compared as 'better' are not 'naturally' those things. Specifically, he suggests women who offer more referrals in this research setting are doing so because they have less power to resist the researcher's authority. This implies that the process of gaining referrals requires the researcher to not only use their authority but relies on a gap in power between the researcher and the researched leaving the participant in a position to have to resist, or not, that authority of the researcher. It is possible that a hesitance to either burden participants without it being essential to conduct the research, or an unwillingness to exploit any power imbalance or authority I may have had as a researcher, or a lack of such authority were factors contributing to the weakness of snowballing throughout the sample. Other factors may have also contributed to the complete absence of referrals in the AI case, which I will reflect on next.

3.5.2 Absence of referrals in the AI case

My access strategy for this group was to ask personal contacts from previous jobs if they knew any potential participants either employed, self-employed or an employer in the field of AI or robotics. The majority of those approached that I did not know myself that I contacted over email did not reply at all or to follow up emails with further details about the study. One female developer I identified through her role in a public group, responded to say she was out of the country and unable to make the time commitment but recommended I contact her former colleague, who was also publicly accessible and agreed to be interviewed.

In communication with potential participants from this case I emphasised the opportunity to talk about machine intelligence and the future of work with a view to making positive change. I explained that I was interested in how workers could reshape work and benefit from the technology, rather than adhering to the dystopian, technologically deterministic view of job replacement and mass unemployment. No participant in this case referred another, despite all being asked at the end of the interview.

Waters (2015) offers four factors that limited her attempt to reach older drug users. The first is the sensitive nature of the topic, which was too personal to share information held about others. This is unlikely to have been an issue for the present study, which did not require any information about contacts other than their industry or type of work. However, the sensitivity could have been related to Water's second factor which is the risk of participation in terms of the topic of research as well as the strength of assurances given about participant confidentiality. This may have been an issue in my research, particularly amongst those who work in organisations which they felt obliged to protect (often contractually) from employees' opinions or accidental divulgence of confidential information. In these cases, the reassurances of confidentiality, anonymity and the research's interest in their personal opinions and working lives rather than the organisation for which they work may not have been sufficient to persuade them to take part.

More specifically, Geddes et al (2018) found that class differences between researchers and the target group led to a gap in trust, which could be avoided by using mediators (specifically not gatekeepers) who are considered part of the population under study. The AI case could be considered to be elite in the sense that they have close proximity to the technology in question. Geddes et al (2018) suggest that in elite groups, interviewees may feel social pressure to keep out 'outsiders.' In this sense, my position as a social researcher without technological expertise was as an outsider. This may have led to the participants in the AI case being unwilling to provide further contacts (although, it should be noted that it is not known whether they would have been willing if I had pushed further requests).

Two incidents in the AI case offer some insight. Firstly, one participant at the end of the interview requested a first glimpse of the very early findings or themes of the research. This was couched in some concern about the negativity of public rhetoric regarding AI and the future of work. The participant stated personal curiosity but it could also be interpreted as a nervousness following the interview that the project could report negative findings of his world of work. Secondly, another participant immediately followed up the interview requesting further assurances of confidentiality reflecting fears of being identified as talking on behalf of his organisation.

Although these incidents could be ignored, they offer some clues into understanding why the AI case did not result in any referrals despite every participant being (albeit, casually) asked. The sort of conversation immediately preceding my request for other contacts was consistently about the future of work and how those who are outside technology might respond or prepare. It is possible that asking these participants to consider, perhaps for the first time, the impact of their work on other workers may have made them more aware of the negative rhetoric, assumptions and fears of AI. Perhaps they thought this section would be off-putting for contacts. For likely different reasons, the snowball was similarly hesitant amongst the factory worker case, which I will discuss next.

3.5.3 Factory Workers

In this case I sought referrals through two personal contacts in the workplace. The workers in this case work at least 10 hours a day, starting at 6am at the latest, standing on their feet. Most of those interviewed do not live close to work with some travelling from a neighbouring city 30 minutes away, increasing to at least 1 hour in rush hour. When at work, mobile phones are left in lockers and only looked at during breaks. The workers work in four-day shift patterns earning (at the time of the fieldwork) £7.83 an hour. The population consists of many workers for whom English is a second or third language. Many of those approached for interviews have other part time or casual work to support their families, health conditions and caring commitments. The workers I interviewed explained that there were issues with motivation related to a lack of pay rises and absence of bonuses. Some workers approached were looking for other work as a priority. This means that in the four days that they do not enter the factory, they are still difficult to access except in the time set aside to rest in preparation for the next four days. This case supports the view of Smith (2006) that some marginalised communities are at least as difficult to access as the most powerful in society.

I conducted my first interview with a personal contact who works at a food manufacturing factory in Nottinghamshire in April 2018. At the end of the interview, I asked her if anyone else she works with might be interested in taking part in an interview. This participant is referred to as Cat from now on.

The two participants in this case who recruited other participants are defined as mediators who facilitate contact between the researcher and willing participants rather than 'gatekeepers' who control access to potential participants (Kristensen and Ravn, 2015). As noted above, the target population though relatively hard to reach, could have been reached through other more direct means. However, Kristensen and Ravn (2015) state that they have found more positive responses are likely when potential participants are recruited through mediators than direct or advertising type recruitment such as leaflets. The mediator might also recruit in their own image and filter out those who they consider to be inappropriate. Kristensen and Ravn (2015) found in one study that middle class male mediators tended to recruit other middle-class males while excluding those who they considered to be too quiet.

For my study, Cat approached colleagues and two people initially agreed while others were put off by the word 'interview'. Cat fed back to me that it was 'English' people who were being put off by that word as they made associations with a job interview. Other colleagues that Cat approached told her they were worried their grasp of English was not strong enough to be able to take part in an academic study. Cat told me that she used the words ‘chat over a cup of tea or you can do it on Skype’ to avoid using the word ‘interview’. Two participants who initially agreed but changed their mind, the second one doing so because the first one was nervous to meet me, someone they had not met.

Access in this case has brought into focus the nuances of the language of research when it traverses across different social worlds. The word ‘interview’ in the context of academic research is very different to that word in the context of a workplace, used by one colleague without any link to academic research to another during the working day. In asking Cat to recruit participants, I had little control over how they were approached to take part in the study. Cat decided how to describe the study to her colleagues based on her own experiences of it and the information sheet she was given.

Many potential participants were put off by the fact it was academic research, something that sounded like it 1) needed fluent English, despite Cat insisting that their English was good and 2) required knowledge, which again Cat attested to not being the case as she herself had taken part and enjoyed it. The second point recurred in the knowledge worker case but I was able to explain that a motivating factor behind the study was to understand how people who did not claim to know about the technology talked about it in relation to work and that there were no ‘right’ or ‘wrong’ answers. Similarly, Kristensen and Ravn (2015) state that the topics that are the easiest to recruit for are those which the people approached perceive to be both interesting and important to themselves and society whilst also believing themselves to be relevant contributors. Topics that are more difficult to recruit for include those which the participants do not have strong feelings about.

While this study received a number of 'silent refusals' to take part through non-responses to emails, the loudest refusals came from the feedback through the participant-mediators in the factory case. These reasons covered many sources of anxiety amongst those approached: nervousness and confusion triggered by the term 'interview'; lack of confidence in English language skills; lack of knowledge about the technology; the preciousness and value of personal time; general dissatisfaction with work and simply not wanting to think or talk about it in personal time. Crucially, there may also have been nervousness about meeting me, possibly linked to my known educational and professional experiences passed through the network from the two personal contacts or a judgement based on the academic nature of the research. This is a gap in trust reflecting a gap in class between academic researchers and the researched (Geddes et al, 2018) which in this case was not easily overcome by the use of mediators (or my known personal connection to those mediators).

In asking who did and who did not take part (Groger et al, 1999; Kristensen and Ravn, 2015) it is worth noting that the two participants in this case that I have never met before were the youngest and most highly educated of the participants in the case. On reflection, their knowledge of the academic nature of research and the subsequent confidence to consider themselves contributors, is a likely factor in encouraging them to take part, as well as their personal connections to the mediators. It is possible that the perceived class gap was smaller for these two participants. Having now introduced the participants and discussed access, the next section moves on to what I asked them in the interviews.

3.6 The discussion guide

I devised a discussion guide (see Appendix 1) to structure interviews. The first questions focused on the participants' working present, then moved onto the past and ended with projections of futures. The overview of the interview structure can be seen in Figure 3-2 in the section 3.8 below. I conducted five pilot interviews to test and modify the discussion guide to maintain focus on the research questions while building rapport. The pilot interviews were also helpful in honing my questions regarding experiences of inequalities, in particular racism in the workplace, which as discussed in the first chapter, has since fieldwork in 2018, been more openly talked about.

During the pilot interviews, it was important to test the need for stimulus during the part of the interview that was focused on the future. Early ideas included using images of news articles about machine intelligence and the future of work. However, due to the largely technologically deterministic media coverage at that time, this had the effect of closing down the topic and failed to stimulate articulations of futures from workers who did not consider themselves experts in machine intelligence. I also tested scenes from films in a pilot interview and found that encouraged talk away from experience of work and towards popular culture depictions of robots. I tested 'The Last Job on Earth – Imagining a Fully Automated World' (Guardian, 2016), a short dystopian animation but found it too broad (e.g. it showed modes of travel, healthcare and advertising in the future) and participants were less likely to focus on the future of work visuals than other parts of the video. Overall, these tests showed it was important to show videos looking at the topic as a conversation with a variety of viewpoints on the future of work with machine intelligence. Screenshots from the two videos I used in some interviews can be found in Appendix 2.

This following two sections focus on how I translated my research questions and the aim of opening up the topic of the future of work alongside machine intelligence into a discussion guide. The research question can be divided into two core elements: social inequalities and working futures with machine intelligence.

3.6.1 Encouraging narratives of social inequalities

Christensen and Jenson (2012) use life story narratives to highlight ethnicity, gender and class in relation to the 'construction of belonging and roots and routes' (120). They also demonstrate that the use of everyday life as a point of departure. The concept of 'respectability' following Skeggs's study of working class women (1997), provides a study of social relations without asking directly. My discussion guide encouraged rather than closed down stories and included a question that invited a brief narrative about the work history of the participant.

My study adopts an inter-categorical approach to the intersectional study of inequalities (McCall, 2005), focusing on experiences, hopes and fears of machine intelligence in working futures across categories of gender, race, ethnicity and class and the groups within them. The categorical approach provisionally uses categories to compare and interpret the differences between categories of inequality. Intersectional studies that have attempted to ask directly about gender and race to avoid an additive approach to intersectionalities have shown that direct questions or questions about race and gender together did not resonate with participants (Windsong, 2016; Atewologun et al, 2016). Instead of asking explicitly about ethnicity, gender and class the discussion guide provided space for concepts to emerge. For example, I operationalised the concept of discrimination to avoid using the term 'discrimination' itself which is problematic as it could be considered as leading and as a technical term, ambiguous.

As discussed in previous chapters, the words ‘race’ and ‘ethnicity’ are used in this thesis with race being used to describe the socially constructed and maintained divisions and ethnicity being used when participants are talking about their own identity. Race is ascribed whereas ethnicity self-ascribed. Racism is a structuring force within capitalism (Virdee, 2019). Therefore, in discussions of intersectionality which applies a power conscious lens, racial inequalities are at the core whereas when, in this study, a worker is talking about their upbringing, family attitudes to education and their identity, it is their ethnicity that matters. Both words, and the difference between them, are crucial to understanding the experiences of workers in this study, particularly those who experience race inequalities through an intersectional lens.

Studies indicate that the exclusion of minorities from informal social networks (isolation) that offer career advice or mentoring, new skills, legitimacy and career advancement makes it more difficult for minorities to be present at higher levels of corporate hierarchies (Elliot and Smith, 2004; Bridges and Villemez, 1986; Campbell and Rosenfeld, 1985; Podolny and Baron, 1997 in Glenn, 2015 Puwar, 2004). Social dominance theory and system justification theory state that the endorsement of myths and legitimisation of ideologies enable justification of the actions that sustain social inequalities. One such myth is that of meritocracy underpinned by colour-blind ideology which originally was used to argue that all were equal regardless of their race but has been used to argue that race is irrelevant and that it should not be discussed as it is problematic (Gotanda, 1991 in Annamma, 2016). The question I asked about meritocracy in Britain offers insight into the experiences of participants as well as their opinions of differences that exist between groups.

3.6.2 Class

Class is a contested term but this research considers the class of participants in terms of their occupation (Crompton, 2010), employment status - whether a worker is employed, self-employed or an employer (Castells, 2008) and education (Bourdieu, 1984). In practice, during interviews, I did not normally have to ask a closed question about education as it emerged organically in the working life narrative. To add to data that could be used to develop an understanding of habitus, I asked how important education was in the family during childhood and about life expectations.

While the usefulness of occupational classes is challenged (Beck, 2007), Bourdieu (1984) built on occupation as a means of exploring class, adding other forms of capital that serve to delineate groups. Recent studies show the continued relevance of occupation in describing stratification structures in Britain (Crompton, 2010; Williams, 2017). Working conditions are used to understand 'control' as an important indicator of class (Braverman, 1974; Friedman, 1977; Wheatley, 2017). Quantitative studies have been helpful as they explicitly share the wording of questions, which is not usually the case in qualitative studies. Although I asked an open question about the amount of control participants had in their work, the prompts I drafted to use if participants were unable to answer, were based on the breakdown of the concept of 'control' used in other studies. For example, Wheatley (2017) analyses selected data from the Understanding Society Questionnaire and captures job control using measures of autonomy over (a) job tasks, (b) the pace of work, (c) manner of (or way of completing) work, and (d) task order. It was not often necessary to use prompts in the interviews.

The section will now move onto discussing the second part of the research question: working futures.

3.6.3 Stimulating working futures

It is not easy to envisage working futures, particularly those related to intangible technologies such as machine intelligence. This section discusses how the interviews encouraged the sociotechnical imagination as developed in Chapter Two, amongst workers. Technological futures, like work, is a site of inequalities as not all individuals 'are equally projective' (Emirbayer and Mische, 1998: 984). Agents' future projections are directly linked to past and present social conditions (Atkinson, 2013; Mallman, 2016; Gaspani, 2017). Influenced by visual ethnography methods (Pink, 2012; Strangleman, 2012) which combine semi-structured interviews with 'photo-elicitation' using images of the workplace to stimulate discussion of working life in the present and past, I used two videos in interviews where participants struggled to talk about working futures with machine intelligence. There is a tradition of the use of visuals in studies of workplaces as images and texts together allow a deeper understanding of work, changes over time and facilitates reflection on the act and place of work (Strangleman, 2012). I pre-selected two short, publicly available clips about machine intelligence and the future of work to provide space in the interview for participants to reflect, possibly for the first time, about the topic. I attempted to balance out a more dystopian view of the future of work (the first five minutes of C.P Grey's Humans Need Not Apply, 2014) with a more business focused view (the first three minutes of McKinsey's What Will Automation Change, 2017). Screenshots of these videos are included in Appendix 2.

As the research aims to understand working futures of participants, thereby widening participation to 'non-experts' in social futures visions (Reeves et al, 2016), I used video to make the abstract concrete and stimulate imagination of possibles (Flusser, 1985, 2011), specifically for the groups of workers who were not machine intelligence workers. The machine intelligence workers did not require any stimulation to talk about the future of technology. This perhaps reflects their position as experts in social futures visions through their proximity to technology development. In some cases, one of the potential outcomes of their work in machine intelligence development was either the replacement of some human workers or the change in nature of work. As such, the future was something that they had already considered, in some cases being something that they discuss and reassure potential clients about in sales of their product.

The option of using videos in the interview for those less likely to have thought about the possibility of work with machine intelligence drew on capacity building ideas trialled by Selin et al (2015) to encourage participants to think about and imagine the future. 'Emerge: Artists and Scientists Redesign the Future' hosted by Arizona State University in 2012 consisted of nine workshops each trialling a novel method of thinking about the future, such as writing science fiction (Miller and Bennett 2008; Davies, Selin and Rodegher et al, 2015; Selin, 2015) to engage participants in longer term thinking about technology. However, I did not show the video to all participants in Knowledge and Factory groups as some were able to talk about the future of work with machine intelligence without any additional stimulation. I did not want to curtail any of the participant's talk with a video that was only there to stimulate that talk. Therefore, it was a matter of judgement about the flow of the interview whether to show the video or not, and it was something that I learned when and when not to use over the course of fieldwork. Once I had decided to show the videos, I introduced them by explaining that there are many different viewpoints on machine intelligence and the future of work and these clips were examples of those.

Crucially, the videos helped to portray the topic as accessible, engaging, thought provoking and important rather than requiring technical or academic knowledge, which was a concern for many participants. I used the video with participants who showed light hearted signs of being slightly overwhelmed at the idea of talking about machine intelligence either when I was negotiating access and explaining that part of my study or in the interview itself. That is, for participants who had told me that this was not something they had ever thought about before or struggled to talk about imagined forms of technology that might improve their work in the first section of the interview. In comparison, machine intelligence workers and others who were not shown the video were more able to talk about imaginary technologies and entered the discussion with confident projections, which meant there was neither the need nor time for the videos. Participants who watched the videos were then more likely to talk about working futures with machine intelligence as something concrete rather than something they felt they did not know anything about.

3.7 Interview process

Every interview was conducted in a similar way, beginning by asking the participant to read the information sheet and sign the consent form. I then explained, as set out above, that they could choose not to answer any question or ask to stop the recording at any point. Before beginning, I checked the voice recorder worked and ensured we both had refreshments. I thanked the participant for their time and began the interview. Each interview broadly followed the structure set out in the discussion guide. This section discusses the issues that are relevant across all cases.

3.7.1 Social ties and researcher positionality

As discussed in 3.5, accessing marginalised groups can be as difficult as accessing elites (Smith, 2006). Although elites are quite visible 'getting a foot in the door' (Mikecz, 201:, 482) and interviewing them about their lives can be challenging (Sabot, 1999; Welch et al, 2002). Participants who could be defined 'elite' were from my professional network. The contact I had with these participants before approaching them for the interview varied. For example, I had not met or been in contact with some for almost a decade. As discussed above in the section on Access, the personal contacts in the factory case did not guarantee easy recruitment.

Importantly, none of these contacts were people with whom I have discussed my research in any level of detail beyond the working title and topic area before inviting them to take part. Nonetheless, reflecting the philosophical position of the research and the understanding of interviews as a performance offering a version of one of many realities, my field notes and reflexivity have been key to exploring how personal connections may influence interviews. For example, these participants had more information about me than those who were not personal contacts. It does not follow that that information had more or less influence on their talk than the impressions held about me by participants who were not personal contacts. However, another related issue is that of researcher positionality and insider/outsider status.

As described above, more than half the participants were drawn from my contacts and for many of these assumed I had 'insider' knowledge of the organisations in which we worked. Rapport was easier to build based on these connections, even if they were a decade old, which meant that as an interviewer, I began the interviews in the position of a 'once-insider.' Herod (1995) and Sabot (1999) argue that being an insider does not necessarily translate to benefits and there was a risk that such a position in some interviews would have resulted in less detailed descriptions of work, for example, on the basis that I already knew, which I did not.

At the point I showed participants the consent form and ask them to read the information sheet which bears the University of Nottingham logo as my place of study, I became more visibly a PhD student, not only outside their workplace but outside the world of work, and for the majority of AI and knowledge workers, notably outside London. This process is supported in Plesner's (2011) argument that insider and outsider positioning is 'not finite' and 'constantly negotiated' (480). For those who were strangers or whom I had only met briefly, I was strongly positioned as an outsider in the way that I talked about my study which was my sole purpose in contacting them. I was defined by my self-introduction as a PhD student researching what different workers think about the future of work and intelligent technology.

3.7.2 Video calls

I used video call for five interviews and recorded using the QuickTime audio recorder. My participants would also have been able to record the interview if they so wished. I did not wish to record the video of the interview which is straightforward to do and others have done (Lo Iacano et al, 2016) as it was unnecessarily intrusive, with greater risks for more personal data, as I did not collect video footage of face to face participants.

Lo Iacono et al (2016) encourage more qualitative researchers to embrace video calls as a complementary tool for interviews alongside face to face interviews. These technologies allowed me to contact participants in a time efficient and economic way. I have not found there to be a noticeable difference in the quality of rapport or depth of answers except that the participants taking part in video calls often were more responsive than some participants in face to face interviews (Deakin and Wakefield, 2013). However, rapport may have been stronger because the people I interviewed were either known to me previously from my network of contacts or were recruited through personal contacts (Roulston, 2009 in Lo Iacono et al, 2016). As the interview did not traverse emotional or sensitive areas, the risk of being cut off at such a point did not arise (Seitz, 2015) and there were no technical glitches. The inclusion of video call as an alternative to face to face interviews has allowed me to access participants who travel regularly for work as well as those who use Skype on a day to day basis for work purposes and for whom it was the natural environment for a conversation about work. It also allowed me to save time in terms of travel to and from interviews (not insignificant in London) and finding venues suitable for participants. Some of the workers I wished to interview were only able to meet in the evenings which was not easy for me as I have a young child and Skype enabled me to include those participants.

The ability to send and receive files and links, for example to articles that the participant was referring to, added richness. In two Skype interviews, the participant moved the camera to show me the view from the window by their desks. One participant did this to confirm that they are ‘doing quite well in life right now’ referring to the grand location of their home from which they were talking to me. The other participant moved the camera so that I could see the cause of loud background noise in their office, which was a co-working space. This is not something I would have been able to see and hear in a face to face interview but it offers a richness of detail to the data. Lo Iacono et al (2016) connect these visual insights into the choices of participants with Ervin Goffman’s ‘presentation of self’ along with clothing choices and so on. In my reflexive study, I noted any impressions I had of visuals and preconceptions to explore how it may influence my interpretation of the data.

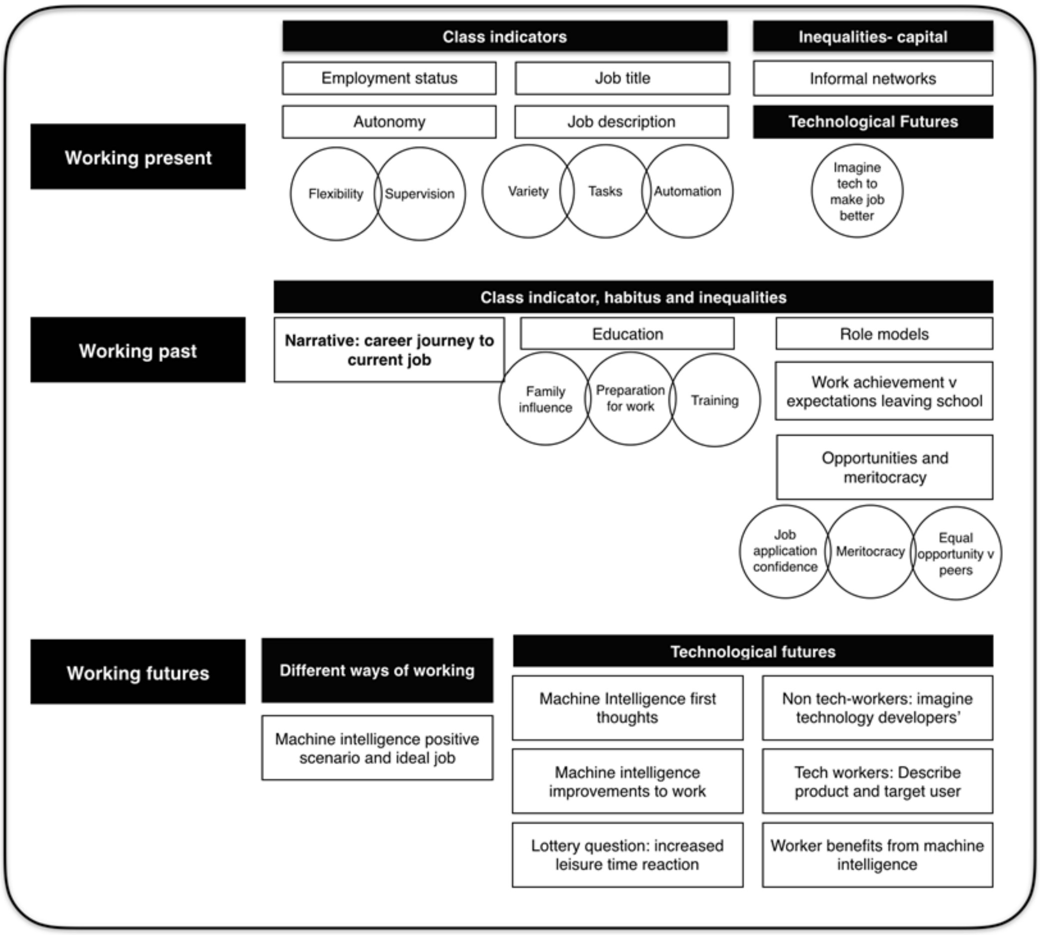
For those I interviewed over video call, it was already a regular form of communication with colleagues, clients and professional contacts. This is not to say that face to face would not have been preferable, but my study has not found that data gathered in a video call to be weaker in any way. The next section considers the methods of analysis of that data and is followed by the conclusion to this chapter.

3.8 Data Analysis

My mode of inquiry is thematic analysis through which I aim to develop patterns and themes into a story (Braun and Clarke, 2006) based on the interpretation of meanings and perceptions shared in interviews. Analysis is a continuous process but becomes more visible at the point of coding transcriptions. The analytical process used follows Braun and Clarke's (2006) phases of thematic analysis of developing familiarity with the data through transcription, reading, keeping notes, systematic coding across the data set to capture interesting features, turning the codes into themes and ongoing analysis to refine and extract underpinning stories of and across themes to refer back to the research questions. Coding occurs at a semantic level, rather than the latent level (Braun and Clarke, 2006) to ground themes in the data and patterns are interpreted and broader implications theorised. The first broad brush coding reflects the topic areas as structured in the discussion guide. However, these are considered 'domains' following Braun and Clark (2016) who point out that when participants provide answers to questions that relate to areas of interest for the research, this does not equate to themes but 'domain-summaries' (740). I used a domain map (Figure 3-2) of my discussion guide (see Appendix 1) to remain cognisant of what participants were asked in interviews and to contextualise codes, differentiating emerging themes from domains.

Analysis was carried out using a combination of pen, paper, excel and NVivo. I find that I am better able to develop familiarity with text by reading on paper and making notes with a pen. However, to keep track of codes, refer back to text and allow ongoing analysis as a live process (likely even more useful when working with others to do the coding), computer assisted thematic analysis is time saving. I conducted this without NVivo's application of machine learning algorithms to perform broad automated coding based on existing manual coding patterns. At the time of analysis, this feature was experimental. It is worth noting that at this point in the development of this particular machine intelligence, the human worker (in this case the qualitative researcher) continues to carry out the initial coding.

Figure 3-2. Domain map of discussion guide



3.8.1 Habitus and Anticipation

My study is interested in Bourdieu's concept of habitus as a means of contextualising symbolic capital. During analysis, I paid attention to data that could be used to construct an understanding of participants' habitus. I also interpreted working futures in the context of past and present working and social conditions, drawing on Schutz's (1959) ideas on anticipation in the everyday world. Thematic analysis combines data exploration and theory-construction (Glaser and Strauss, 1967) which help ensure an open mind to the forms of habitus of individuals (Brown et al, 2008). I use a strategy of thematic analysis rooting findings to the data and maintained an open mind in terms of the form of habitus. I incorporated interest in habitus and past experiences in my discussion guide within questions regarding participants' upbringing, education and expectations. The data from this topic or 'domain' (Braun and Clarke, 2016) developed into an understanding of habitus to aid interpretation of futures.

3.8.2 Analysis of narratives

An intersectional approach to understanding experiences of interacting inequalities as processes is applied in the analysis. Christensen and Jensen (2012) highlight the importance of narratives because categories and intersections arise in the stories people tell about themselves. While the semi-structured interview is differentiated from the method of life history interviews, narratives play a significant role in interviews. Each question engenders stories which are narratives of the self (Holstein and Gubrium 2000: 129 in Denzin, 2012). For example, I asked participants to tell me the story of how they found themselves in their current job early in the interview. This led to the collection of small work life narratives and stories about other experiences. I was careful in interviews not to close down stories and pay attention to narratives in the analysis stage. Mishler (1986) encourages analysis of narratives within interviews as a whole rather than breaking them down into pieces which removes the opportunity to understand how the story is told (Taylor et al, 2015). Before this chapter comes to a close, I will describe the transcription part of the process of analysis.

3.8.3 On transcription

I transcribed interviews to develop detailed knowledge of the data. Although this is time consuming (taking 5-6 hours per hour of speech (Bryman, 2016: 481), transcription is an important stage in building familiarity with the data as part of the early process of identifying themes and patterns (Braun and Clarke, 2006). The transcription processes of listening, typing, rewinding, listening again and correcting is a critical step in analysis and the thoughts and interpretations (including how my role as the interviewer may have influenced the data) made during this process were captured in notes. Oliver et al (2005) encourage researchers to consider transcription choices in relation to their research goals as the transcription practices have consequences for the ways participants are reflected and the conclusions that are reached. In the positivist paradigm, thematic analysis relies on a pre-existing coding frame which can be applied by different researchers with a view to achieving a greater level of accuracy in reporting reality, which is not considered possible in the constructivist paradigm which prioritises interpretation based on the view of multiple realities.

I captured every word as it is spoken, pauses that are longer than a few seconds and laughs or sighs. This 'denaturalized' level of detail is appropriate for my aim of capturing the stories and language as told but is not as 'naturalized' (Oliver, 2005: 1275) as a conversational analysis approach which has an interest in the mechanics of the conversation. As described above, I do not consider interviews to be conversations but co-constructed performances and seek to interpret them through thematic analysis, which prioritises the content of the interview over the way the words have been spoken. Conversational analysts focus on the verbal and non-verbal signifiers at a more detailed level and code, amongst numerous other elements, patterns, emphasis, deep breaths, sniffs or drawn-out syllables (Oliver, 2005).

The transcription process is a key point in the research design because it is arguably when the researcher has the most power to decide how participants are reflected. The researcher's position of power and privilege in the research design necessitates the reflexive analysis throughout (Dean et al, 2017), particularly in a lone researcher design:

> 'A different researcher, or the same researcher in a different frame of mind, might write a different report from the same data.' (Brown, 2010: 238)

In common with most PhD studies, the lone researcher design is a limitation as it is not possible to include a range or researchers from a variety of disciplines and theoretical approaches to analysis as shown in Dean et al (2017) or different approaches to interviews in Pezalla et al (2012). Having described the methods and research design decisions, this chapter will now be concluded.

3.9 Conclusion

This chapter has set out the research design and methods undertaken to answer the research question: how social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures? An intersectional lens on social inequalities is reflected in the purposeful sampling, which includes workers who experience intersecting social inequalities across three worlds of work to account for control as a proxy for class. Careful consideration was given to the discussion guide, followed by testing, to ensure that the participants would be encouraged to talk about their backgrounds as well as imagined working futures alongside a technology they may not consider themselves to be knowledgeable about. While the concept of the sociotechnical imagination which is discussed in Chapter Two emerged from the analysis of the talk of workers in interviews, the research was designed from the outset to open up the topic of working futures with machine intelligence amongst workers. It was also designed to highlight the voices of those experiencing work (and life) through multiple social categories of class, gender and ethnicity as discussed in Chapter Two.

The thesis now moves onto the empirical chapters rich with the talk of the workers who participated across three chapters. The next chapter focuses on experiences of social inequalities in the past and present.

Chapter 4: Workers' experiences of social inequalities and sense of agency in the past and present

> *'Everything conspires to make us forget the socially constructed, and hence arbitrary and artificial, character of investment in the economic game and its stakes: the ultimate reasons for commitment to work, a career or the pursuit of profit in fact lie beyond or outside calculation and calculating reason in the obscure depths of a historically constituted habitus, which means that, in normal circumstances, one gets up every day to go to work without deliberating on the issue, as indeed one did yesterday and will do tomorrow.' (Bourdieu 2005:10)*

4.0 Introduction

This chapter contains the talk of workers asked to deliberate on their working lives and considers the habitus through talk of yesterday. This chapter focuses on the first sub-question to answer the part of the main research question pertaining to the present:

1. How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?
    a) How do workers perceive their working conditions, control and their social position in the workplace?

Chapter Five then explores the way workers imagine working futures. Together these chapters explore how positive working futures alongside machine intelligence are based on positive working lives in the present. The capacity to anticipate (Selin, 2017) technologically transformed working futures is not limited to one group of workers – my study indicates workers can articulate those futures for themselves and society in general. However, I identify different orientations towards those futures (discussed in Chapter Five), influenced by the present sense of control over working lives and machines and the experiences of a relatively reduced sense of control due to social divisions of class, gender, ethnicity and immigration history (among many other divisions which it is not possible to include in the present study). Chapter Six looks beyond the individual futures to the collective, considering how workers talked about futures for society.

This chapter begins exploration of the data in the past and present. It takes in turn each of the following five forms of agency, which emerged in workers' talk about their present working lives:

1. The sense of control a worker has in their everyday working lives;
2. The extent to which a worker has experienced social divisions in the workplace, influencing the sense of agency over their working lives and opportunities;
3. The sense of control over their longer-term working trajectories in terms of their job choices;
4. The extent to which workers talk about finding purpose and significance in work as a source of agency;
5. The extent to which workers indicate agency in their relationship with machines at work.

Before addressing these themes, I discuss the relevance of the research question to this chapter about present working lives.

The Presence or Promise? Machine Intelligence as Always Present

The previous chapters define and conceptualise machine intelligence for this thesis and explore the discourses that surround its existence (or possibility). For this chapter focusing on the present, the research question creates a temporal tension in the thesis, reinforcing a view of working lives in the context of machine intelligence as a technology that is becoming rather than already existing as an object to study.

Machine intelligence is a lens through which to consider the future of human work, the ways in which it could be positively reconfigured or transformed. This chapter takes the opportunity, in that shifting space of possibles to foreground the inequity and social divisions within work as it is experienced and talked about by workers. The analysis that follows focuses on themes of agency in the talk of work in the past or present, the experience of working with current technology and the work of learning how to use it or that of creating it.

Few workers in the study talk about currently working in the presence of what they would describe as machine intelligence (the knowledge and AI workers use Google search daily but do not mention its algorithms; the AI workers had reservations about calling technology they used as "AI" or any such term, as discussed later in this chapter and in Chapter Six). However, all workers in this study currently work in a context of future machine intelligence. That is, everyday working lives are taking place amidst workers' imaginings, expectations, hopes and fears of forms of more intelligent technology in the workplace.

As described in Chapter Two, this study draws on Schutz' 'Structure of Knowledge for Anticipation' (1959) in exploring futures. The working futures described by workers in the next chapter are shaped by the structure of their 'stock of knowledge at 'and (Schutz, 1959: 76) made up of past and present experiences. Uncertain working futures analysed in the next chapter are tied to working presents and pasts that make up this chapter. The stock of knowledge drawn upon by workers to imagine working futures necessarily includes their current experiences of technology that they could imagine becoming machine intelligence, regardless of whether they have already worked with technology that they would describe in those terms.

For example, a factory worker using an automating machine and noting the roll out of more efficient technology, which makes work slightly easier but also replaces workers, is carrying out their work in the context of possible futures in which the technology continues to improve. An AI worker who is working towards a goal is working in the context of that goal being achieved, moving closer to a future with technology that they would themselves define as AI. A knowledge worker who works in strategy focused roles is aware of and alert to technology developments that may make their work more efficient or offer richer analytical insight. Work is experienced with imaginings of the future and machine intelligence, in whichever form the workers conjure it.

The next section briefly introduces these workers, adding to the demographic breakdown and sampling strategy in the previous chapter, to illustrate the very different types of work they do each day.

Workers' experiences- the types of work and tasks

While the rest of this chapter is focused on the forms and sources of agency articulated in workers' talk, this section highlights the differences in the types of jobs through a task-based description of work. This data is fundamental to the analysis because it illustrates class differences in experiences of control and autonomy across the groups. A task-based understanding of work has long been a part of labour process theory as a means of interrogating management control, routinisation and deskilling (Braverman, 1974). Autonomy can be categorised as 'job control' (decisions about tasks and work conduct) and 'schedule control' (Karasek, 1979; Wheatley, 2017). Task descriptions illuminate analysis of workers' talk of agency in this chapter and provide a better understanding of working lives and the inequalities therein.

However, within the subject area of machine intelligence and the future of work, task breakdowns have served another purpose. As discussed in the Chapter One, there has been a tendency for discourses about work and machine intelligence to fall into one of two viewpoints: jobs being replaced or tasks within jobs being automated. Some tasks are considered more easily automatable by AI than others leading to a broad consensus that AI will augment (some) workers allowing them to carry out reconfigured roles (Lewis and Bell, 2018). A task breakdown has been used by those aiming to predict workers most likely to face job losses (Frey and Osborne, 2013, Autor, Levy and Murnane, 2002)

Returning to this study, I asked all workers to describe the tasks that they undertake on a typical day and the technology that they use at work. As the workers were drawn from three dispersed spheres of work, each group carries out tasks that neither of the other groups would carry out. While there is crossover between tasks in the AI and Knowledge groups about communication and building relationships, strategy development and market research, the Knowledge workers do not code or develop or conduct product testing unlike the AI workers. Therefore, the workers across the three groups work with different technology suitable to their tasks. The factory workers are working with large industrial machines that automate tasks. The knowledge workers primarily use computer or phone devices and Microsoft Office. The AI workers are mostly coding and working towards a programme that could be labelled as a component of, or in the cases as CEO/founders, towards a whole machine intelligence product using a range of methodologies and programming languages.

Brief examples of the tasks from the three groups of workers are summarized in the Table 4-1 below. The worker groups from this point onwards will be labelled by K (Knowledge), F (Factory) and AI (AI developers).

Table 4-1. Typical work tasks of participants

Group	**Most common tasks in group**			**Least common tasks in group**
Factory (F)	Packing food product into boxes (partly assembled by 'packing machines') and	'Piping' – filling food produce with another ingredient or otherwise assembling the products e.g. layers, toppings	Informally training and helping new, temporary agency staff	Supervisors (x2 participants) in 'outer packing' (before dispatch to supermarkets) set up the printers to print food labels, metal detectors and weighing machines; on the line, set up ingredients
Knowledge (K)	Reading and analyzing documents, drafting documents with colleagues; market research	Developing business strategy, researching market developments and trends; and planning for up to five years ahead	Presenting findings; Business development in person, phone or email; team management	Measurement and evaluation of business performance
AI	Product coding, designing, development and testing	Machine learning for business insights e.g. keyword ranking for advertising	Implement experiments of computer carrying out cognitive tasks in machine learning research	CEOs (x3 participants) Business development/acquiring customers; funding rounds/angels pitching events; strategy for business future; competitor research

Social inequalities

As discussed in the previous chapter, I adopt an inter-categorical approach to the intersectional study of inequalities (McCall, 2005) and it follows those intersectional inequalities, experienced as multiple oppressions are indivisible and cannot be prioritized- that is at the core of the experience of being multiply oppressed (Crenshaw, 1989): gender or class does not come above ethnicity and vice versa. However, for the purpose of analysis, I focus on the intersections across and within categories of differentiation (gender, ethnicity and class) and the groups within them. The categorical approach provisionally uses the categories to compare and interpret the differences between categories of division. That is, in this study, the categories that are analysed are not prioritized or ranked in order of importance.

The next section of the chapter begins exploration of the themes of agency, focusing on the significance of work and the sense of control over working lives.

4.1 Workers' talk of the significance of work: agency in working trajectories

Despite the differences in the types of tasks the workers carry out, they were consistent in one area: 'meaningful' is not a word used by any worker in this study when talking about their work. Instead, other adjectives and concepts were selected to articulate the significance of work in their lives. 'Meaningful work' is a problematic term, existential in its nature and ambiguous. Martela and Pessi's (2018) examination of the various research definitions of the term resulted in another term: 'work significance' (6). This term has two further sub-meanings: 'broader purpose' (6) and 'self-realisation' (7). The authors of this review argue that the generic nature of significance should be broken down into these two elements, one which looks outward at the value of the work beyond the worker and the other which looks at the extent to which the worker experiences agency, connects to and expresses themselves in their work. This section highlights the inequalities in opportunity to experience a sense of work significance (Martela and Pessi, 2018) as articulated in workers' talk about work.

In the next chapter, which will focus on working futures, I will discuss the theme of the meaning of human work in the context of dystopian futures where machine intelligence functions to reduce work opportunities. In the talk of everyday working lives in the present, the extent to which workers expressed a sense of broader purpose and self-realisation in their work differentiates factory workers (F) from the knowledge (K) and AI workers (AI).

4.1.1 The significance of work in knowledge and AI worker talk

For the knowledge and AI workers, their field of work tended to be a result of self-realisation, consideration and deliberate decisions. In these cases, talk about work is rich with the notions of motivation and passion, interests and fulfilment, and a steady journey through work trajectories as a narrative of self-knowledge and learning towards work that is ever closer to their own identities (Kira and Balkin, 2014). One example is shared below from the interview with Antonia (K)

> Antonia: I'm very motivated by purpose, missions, sense of having a positive impact on the world which has actually been ingrained in me for most of my life I think. That was always what I was looking for with work and that's always the thing, when people ask me what I do I always end up describing justifying the purpose of what I'm doing, is kind of my default way of describing what I do. And I have worked in sort of government type stuff doing consultancy and sort of government-esque organization. And then I sort of switched to do some non-profit stuff thinking I'd have some real impact working in

> some non-profit charity sector. Then I’ve come to the conclusion that actually, arguably, the power in the world now rests with business. That’s where the big impact is to be had. And therefore, the place I can have most impact is working within business rather than outside it. And, then I’m really keen to work in a business that’s trying to role model a new way of operating and a better way of existing. So a company that isn’t just thinking about its profits but is also thinking about the impact it has on the environment and on you know local communities, and social structures around it. So that’s why I’ve ended up quite deliberately working for a company that gives 1% of its revenue to environmental causes […]
>
> *Interviewer: So there’s two massive words there that I’d like you to just expand a bit on. The first one being ‘purpose’ in work and the second one being ‘impact.’ I guess that’s meaning impact of work. Could you just talk a bit more about what you mean by purpose?*
>
> Antonia: So by purpose I mean working on something that has a point to it and that is ultimately seeking to do something for the good of mankind or for the good of the planet. So something that delivers something positive back. And isn’t all about just taking or negative or yeh, I don’t know working in an organisation that isn’t considerate of its role, yeh in terms of the environment and in terms of impact on people. And a lot of companies that don’t consider that at all and just operate to make as much money as they can at whatever cost. [K, British White, female 35-40]

Antonia describes her ‘deliberate’ decision to work for an employer with a specific type of business model. Antonia’s motivation to make a positive impact on the world in work is a driving factor in her working life decisions and her language is active rather than passive. She describes a series of job choices through which she has been able to understand more about what is important to her in work, and then be able to make choices that best suit her priorities. This is an important theme amongst participants in the Knowledge and AI case where work can be talked about as a personal choice based on motivation, interests, passions or sense of purpose.

There is also talk about next steps, promotions, and being able to make those moves or staying in the same position for 'too long'. Across both groups only one worker does not hold a university degree (but did study at university for a number of years). Education, as a process and a form of capital (Bourdieu, 1984) is inextricably linked to the workers' articulation of personal reflection in work. While education will be discussed later in the chapter, I will now explore the very different meaning(s) of work in factory workers' talk.

4.1.2 The significance of work in factory workers' talk

Rather than indicating absence of significance or intrinsic value of work in the talk of factory workers, their talk shows a considerable difference in the sources of that significance. Although the purpose of working is to earn an income, this is not the same as connecting to work with a broader social purpose. In one sense, the articulated broader purpose of factory workers' work is to contribute to the success of the business, to maintain their own job and the jobs of others. This could be applicable to other workers, particularly outside the public sector, and is talked about by knowledge workers who have either changed or are changing their career direction as a result of their dissatisfaction in working 'to further the interests of the company that I work for' (Catherine, K, British White, female, 30-35) or Paul (K, British White, male 40-45) who described leaving the advertising industry because he felt deflated when his strategic insights into human nature only served a 'superficial' purpose.

However, the five workers who have worked at the factory for more than ten years talk about the previous owner and their wholly more positive experiences at that time of working for a family run business. When 'big business' (Ida) took over workers talked about being made to feel 'like a number' (Max), disrespected (Ela, Patricia) and that the quality of the product decreased as the demand for quantity increased. The key points to note are that when the business was family run, the workers felt respected and valued (small rewards such as wine and a party at Christmas), and they felt as though they knew the owner:

> Patricia: You got treated like you're a person. At end of year you sort of got a bonus, even though it's not money, [previous owner name] what had it, he used to put a big bash on for Christmas, he'd pay for everything, all the booze, food, we had raffles, everything. And he paid for everything. This company, and I don't like it, and I don't care who knows I don't like it, this is the worst company I've ever worked for, have no respect for people, they don't treat you, they'll say 'oh you're doing a good job' and all this but you get no respect…There's more accidents now in that factory than there ever has been. Oh yeh. We've had ambulances, god knows how many times now, heart attacks, stress related, stress because of the way they treat us, treat us like dirt (F, British White, female, 50-55)

Patricia describes not knowing who is in charge today, compared to her experience with the previous owner, who she remembers brought his children to the factory floor. These workers have experienced the shift over the past decade from a local, family run business to a large, multi-national corporation in their day to day working lives- in the speed of the lines, the perceived reduction in quality and the resulting feeling of 'not caring either' about the product.

The factory workers’ talk suggests the source of that intrinsic value in work resides in the capability for these workers to use the skills that they have developed (for the workers in this study, over a number of years) to be paid, which allows them to maintain a way of living which they have reason to value and to take part in society, to build friendships with colleagues, and to take no responsibilities into home life and personal time.

While these may be sources of significance which the factory workers use to judge the value of their work, they were unlikely to talk about actively searching for work that feels more significant. As described above, the knowledge and AI workers often articulated the exercise of agency in the journey towards work that they then described as more fundamentally a reflection of themselves (their interests, passions, values) while having a broader, social impact. My research indicates that this is because of the set of opportunities perceived by these workers. For example, there is talk in the factory case from workers who have other interests but these co-exist with factory work. Making cakes is not the self-actualisation (although some of the workers do talk about a sense of pride when the quality of the finished product is high, but the general feeling is that this is rare now) but the workers value the work for enabling that self-actualisation outside work.

In paid work, the factory workers talk about limited options, jobs being difficult to find due to changes in the regional labour market, machines replacing workers in their workplace and being disrespected at work. Often, in their talk, it is the capability to work at all that is valued. The data supports the view that this perception is shaped by the experiences of multiple, intersecting social inequalities that workers face in everyday working life, which restricts perceived agency in working lives and leads to adjusted expectations (Sen, 2009; Bourdieu, 1984).

Interviewer: Can I ask how you came to this job, why did you choose the [factory]?

Sonya: I came England for two months and then I sit down in home and boring, I like to work. And then, my husband say ok, him have friend, working here, and then after that them contact and them send me form and then I fill up and send back. And then after two week them send me letter to come to interview. And then I got job. I never go agency, I never go staff line, anything before.

Interviewer: So you had two months?

Sonya: Yes, boring.

Interviewer: Did you choose cakes or was it that was the connection?

Sonya: No, no, just connection like that. Because in the past, my country, I'm work in [] technology, they make hard disc, hard drive. When I came here and they say it a factory cake like that, ok, I worked in factory before, I'm ok, there I sit down, I control robot before, in my factory before IBM takeover in Thailand.

Interviewer: How long were you working there?

Sonya: 6 year and a half.

Interviewer: You were assembling?

Sonya: Yeh, and I think it's a factory, it's ok, maybe sit down, I not know that England work hard, stand ten hours, my country work only 8 hour. That's why I surprised when I work here.

Interviewer: So you thought this would be easier?

Sonya: Yes, yes! Not easy, ten hour and stand as well and then cold, and all sort of things. But I have to work. [F, Asian, female, 50-55]

For Sonya, the starting position is: 'I have to work' and the factory offered that opportunity. Others in the factory case share similar talk about work such as Lakshmi who came to the factory work through an agency after completing Level 3 childcare required to work in nurseries (on top of her primary school teaching degree and 3+ years teaching experience from her native country) and being unable to find nursery work in Lincolnshire.

Work is routinely talked about as a choice from a limited set of options due to a range of social obstacles (such as perceived language proficiency, devalued skills and qualifications amongst immigrants, the labour market changes resulting in the closure of many local factories) in the factory case.

However, there is a sense of control over working lives because of the shift pattern at the factory. The workers work full time hours in a four days on, four days off rota which allows them in some cases to follow other interests (Cat and Radtha), childcare (Ida), study and develop their own businesses (Max and Ela).

> Max: Honestly, I didn't really much like that place. What I did like about it was the rota system that you would be working 4 days on 4 days off which gives me all the 4 days off for me, for myself, where I can do whatever I want. (F, Polish, male, 30-35)

This does not lighten the talk of restricted choices amongst the factory workers. A concern amongst the factory workers is the limited amount of factory work available today. Patricia points out that when she left school there were more options than today and now sees her choice as that of working in a factory that she feels is disrespectful of workers or to claim benefits which would not cover her bills:

Interviewer: Thinking back to when you applied for jobs, how confident were you that you had as much chance of getting that job as anybody else who might be applying?

Patricia: Oh when I was a kid, easy. ‘Cause basically there was enough work to go around. So, I could walk out of one job and go straight to another. But you see I’ve worked in factories most of my life, in fact it’s all my life. Now, if I was going for some other kind of job, like secretary, no I wouldn’t’ve been confident at all.

Interviewer: The experience makes you confident?

Patricia: Yeh, ‘cause I mean, like I say, I left school when I was 16, no brain box but it’s a factory, it was where I live so it was close to home so basically that’s what I went for. It was 15 minute journey for me to get to work everyday so, working in a factory, yeh …[…]…I was on better money then than I am now, you had to earn your money, which you didn’t mind, you earned it, you got it, when I was about 24, what you call piece work, you got paid so much for every dozen …[…]…I loved coming to work then, I used to do a lot of work here at [factory under previous owner], I used to do a lot of overtime. Now I wouldn’t, they come to me, do you want to do overtime? Don’t talk stupid! Four days is enough, I’m not coming back for another one!...[…]… I hate [current employer] I’m just going, it pays my bills, it’s a choice, either I go to [current employer] to work for £200 a week which pays my bills or I go on the dole, I don’t know if it’s called dole still like and get what, £140 a fortnight. So, what would I do? Well I’ll go to a factory that I can’t stand, get £200 a week, and still pay my own bills… (F, British white, female, 50-55)

Patricia works to be able to afford to cover the costs of living. She is pessimistic of the likelihood that she would find other work. The talk here is that of being trapped to some extent in a job which she ‘hates’ to pay her bills, the awareness of her situation and the reason why she works. For Patricia, unlike the worker Bourdieu writes of in the quote at the beginning of this chapter, there is an awareness that her social position impacts the choices she makes about work, and that she does in fact deliberate those reasons.

While the social aspect of the factory work is also an important source of value but, just as important to note, this does not compensate for the frustrations the workers shared about feeling disrespected:

> Ela: Like when I first started the factory, I enjoyed, I talked about the factory so negatively but I do enjoy some parts but these parts are not to do with the factory. It’s more to do with the people. You even learn different languages from them, meet new people and you enjoy talking to them and it makes the day go faster, you help each other. In the sense of socialising, it’s really good. But in the sense of how the workplace is, it needs a lot of improvement. (F, Middle-Eastern, Female, 30-35)

In the factory workers’ talk, there is a clear sense of hierarchy in the workplace (denoted by different coloured hats) and certain roles ‘somewhere up the ladder’ (Cat) but there is very little motivation for climbing that ladder. Patricia talked about volunteering as health and safety representative for the factory floor as a disempowering experience with co-workers refusing to listen to her (shared by Max when he talked about his negative but illuminating management experience as a supervisor). Ela explains that she wouldn't expect a future in the factory. The progression routes are not worth the effort because of the perceived imbalance between the small increase in pay and increased stress. Similarly, Ida 'acted up' as supervisor in training taking on additional 'stressful' responsibilities but did not receive an official position (or the extra salary – Ida's experience is reported in the section below on intersections of inequalities). In all talk about taking on extra responsibility, the experiences are described as disempowering.

Overall, for the factory workers the significance of work lies in their relationships with colleagues and their own, free time outside of work. I will now explore the talk about education across the groups and the ways in which it is seen as a means of increasing control for workers at the intersections of social divisions.

4.2 Education and sense of control over working trajectories

This section will discuss the ways education, which foregrounds social inequalities, is seen as a means of increasing agency over working lives. A further use of the interview questions about education was to introduce retrospective to the discussion as it required participants to recall elements of their past. Without being invasive, these questions created space to talk about childhood, family and steps towards working life. As discussed in the Chapter Three, the interview was designed to allow temporal fluidity in which present, past and future co-exist in talk about work. Education is an ever-present potential opportunity (Högberg, 2019) or set of opportunities perhaps seen and taken or seen and not taken, which means that talk about education (like machine intelligence and other developing technologies) also encourages prefigurative states and enables orientation towards working futures.

In the capability approach (Sen, 2009) individual advantage is judged not by resources such as income or 'happiness' (Bentham's principle of utility, 1789, 1907) but by the capability (or opportunity) that an individual has to do the things that they have reason to value, regardless of whether they act on those opportunities. The capability approach is helpful in this section because talk about education can heighten understanding of the perceived set of opportunities open to workers in their past, and therefore anticipates their envisaged set of opportunities in working futures. This shifts the focus from the 'means of living' to the actual opportunities of living' (Sen, 2009: 233) in the assessment of individual advantage. The educational opportunities that are acknowledged by an individual do not need to be actualized to positively impact well-being or positivity towards the future. Increased capabilities or potential opportunities have a positive effect of well-being (Högberg, 2019).

4.2.1 Attitudes to education at home

The analysis begins with workers' answers to the question: how important was education when you were growing up at home? It is noted that the question removes agency in the sense that it is focused on the family surroundings that the worker grew up within and their perception of the attitudes held by their parents towards education. However, the talk about education surfaces the differences between those with immigrant family history and those without as well as between the British White workers in the factory case and those in the Knowledge and AI cases. Specifically, workers with an immigration history emphasized the importance of education. The expectations from family are 'absolute' (Malik).

Patricia and Cat in the factory case, talked about a more relaxed attitude to education in their upbringing.

Patricia: For me, if I could get away with it, I would! To be honest it was easy to get away with it with me mam, 'cause basically I was brought up with my grandma. Now, she's a tough lady, she's a tough lady. With her, I couldn't get away with nothing. But with my mamma, I could get away with blue murder. Yeh, now I wish I had carried on. I'm not thick thick but I could've done with learning a bit more.

Interviewer: So one was more relaxed, one was more pushy?

Patricia: If my gran knew what my mam was letting me get away with she'd have flattened her. So, I should've stayed more with my gran than with me mam! She'd've made me go. My mam, yeh, I could wrap around my little finger, get away with it. [F, British White, female, 50-55]

Cat: Um, it wasn't, I don't know, it wasn't pushed, it wasn't pushed to do, and you were just helped and you generally did what you needed to do in class and that was about it… I got a job when I was 17 and have been working ever since. [F, British White, female, 40-45]

The workers in the Knowledge and AI groups talked consistently about the importance of education at home. For Antonia, her mother's working class background and limited opportunities because she was a woman, were seen as a reason for the positive attitude towards education:

Antonia: Very important, so yeh. My mum came from a reasonably working class background and her mother told her there was no point going to get a degree because she'd be much better just getting a husband. So she never went to university and my mum holds that as a real point of absolute sadness for her, for her whole life. It's something that she still thinks about daily and regrets. [K, British White, 35-40]

Antonia's talk about her mother's regret in not pursuing her education and Patricia's regret at not continuing school and being able 'to get away with it' points to perceived closed opportunities to British white working class women.

Others in the knowledge group talked about the expectation that they would do well in education and go to university. This expectation was clearly felt if not forcefully made.

> Catherine: Very important, um, yeh, yeh it was something that my parents like really valued, I went to a quite results driven grammar school so by virtue of that academic success was valued and that was kinda compounded by the fact that I was quite a good student so therefore, expectations in terms of success in exams and things went up around that. And if I think about the decision to go to uni, it wasn't really a decision, the expectation was that I would go to university and I can't remember having a conversation with anybody about oh should I go to university or not, it was just a, kind of given. [K, British White, female, 30-35]

> Will: Yeh, pretty important, you mean in the sense were my parents pushing me, it wasn't like tiger mum nagging you about your grades and stuff but it was definitely important to them. [AI, British White, male, 30-35]

William: I was under an incredible amount of soft pressure.

Interviewer: Soft pressure. Nice.

William: No direct pressure and theoretical freedom. [AI, British White, male, 30-35]

First and second generation immigrants were often aware of sacrifices made by their family for them to study.

Jun: It was very important. So my family sacrificed a lot to send me to school here in the UK, a tremendous sacrifice because I was born in Malaysia and actually opportunity is not so good for people of my race because we're a minority, and for my parents it was very important to send me to the best schools [AI, Chinese, Male, 35-40].

Lakshmi: No they think about, I need to study, very important, studying is very important. Because if we not study we can't get good job, and, so that is important for us and our life also, if we not study, we can't manage our life as well, that's why they want, even they not teach me cooking or house job or anything, they only study, study, study, they say only study. Even they give me all the facilities for the study.

Interviewer: Study was the most important thing?

Lakshmi: Of course, even my mum always come and sit with me and read all the books and everything for me, if I am not studying, if I am getting lazy to read, she read everything and she ask me question, she teach me everything. [Lakshmi, F, Asian, female, 35-40]

> Antar: Very important. My parents didn’t have, well grew up in this country but both missed out on opportunities that they both felt they could’ve and I think certainly should’ve had because of family situations. They always valued education for themselves so felt they missed out, so really pushed my sister and I to make the most of the opportunities we had. I had a private education and I wouldn’t have had that if it wasn’t because they cared. They worked damn hard to make sure we could get the best we could. [Antar, K, Asian, male, 35-40]

For others, their cultural upbringing meant that education, particularly university, was not a choice.

> Roly: Very. I grew up in an Indian family. And, I don’t think I had a choice. [AI, Asian, male, 45-50]

> Malik: Well, I think where I come from, Middle-Eastern background, it’s absolutely, I don’t think it makes a difference but, both my parents were lecturers so…Expectations were pretty high.
>
> *Interviewer: Was it expected you’d go to university?*
>
> Malik: Yeh, it wasn’t even like a choice really. [AI, British/Middle-Eastern, male, 25-30]

> Alabi: Very important. So my mum, dad lived and breathed it and that’s, you know we’re African, Nigerian, and Yoruba which means that we’re more likely to have ten degrees than ten thousand pounds in the bank. So, you know.

> *Interviewer: So what's the purpose of education?*
>
> Alabi: Colonisation. So basically, it's a deep rooted thing called colonisation. In some ways, some ethnic minorities see education as a way out but also they see it as a point of acceptance, it's subconscious, you speak well, you read well. [K, Black British, male, 40-45]

This talk about education is steeped in cultural background that is different to those talked about by the British White middle class workers. The weight of cultural expectations that Alabi talks about or the awareness of sacrifice that Jun and Antar talk about plus the idea that education is an opportunity to find a 'way out' or to be accepted means that it is perceived as valuable for a different set of reasons than those held by a privileged majority worker. It is more than a given when it is the means of increasing agency and control by improving chances of employability (Hogberg, 2019).

More broadly, the type of talk about university education being a given, not really a choice but an 'unspoken expectation' (Jacqui, K) suggests it was not an act of agency to pursue an education. Rather, it is as though it was a natural progression in life. This becomes starker when compared to those who finished full time education at school and were unable or unsupported to study further. Radtha's (F) father was a headmaster of a primary school in Sri Lanka but she and her siblings were unable to continue their studies due to a lack of resources.

> Radtha: My parents think education important because my dad was headmaster. No money. No money for education. Everybody go local school, through a-level, GCE, then after stay home and make clothes, and doing- that's all, and help mum. [F, Asian, female, 60-65]

Opportunity to be educated is one means of gaining control over working lives. Another theme that emerged in the data is the opportunity that comes from exposure to fields of work, which will be discussed next.

4.2.2 Exposure to work fields as increasing control over working lives

In terms of the type of subject matter and first jobs, a theme emerged around exposure to potential fields of work. Catherine (K) talks about her interest in the technical aspects of her work, despite saying she has no technical training and has learned on the job. She describes wondering where her work would have taken her if she had taken STEM subjects at school rather than focusing on humanities.

> Catherine: Yeh. It's hard to know, you can never know what guided your decisions in terms of like, could have been different decisions that I might have made that weren't due to lack of interest but they could've been really due to lack of knowing what different subjects were about.
>
> *Interviewer: Exposure, role models?*
>
> Catherine: That's the thing really, I don't really, like I went to the school that was like you know really, really focused on good grades but I had no, looking back on it, I don't think I had any real concept of really, what that meant in terms of what, beyond understanding what the traditional professions were like a lawyer or whatever, a doctor, I had no idea in terms of what opportunities university was supposed to really open up or what kind of jobs you might do, I think it was a bit of a shame really that there wasn't more just like kind of stimulation of that, these are the different types of things that people do, and I think I am thinking there about gender kind of bias as well and maybe limiting, not understanding that certain opportunities were available

to you, I guess. In hindsight I would've liked to have known a lot more about what opportunities there were. Which sort of seems mad in hindsight because why are you doing all this studying if you don't really know where it might get you. [K, British White, female, 30-35]

Catherine's view that she did not understand the opportunities available were a key factor in her decisions not to follow engineering, for example. In contrast, Jacqui (K) who studied engineering describes the exposure she had to that work from a young age:

Interviewer: Do you think there's any connection between the network you had as a child with your family and then later on in life?

Jacqui: My network because of family kinda got in me into engineering because I've got relatives who were engineers, so they were good role models saying this career exists. [K, British-Chinese, female, 30-35]

In talk about current working lives, education is an opportunity to change or specialize work. It remains an opportunity to take more control over working lives. For example, Will (AI) completed his Masters in Machine Learning after working for five years and noticing the potential of the field during that work. Malik (AI) also shifted his career further into computer science after working as a teacher.

Interviewer: How did you choose to work, going back a few years, how did you choose computer science and this sort of field of technology to work in, what is it that drew you to that?

Malik: Probably an instinct to, that it'd be the most important skill going forward.

Interviewer: Ok, do you remember why?

Malik: I don't know why but it was very obvious that everything would be governed by data at some point. Or many things would be governed by data, to navigate the world, to be competent in that field was going to be a really important skill.

[AI, British-Middle-Eastern, male, 25-30]

Catherine (K) talks about her recent decision to work part time so that she can study in an area that would allow her to change the work she does. When asked why she noted that she wanted a job that had a more direct positive impact on people and society.

Catherine: It's personal interest completely separate from my work, the job that I do now…essentially it's about learning practical skills. …[…] I think it's um, I wanted to deal directly with people rather than concepts…[…]…combined with my fascination, interest in mental health and people's wellbeing. And I think to get away from an office based job and into something where it's a bit more kind of, I don't know, the output of what you're doing is even less tangible in some ways but the motivations are a bit different than what I do now, which is about protecting the companies' interests….[…]…it is about social contribution, I guess that's something that's motivated me all along. Through the knowledge and skills that I've learned, I've ended up in a place that is different from where I might have imagined that I might have done. And I guess like, these choices are about trying to reset that a little bit. But also, it is just genuine, kind of like, wanting to learn, to challenge myself and learn new stuff as well. And I guess I feel I'm now in a position where I feel I can make a choice to do that.
[K, British White, female, 30-35]

Catherine describes her current professional position as one which allows her the opportunity to choose to study alongside work, to find different work which is more in line with her personal goals and needs. That is, she has the capability to achieve her goals and move towards an area of work with increased perceived broader purpose and self-actualization (Martela and Pessi, 2018).

Max (F) talks about resisting education as a teenager in Poland but his childhood interest in electrical engineering was reignited while working at the factory when a manager offered advice about the best way to study to become an electrician. Max's capability increased significantly because he developed a relationship with a person who had more understanding of the British educational system.

> Max: While I was working [food factory] on the stores I met one of the managers there who encouraged me to do the course for the electrician. He's an electrician and he was the manager or supervisor of the engineering and...I didn't know how to start that college, I didn't know what I'm supposed to do, I looked at a few courses on the internet over a few months and you can then work as an electrician. I didn't know if that was a good way of doing it. So, I just purely by accident I found him at work and I started to speak with him because I find similar ideas, similar point of interests, I speak with him, what's a good way to do it and he encouraged me, go to college do the full proper course rather than over the internet. Even though it took three years I think it was a good decision…[…]… . I never been learning in England, so I don't know how the educational system works here. So I asked for advice. How it happened. He just came up to repair a machine there and because I'm so interested in machines, I just stand

> next to him and see what he been doing because I was interested in what broke down, what caused it and how he fixed it. So we started to chat about it. [F, Polish, male, 30-35]

Max’s change in work is reliant on education but it is important to note that as an immigrant, he talks about difficulty in navigating the education system. While he did not choose to work in the cake factory because of the machines (or to make cakes) but rather it was the work that was available, it was in the factory where he was able to 1) access relevant advice informally and 2) use his time off to study. In contrast, Catherine (K) describes her seniority at work as enabling her to be work part time and study towards a carefully planned career change.

The term ‘career’ is used by participants in this study but it is a problematic, gendered term that requires more sociological attention (Cuzzocrea and Lyon, 2011) and cannot be dealt with in full in this thesis. However, before moving on, it is worth noting in management, work and organisation and psychology literature the ‘proactive career’ has been studied, exploring what personality types and behaviours are more or less likely to manage their careers proactively (Doğanülkü, 2022; Peng et al, 2021)). Forrier (2022) makes a plea for the field of work and organisation to move on from the ‘individualist’ concept and instead consider ‘how careers are shaped by individuals embedded in context and a network of relationships’ (196). My research sees careers as bound in the narratives of workers, through an intersectional lens applying habitus and forms of capital to embed careers in the dynamic between structure and agency. While opportunities in education are available, the opportunity to act on them and the ways in which that agency is exercised is unequal, influenced by the experiences of intersecting social inequalities. This is the theme that will now be explored.

4.3 Workers' talk of perceived intersecting social divisions

> *Interviewer: What's your view on the idea that Britain is a meritocracy, that if you work hard enough-*
>
> Catherine: [laughs]
>
> [K, British White, female, 30-35]

This section explores the articulation of agency within the confines of structural inequalities in working lives. The experiences of multiple, intersecting inequalities are understood in this thesis to reduce the potential sense of agency experienced, articulated and exercised by a worker.

In an independent government review of 'Race in the Workplace' (2017), McGregor-Smith found ethnic minority workers are not able to fulfil their potential in the workplace, which results in a potential loss to the UK economy estimated to be £24 billion a year (1.3% of GDP). Ethnic minority groups are reported to be more likely to perceive the workplace as hostile, to be disciplined and judged harshly. 'Organisations', she writes in the preface 'tend to hire in their own image whether consciously or not. Those who have most in common with senior managers and decision makers are inherently at an advantage.' This, of course, applies to other axes of social division beyond the scope of the McGregor-Smith review. In the current study, Antonia (K) talks about this phenomenon from her own experiences of recruitment within organisations of hiring 'people like us':

> Antonia: I have worked in environments where most senior roles normally are male without exception, anywhere. I've worked in organisations where they are trying to recruit a more diverse

> workforce, but it does feel a bit tokenistic, so you end up with one black girl in the team, I dunno, a few people who are not white and English, but definitely I've worked in places where it's a conscious discussion and there is some effort going in to try to make it fairer but in order to be fair…[…] And then my experience as well, it feels so much easier, more comfortable, and it feels, I think a lot of people fall into the trap of just recruiting in the same mould of people who already exist within a culture because they know it works, they have 20 reasons why they think it's going to work because they've got 20 people like that already where it does work. And also, so much about companies coming up with a culture and a conversation and a kind of vibe and atmosphere in a place that helps you drive forwards and helps you achieve and work together, leads to good team work and all that stuff, and actually getting a lot of people from a similar background with similar ways of working, that's quite a default, easy option isn't it to create a nice culture, I can see how that happens. But then you miss the opportunity to get the variety, different ways of thinking, totally different way of generating ideas, different new approaches to doing things and I think there's a lot more variety that if it's managed well, that if you're confident to manage disparity of people it can be really brilliant, but you need some really strong leadership and management to enable that. [K, British White, female, 35-40]

Antonia has experienced organisations which create and maintain social divisions to develop an easily manageable homogeneous culture. She weighs up the perceived benefits of placing obstacles for some workers while favouring others with the lost opportunity of 'variety.' The responsibility is seen to rest with managers. However, the implication is that existing teams find it easier to work well together when they are from similar backgrounds. This is a difficult obstacle to contend with which, as Antonia points out, may be left to those higher up in the hierarchy to action- likely those to be in a strong social position.

This section focuses on the intersections of social divisions to draw out the differences in agency in working lives that are within the folds of multiple inequalities. The distinction of class (as denoted in the level of autonomy in working lives and education), as well as that of immigration history are added to those of gender and ethnicity. It is understood that these are terms to describe socially constructed and maintained division. It is necessary to engage in a dialogue with these constructed categories of discrimination to examine the working lives at those (constructed) intersections.

4.3.1 Intersections of ethnicity, gender, class and immigration

Intersectional frameworks consider how immigration policy sustains structures of social inequalities (Collins and Bilge, 2020) and immigration legal status is another category of power. The experiences of migrant workers are shaped by the structural inequalities of gender, race, class and legal status (Maury, 2020). As with other categories that cannot be included but should be part of further research, my study does not explicitly focus on migrant status. Although non-citizenship is an additional structural inequality for workers (Könönen, 2019) all the workers in my study had citizenship. However, this section is interested in the ways that workers who are first or second generation immigrants at intersections of ethnicity, gender and class talk about their experiences of work.

The factory workers with migrant backgrounds talked about being devalued because of their status as migrant workers (even if they had been in the UK and the same workplace for a decade or more). Ida and Lakshmi both talked about the invalidity of their qualifications in the UK. This points to the devaluing of the cultural capital (education) of migrants because it occurred outside Britain. In a study on migrant female workers from Turkey in Britain and Germany, Erel (2010) found 'most were affected by the non-recognition of qualifications and by racist labour market structures' (642). Erel (2010) uses Bourdieu's cultural capital to explore how migrants proactively develop their own validation mechanisms for the cultural capital they already hold. In research about precarious work, Harrison et al (2020) interviewed Roma migrant workers in the UK and found participants formed a 'precarious habitus' underpinned by 'social capital on the move' through strong networks and informal support from other Roma, enabling these marginalised groups to work. These studies applying Bourdieusian concepts to the study of migrant workers illustrate the importance of researching how migrant workers talk about their perceived social positions and how they negotiate ethnic majority institutions. In the talk of participants in my study who have an immigrant background, either first or second generation, there are experiences of how workers perceive and negotiate their positions as immigrants, despite being citizens.

Lakshmi worked as a teacher before arriving in the UK, where she studied and gained a Childcare Level 3 certificate. However, she was unable to secure work in childcare and considers racism one reason for that after being rejected for a job in which the person who was successful had a lower grade of qualification than her but was British White. However, Lakshmi also simultaneously holds that her English language skills would not be good enough to teach in the UK but that she would be able to find such work if she moved to London, which is perceived to offer more opportunities to migrants.

Ida on the other hand gained a food related qualification in Poland but perceives it to have no value in Britain. She finds employers often dismiss it even if it is a suitable or higher-level qualification than is required for the job.

The invalidity of her qualifications meant that Ida said she would in future gain further English qualifications to communicate her skills and knowledge better to British employers. In addition to this, Ida perceives a general lack of value attached to the migrant workers, once marked as such:

> Ida: We don't have a lot of support. Usually when we start a job, it's like 'oh it's another immigrant' and that's it. So nobody care about you. If you have good qualification you have to try harder than English ones. I think that, that's my point of view, maybe it's wrong but that's my point of view. That always, the immigrants, someone who came here, didn't was born here, the qualification maybe are better than the English one but still it's not English paper is Polish, Lithunanian, Russian, so the English…I'm not saying that, because maybe the English don't know, the English employer don't know on which level that training was, and it could be much, much better than the English one. But still, they need English paper. [F, Polish, Female, 30-35]

Ela talked about Britain optimistically, explaining that you can achieve what you want, there are more opportunities here compared to her country of origin but not in the factory where 'it's more production, more demand, less money…kind of like slavery.' Ela describes similar feelings of being devalued as a migrant worker:

> Ela: They make us feel stupid. I mean lots of us have had good education as well whether we're from Turkey or from Romania, we've finished university and stuff and when we come over here they think we don't speak English or we don't understand because we're from a different part of European Union. And they usually think this way, oh I'll just give them, like if we complain about it they'll just give us-, my

> boyfriend said last shift, because we had written a questionnaire to say like ‘are you happy at your work?’ and all this and then people say we don’t have no motivation, we don’t have no pay rise, we don’t have any experienced people on our line, we’re doing two jobs- so everybody wrote something in that company questionnaire. And then afterwards they suggested to give us fish and chips for motivation…Fish and chips for motivation, which everybody’s laughing and saying ‘are you joking with me? Fish and chips? I want a pay rise. I want, I don’t know, some kind of bonuses!’ [F, Middle-Eastern, Female, 30-35]

Ida talked about her experiences as a trainee supervisor for a year and a half during which she carried out the duties of a supervisor without the full additional pay. Her story is grounded in her position in the workplace as a female immigrant:

> Ida: First I was working on one of the lines and then I quit because I didn’t get a contract so I quit and then just before I was pregnant with [child] so five years ago, and then they want to give me contract but because I was pregnant, so you know how it is, ok so maybe we would take someone else…so I also said no thank you, I will stay on my line, I will do my job and go to home without any responsibility, yeh.
>
> *Interviewer: So you got the supervisory role for just a short period of time before you were pregnant, and then after you were pregnant they couldn’t give you the contract.*
>
> Ida: No because then they found other person, which one was already work there.
>
> *Interviewer: Do you think that was because they didn’t want to pay the maternity and things or-?*

> Ida: All in all if I would have contract you are getting statutory maternity, so for them it doesn't make any difference I think in the money, no, it doesn't. So it just, it just the problem with covering me, yeh? So they want to take straight away other person which will be prepared when I will be leaving soon so he can cover me. [F, Polish, Female, 30-45]

As a pregnant woman, who also happens to be an immigrant, Ida faced multiple obstacles to progressing a single step in the factory's hierarchy. Having been worn down by the additional stress of the supervisor role while being paid for a 'training position' for a year and a half, Ida simply agreed when told that because she was pregnant, that the contract would go to someone else- a male. Ida explains that it was a straightforward choice in deciding whether she or her husband would take care of the children at that point:

> Ida: It was simple to choose who is stay at home [laughs]. When after ten years you got £7.66 for an hour. And [husband] for start, he's got £8, for start in new company. So it was simple to choose who will stay home. [F, Polish, Female, 30-35]

Jacqui (K) explained that she is almost always the only female, ethnic minority under the age of 40 (age is a differentiation relevant to this study but beyond scope) in meetings with senior colleagues in her technology related job, where there continues to be a shortage of women (Wajcman, 2016). In Jacqui's talk about these meetings, she noted a sense of not belonging in the meeting. Experiences of social divisions are perceived through a form of self-doubt, shaped to a large extent by those very social divisions that make it more difficult to 'fit in.'

Jacqui: I think I'm quite lucky as I have diversity on my side. So as a woman, as someone who isn't white, I think sometimes I might have gotten selected because actually I help with the diversity statistics…I think people like me, for the skills as well, but maybe they look at, oh it's a woman and in this sector, we don't have a woman so that sort of helps. And I don't mind playing the game a bit to my own advantage…

Interviewer: Can you describe times when you've used it?

Jacqui: I sort of use it to cover up my lack of experience sometimes. So, when I go to meetings with stakeholders, very often I'm the only woman in the room and definitely I'm the youngest in the room if I'm not the only woman. And I do have a bit of a confidence issues sometimes. So sometimes if I don't feel like I'm sure of a subject I kind of use the whole, I'm quite new to this, I'm a girl, sort of thing to my advantage so the men don't, I don't feel like I'm, I don't know how to articulate this, sometimes I don't feel like I'm qualified enough in the room so I used that sometimes to cover up.

Interviewer: Are you qualified enough to be in the room?

Jacqui: It's more my self-doubt than anything else. The diversity thing is more like a comfort blanket for me […] It gives me a reason to be there almost. Without feeling like I don't belong, if that makes sense….Well it's generally middle-aged white men…So, and I could probably go into the room and explain that I'm new to the meeting, they could probably just explain to me but I feel like I need a reason and the reason is that I don't quite belong there and I use all the aspects of myself to articulate why I don't quite belong there to get those explanations. [K, British-Chinese, female, 35-40]

Jacqui describes a complex social interaction that takes place regularly in her work which requires her to acknowledge, accept and act on the multiple, interacting social divisions that she feels explicitly mark her as an outsider. She describes playing the 'game' and using 'diversity' as both a comfort and a strategic tool to gather information from the older, white males in the room more easily, enabling her to do her job better.

Radtha (F) said that those who worked hard enough could achieve their goals in the UK. Structural obstacles that she herself faced, for example as a working class first generation immigrant who had her education cut short due to financial difficulties, with perceived lack of English language skills and the large scale changes to the labour market including the offshoring of work that she had previously undertaken, were not reflected in her views. This echoes Mijs's (2022) finding of the meritocracy paradox in countries with high levels of income inequality. Instead Radtha explained that she was not motivated to 'climb higher' because of the fears of extra pressure. However, she said that if someone else wanted to, they could do so. This 'self-elimination' is arguably a symptom of structural obstacles (Bourdieu, 1977; Friedman and Laurinson, 2019) internalized and articulated solely as an act of individual agency.

4.3.2 Intersections of ethnicity and immigrant background

Male workers from ethnic minority groups described a sense of holding themselves back (as distinct from and in addition to being held back). Antar (K) says 'there's been part of me that's always held myself back' to account, to some extent, for remaining in the same job for longer than he would have expected without securing a promotion. Importantly, this follows his description of finding out about widespread discrimination in the organization for which he has worked for most of his working life:

> Antar: But I've seen enough within the organisation I work in where there've been revealed to be systemic issues where people for example from ethnic minorities were getting, for years and years, were getting lower appraisal ratings at every job grade and people just weren't paying attention to the issue. And these are all people, I've never directly felt direct discrimination against myself in that organisation but when you look at it across the board, there are definitely problems there. And they just weren't confronting it for so long and the fact that can happen in an organisation of intelligent, generally kind and generally socially liberal people makes me think that unless you pay a lot of attention, quite a lot of activity and action behind, that it's very difficult to change that.[K, British Asian, male, 35-40]

Following this, Antar explains that although he has not directly experienced racial discrimination, he does find himself wondering in hindsight if he has missed opportunities because of his ethnicity:

> Antar: There is a bit of me that sometimes wonders whether ethnicity has something to do with it. And that thought is planted there because of those other issues like the systemic ones I mentioned about the organisation ignoring the things about…that widespread systemic problem. .[K, British Asian, male, 35-40]

Antar then describes how he feels 'slightly apart' from the majority, perhaps, he says, due to his 'immigrant background' rather than his ethnicity.

> Antar: There are some things where it's not so much about race but I think my cultural background has made me act differently to other

people. And there are plenty of situations in which I've felt slightly apart from everyone else in conversations that have happened in the workplace because they all had, well I had what I consider a very middle class upbringing in the sense I went to private school, parents own their own house, dad's run his own business, but my parents' upbringing was very working class, they've been the mobile, moved up, socially mobile people. So aspects in the way I was raised, also linked to the fact my grandparents were immigrants and were learning things from scratch, the way these things, just my comfort and my familiarity with some many things that people treat as really normal is very different, so my ability to interact in some of those situations is quite different. And that is, I don't know, I'd be ridiculous if I call myself working class, but aspects of my upbringing were, I don't know if they were working class immigrant, being immigrant background.

Interviewer: Compared to being British working class is it?

Antar: Yeh, yeh, those things mean I don't know, it's hard interacting in those situations so it's not, I don't think my interactions with senior people have been the same as my interactions in team settings. People going to like dinner parties and things and the way they talk to each other, it's a completely alien thing to me …the foods that people eat in those situations for example or things I've only come to know, like people take as really normal those expectations that I have to actively learn, oh these are foods that you would buy, those sorts of things, really, so I think that sense, felt quite different, being apart from something. It's not that those things are defining, things that define your career prospects but they are things that help and make you feel part of a group, that make you feel more comfortable in, and allows you to participate actively within that context. [K, British Asian, male, 35-40]

Antar's description of feeling 'apart from something', the sense of not quite belonging and feeling held back or holding oneself back within a specific work context could be described as a form of symbolic violence (Bourdieu, 1984) that is also expressed vividly by first generation migrants in the factory case. For Antar, his cultural background as a third generation immigrant and the notion of 'learning from scratch' the things that those around him in the workplace 'take for granted' create a subtle disturbance in his capacity to identify with the majority (non-immigrant background) colleagues. Applying Bourdiesian concepts, this could be described as a disjuncture between field and habitus (Bourdieu, 1984). The sense of ease and confidence with which a worker can navigate the workplace (the field) is shaped by their habitus:

> 'which restores to the agent a generating, unifying, constructing, classifying power, while recalling that this capacity to construct social reality, itself socially constructed, is not that of a transcendental subject but of a socialized body, investing in its practice socially constructed organizing principles that are acquired in the course of a situated and dated social experience.' (Bourdieu, 1997, 2000: 136)

Antar's awareness of systemic discrimination against ethnic minorities, the undeniable data showing systemic unfairness creates and maintains a division in his workplace. The weight of ethnicity with its implications for his identity and treatment within racialized capitalism (Virdee, 2019) is added to Antar's effort of labour. The existence of racial divisions, in addition to Antar's 'immigrant background' which also divides him from the majority creates an extra layer of burden at work.

Alabi (K) describes ways in which he attempts to proactively negotiate that weight of ethnicity in workplaces. Alabi discusses the many ways he does not have the luxury of 'fitting in' (Freidman and Laurison, 2019) within his senior corporate social groups. However, ethnicity is a factor for which he has perceived traps and threats to success within the workplace.

> Alabi: I've got this theory, and I've had it in my jobs, if you're black you must never, ever, ever dance at the Christmas party. Ever. […] As my career's grown, I think perception's everything. I think people make a judgement of you within the first minute. And I, my theory is this, if you're a person of colour, it's different for Asians than black people. If you're black, don't dance at the Christmas party because it demeans you subconsciously. So I think, I was doing really well at an agency and then I got drunk and I danced, nothing bad, and I'm quite a good dancer, and I always remember my boss looking at me differently, going 'oh my god.' And I have this thing that, you've got the job because they've forgotten you're black. Seriously.
>
> *Interviewer: They've forgotten you're black?*
>
> Alabi: Yeh. You're Asian. And then there's Asians. And on an individual basis you're alright because at the end of the day, academically you seem sound, and this is a bit of a bonus, you've got a foreign sounding name and you're ethnic. So you're as, that's a tick box, at the same time you're doing a good job. But at the same time, their perception of the majority is very different to their perception of you. So I think, once you show that, it reminds them that you are black. I used to say to [wife] that if there's a, [wife] thinks I've gone crazy, if you're out and there's a department and there's a few black and ethnic people in there, at no point in that meeting or that social outing should three of you stand alone. Two is ok, you can get away with that if you have limited time, but three of you in a huddle in a corner [clicks fingers] that's trouble. So… [laughs] […] Oh it's so subtle everywhere…[] we all went to a karaoke night. And everyone assumed I can sing. Course I

can't sing. But they assume I'll sound like Barry White, we all sound like Barry White, right?

Interviewer: Didn't you call people out to it?

Alabi: Why do you think I've been successful? This is the thing, calling out destroys you, you become pariah. And also no one would really believe you. There's a girl from marketing at [large media organisation]. She went out with two Asian girls, a black girl and a mixed race girl. And that day she came to me and said, 'honestly, it's so weird, I was the only white person there, it was so weird, we all went out and it just dawned on me that I was the only white person there'. I said to her, that is weird. Every day of my fucking life is like that. She said 'what do you mean?' I said, 'look around you. Look, and I showed her my calendar, look at my meetings, I said how many people of colour in that meeting?' And she went red and she went, 'ooooh- but it's not the same.' [K, British Black, Male, 40-45]

Alabi considers his silence when he experienced racial prejudice to have helped his career. He talks about having experienced both direct and indirect racism in his working life. He must carry out the tasks of his job whilst simultaneously managing the actualities of being differentiated through the maintenance of racial divisions. However, it becomes to some extent a part of his performance at work, the role he plays to carry out his labour. This is in some regards, a necessary performance (Goffman, 1959) of 'whiteness' (Virdee, 2019) by an ethnic minority from a working class background who plays the field of a majority white, middle class workplace (Bourdieu, 1984). For example, Alabi explains that the person he replaced in his current job was different to him: 'he is very posh, very English, very well spoken.' And he felt that his new colleagues questioned how he could be replacing someone so different from him.

The experience of deep acting and alienation described by Hochschild (1979) and Marx (1844, 1992) as discussed in Chapter Two, could be applied to the management of emotion required to quietly register racism in work, or to carry the burden of its possibility. Alabi describes doing so without calling it out, which is a form of deep acting as a result of coercion (fear of being 'pariah' and have fewer opportunities in the field) and an instance of alienation from the product of labour (in this case, the product of labour is the acted 'whiteness' and managed emotions). In Chapter Two, I mentioned Bourdieu's use of the word 'pariah' to describe the social position of some ethnic minorities (1997, 2000: 241).

Workers' at the intersections of social divisions talk about explicitly or implicitly managing everyday racism or other forms of differentiation through a performance outside themselves to carry out their work, in addition to the actual tasks required in their work. These experiences, suppress potential and erode a sense of agency in working lives. This interacts with the type of autonomy workers enjoy, which I use as a proxy for class and is the theme that I will now move on to discuss.

4.4 Workers' talk of autonomy and control mechanisms

This section considers the workers' talk about autonomy and control in their everyday working lives, discussed in Chapter Two. Each worker was asked the extent to which they felt they had influence over the way they work, how much flexibility and freedom they have at work. As well as indicating class, the talk about control and autonomy communicates perceived capacity to act independently and to influence change (Dearman, 2005). The talk about control highlights the equivocal relationship between management control and worker autonomy. While the factory workers experience being controlled to the extent that they are unable to take toilet breaks without permission and cover for their place on the line, the knowledge and AI workers in the least senior positions experience masked forms of control while talking of their freedoms.

> ‘By giving our staff unlimited time to sort out any issues with their homes or personal lives, it means when they do come to work their mind is unburdened and they’re ready to focus…And by having the freedom to deal with the life stuff, which can frankly be complicated, they begin to associate work as an enjoyable place to be, where they perform at their best and have the freedom to be completely creative.’ Dean Hall, CEO of gaming company Rocketwerkz, New Zealand (Guardian, 19th February 2017)

The quote above captures the ‘struggle to control’ (Watson, 2012: 156) the worker in a progressive and technologically creative industry within a developed capitalist society. The need for control arises from the variability of human labour power (Marx, 1930). Braverman (1974) argued that capitalism in the twentieth century used Taylorian methods of scientific management to control workers. The spectrum of control measures goes some way to illustrate the unequal status and conditions of workers, itself a symptom on an unequal society.

As control strategies are attempts to exert influence or direct the behaviour of workers to increase productivity, workers who experience better job opportunities may be more likely to choose jobs within businesses which mask their controlling efforts in acts of managerial kindness and understanding. Friedman (1977) labelled these efforts as ‘responsible autonomy strategy’ in which the variability of the worker is harnessed for the managers’ ends through a mixture of overt manipulation and distraction from problems that may otherwise result in resistance. The extreme flexibility offered at the gaming company is at one end of the control strategy spectrum with factory workers today still likely to experience more ‘direct control’ strategies of close supervision, discipline and the threat of replacement.

Despite the chasm between those workers experiencing opposite ends of the control strategy spectrum, the purpose of control strategies remains largely the same today as for capitalists observed by Marx: to deliver profits and the survival of that organisation (and in doing so to some extent, protecting and creating jobs on which those workers depend).

4.4.1 Factory workers' talk of control

The contrast in control mechanisms between the factory case and the other two cases is stark, as would be expected. The factory workers talk about experiencing very little variety. Some described making the same product every day for ten hours, although having a slight variation in task due to the risk of Repetitive Strain Injury (RSI). The sources of variation are in product (if workers are moved to different areas of the factory) and in the colleagues who change frequently due to the use of agency staff. The change in product is important as some workers describe having to manage the boredom and a change creates some form of interest and stimulation. In contrast, amongst the knowledge and AI workers, variety is a highly prized aspect of their jobs. Day-to-day administration is considered the most repetitive task.

The factory workers do not experience influence over the way that they work. Instead, they talk about their speed of work being controlled by the speed of the line, itself controlled by managers are business decisions to increase quantity over quality:

> *Interviewer: Does the machine regulate how fast you go or do you control the machine at the moment?*
>
> Cat: I think it's all done on one, I think the manager or supervisor of the line sets the speed and then everything goes at the speed it could

go. But it goes as fast as they could possibly get it to go without it breaking or causing problems.

Interviewer: Does it ever go too fast?

Cat: Our line goes too fast, [other] line goes a little bit fast and if you struggle they don't really help you, they just go faster, it's nothing they slow down for one person or even the line, like [name] isn't experienced and it goes too fast for her and everyone on [other] line have been complaining about the speed of their line. I think they get bonuses for getting the work out, if you can get all of your work out, the supervisors and the managers get bonuses so they're more concerned about that than watching people struggle because they don't even help on the line. [F, British White, female, 40-45]

Ela links management techniques to control workers (Friedman, 1977; Edwards, 1979, 1994) to the devaluing of 'immigrants' or non-English speaking workers. However, similar levels of frustration, particularly with the lack of care and respect of workers and treatment 'like a machine' (Ela; Radtha) were shared by workers who were not migrants. It should be noted here that none of the workers in the other cases expressed such high levels frustration with their treatment at work and the experience of the work itself (except for instances of perceived discrimination). This points to the class inequalities in the experiences of work. The talk of factory work is far more tightly woven with talk of the machines at work (discussed in 4.5 below) than either of the other cases. Importantly, the machines are not talked about as a controlling force – it is the higher echelons of managers and owners whose decisions drive workers 'barmy' (Patricia, K). The factory workers do not expect autonomy or freedom but they do value 'being left to it' once they know what they are doing.

4.4.2 Knowledge and AI workers' talk about autonomy

Amongst the knowledge and AI workers, experiencing a high level of autonomy is expected:

> Malik: I enjoy good autonomy now, I think I couldn't go back to a job that required me to be somewhere nine to five Monday to Friday. So that's gone now for me, that I imagine is going to be more and more, I want to be able to work from a café in Barcelona relatively easily, I think I can do a lot of my work like that now. [AI, British/Middle-Eastern, male, 25-30]

However, Malik also introduces the line between complete autonomy and surveillance:

> *Interviewer: How much influence you have over the way that you work? For example, in the tasks that you're doing and the order you do them in.*
>
> Malik: Pretty much 100% autonomy.
>
> *Interviewer: Is that about right for you?*
>
> Malik: Yeh, absolutely, I couldn't do it any other way.
>
> *Interviewer: And how do you feel currently about the level of supervision or management that you have?*
>
> Malik: Interesting and probably it's currently ok, it's fine but I can see a world where it gets slightly too intrusive.
>
> *Interviewer: What do you mean you can see a world in, you mean it doesn't happen-*

Malik: Well, so I'm starting to see systems where the employees are very much tasked, tracked by their task and you can see what they're doing today, in a day, you know, how well they've done the task. All very efficiently and so, it doesn't necessarily allow for, um, moments that aren't necessarily deemed as highly productive but are really important. So if, a system might say that you know, you are 80% productive whereas it might not count for stuff that it does not anticipate as productive use. Does that make sense?

Interviewer: I guess you're talking in a way about what technology enables for a manger to get, kind of technology enabled management rather than management of a person, themselves.

Malik: Exactly, yeh, yeh that's right.

Interviewer: Ok you're seeing more systems becoming like, not necessarily surveillance but-

Malik: Yeh well, it can be if you want it to be.

[AI, British/Middle-Eastern, male, 25-30]

William, who is a co-founder and CEO of a machine intelligence related start-up describes the processes of managing his team:

William: Everything is projects based, we have projects are opened or closed. If projects are open, anyone can work on them. If they're closed, you're not allowed to work on them. Then we just generally decide as a team which projects to have open and which ones to close. Generally, MD is in charge of that then I'm more in charge of what the overall objectives for the year are. So objectives for the year are to grow our revenue.

Interviewer: When you say the word 'project' can you just describe what that entails because obviously a project can mean so many different things.

William: It's really important. In front of me I've got the GDPR project so we use software called Osana, don't know if you're aware of it, anyway, on the GDPR project open in front of me it's got various headings, it's got the first one, which is the objectives which is basically before 25th of May we need to be GDPR compliant, useful examples, reading, compliance checklist and then it's got a backlog. So everything is ticket based. Then I've basically got technical and non-technical back logs of my project of work to be done and then in those are just long lines of tickets. […]… And then there's a long list of things do be done, generally they're in order of priority so when a project is open, people can look at it and go, oh, as [own company] I want to formally assign a data protection officer, I'll do that, and someone can just take it and work on it, if they say 'I'm working on this' and then they put it up for review.

Interviewer: Cool, I get it, so it's, in one way a project incorporates the whole goal of- project means project but it's also a physical thing in the computer where anyone can access it and know what's going on, like a project management tool as well. And it could be anything, that's a GDPR one but it could be to do with a customer support thing or if there's a problem in the business it could be that.

William: So current open projects are bugs and open customer support, marketing, SEO, email marketing, people and HR, admin…[AI, British White, male, 30-35]

William describes a project management tool that enables visibility (towards Malik's vision of surveillance) of the work is a form of control which also allows a sense of autonomy as the workers can exert agency in their choice of work from a set of possible options.

Another important form of masked control in the knowledge worker case is the process of promotions and pay increases: gaining recognition in a workplace in which a worker perceives themselves to be an outsider. The knowledge workers talked about the hierarchy systems within their organization, such as appraisals, in terms of their perceived opportunities at work. Some workers talked about having stayed in a position for 'too long' (Antar, Catherine, Will, Jacqui), reflecting a desire for progression within the pre-existing structures of hierarchy. This is a key feature of playing the game of progression by earning recognition from managers at work- a crucial means of controlling workers' agency in autonomous positions. That is, while the workers describe being free to decide how they go about their given tasks, they nonetheless must deliver that work to a certain quality by a certain time. Beyond this, the workers must negotiate the systems of recognition that exist in their workplaces to increase their social position (Bourdieu, 1984). In playing that game, those with more capitals are in a position of advantage. Those who perceive themselves to be outsiders, existing at the intersection of social divisions, experience reduced agency in that game of building and deploying capital in their working lives. Interactions with machines at work, intelligent or otherwise, have a noticeable influence on those experiences and the capacity to play the game (Bourdieu, 1984), as the next section will explore.

4.5 Workers' talk of machines at work

At the start of this chapter, Figure 4-1 set out the different tasks carried out by workers in the group. The variety in tasks lead to contrasts in the types of interactions with technology. Following this breakdown of tasks a number of themes emerged in the workers' talk of machines in the working present. The first theme is about the human-machine working relationships in workplaces, which indicates varying working conditions and levels of agency in the development, implementation and use of technology. There is the physicality of technology alongside the human body in the factory workers' talk. There is also the talk of technology at work as tools in the knowledge worker case, with opportunity for small but significant improvements to work. The AI workers' talk shows a relatively increased level of agency in terms of working with technology.

4.5.1 The human and machine body

> Radtha: Machine teaching the people [be] like machine. That's all.
>
> *Interviewer: So you think the machine can only teach people how to be a machine?*
>
> Radtha: Machine. Yeh. That's why, no help people, the machine. Da-da-da- it go faster, we go faster. [F, Asian, female, 60-65]

Perfectly working machines and robots in her workplace would, Radtha thinks, lead directly to more job losses for workers, with little hope of finding other work as that too would be covered by machines. This recalls Marx's language on the relationship between the worker and production:

> 'It replaces labour by machines, but it casts some of the workers back into barbarous forms of labour and turns others into machines.' (Marx, 1844, 1974, 1992: 325)

When the factory workers talk about their work, their talk is full of machines. They describe large, loud machines that break down regularly which require the workers to work harder, under more time pressure to make up for it. They also describe seeing new automating machines replacing people. As mentioned above, the factory workers often talked about being disrespected at work. The notion of human workers as machines is useful to explore the more negative constructions of the human and machine body at work. The descriptions of tasks undertaken by the factory workers show how they are required to work in unison with the machines and with colleagues, quickly and repeatedly:

> Patricia: We have an automated skillet machine what puts skillets down. That came in, what four month ago, no not even that long, they'd been on about it, it's in the middle of the line, the lines aren't that big, you've got all these people, they're stood like this [gestures standing squashed] 'cause they've got skillet machine, press that button, turn that switch, easy. You're working on two sides, right, two sides of the line you're working, so you've got [product] coming this side [more product] coming other side, skillet machine's in the middle. It gives you one skillet and you've got two lines, so you've got to seal it [] if you don't feed it, because you don't always, it stops mid-way or it chucks them all out together, and you've got to be quick, quick skillets [gestures], do it, and you've got to pick your cakes up before the skillets, and the skillet machine decides 'I'm not working!', you've had it! [F, British White, female, 50-55]

The talk about factory work is also full of gestures, movement, and the body language the workers describe using to communicate with non-English speaking agency staff. This pertains to the physical nature of the work and the relationship with the machines. In Patricia's description of the skillet machine, not only are the human tasks transformed, the workers are squashed together around machines that, at times, 'decide' not to work, which means the workers have the extra task of being prepared for the machine to fail. Much of the health and safety initiatives – focusing on physical health, relates to the use of machinery. At the same time, the factory workers talk about a lack of training, asking colleagues for help with machines and having to train new agency staff themselves. For example, Ela talks about setting up a machine herself rather than waiting for an engineer to avoid delaying the work:

> *Interviewer: Do you feel like you have choices in the way that you do your work or how quickly?*
>
> Ela: Sometimes I feel like no, I don't have choices because sometimes the machine you have to set it up and all this and it's not my job to do that, so I feel like you know.
>
> *Interviewer: Whose job is it?*
>
> Ela: Whose job is it? They usually get an engineer who works for the machine to you know set them up because every product has different boxes so that needs to be set up differently so- sometimes you have to it and you don't really have the experience as much as they have so
>
> *Interviewer: Ok have you had to do it yourself before?*
>
> Ela: Yeh, I had to do it myself.
>
> *Interviewer: Do you remember why you had to do it rather than the engineer?*
>
> Ela: Because there wasn't any engineer at the time available so
>
> *Interviewer: Did you have training to do that?*
>
> Ela: Training, not really, no training at all, kind of see how they do it and then get used to it.
>
> *Interviewer: I see, is that sort of expected of you or is that just a one-off, is it something that's part of your job?*

> Ela: No it’s not expected, you could call your [supervisor] in charge there and they will get somebody sometimes or they will help you set it up together.
>
> *Interviewer: In that situation where you did it yourself, was there some reason you chose to do it rather than asking somebody?*
>
> Ela: Yes, when they’re busy, when your mantec or manager, when they’re busy you can’t really talk to them and you go, you know what I’ll do it myself, it kind of makes you, you know, they’re not available and the products are coming, they’re like rushing all the time, when they’re rushing you just kind of think, you make the choice of yourself doing it instead of getting someone. (F, British/Middle-Eastern, female 30-35)

Importantly, Ela talks about taking on the task of an engineer in response to a question about control at work. This highlights a nuance in the relationship between machine and worker. Rather than suggesting that the machine controls her work, Ela instead says that she feels she has ‘no choice’ because the machine she uses is set up by someone else. Even though she is able to step beyond her assigned tasks and set up a machine sometimes, Ela talks about the interaction in disempowering terms. The fact that it is someone else’s job (someone who is paid more) to set up the machine creates a disjuncture in the relationship with that machine. While Ela is able to set up the machine herself, she only does so when the alternative is to stop working while she waits for the engineer. In this instance, Ela allows a blurring of her tasks partly due to the pace of work but also because she has the capacity to set up the machine herself- the machine therefore offers a small opportunity to increase her sense of control over her work.

4.5.2 Relationships with technology at work

Before moving ahead to the next chapter which focuses on working futures, this final section about past and present experiences of work indicates how past experiences of technology shape expectations and imaginings. This is particularly the case amongst factory workers who have already observed and experienced work with machines that automate tasks. In contrast, the knowledge and AI workers talk about technology to enhance their capabilities. Patricia, from the factory group, describes having worked with a robot.

> Patricia: I have worked with a robot in cheese factory, that was fun.
>
> *Interviewer: Have you?*
>
> Patricia: Oh yeh!
>
> *Interviewer: Go on, tell me a bit about that before we have to end.*
>
> Patricia: Basically it was, it was just like a robot, in the cheese factory they have like big blocks of cheese and they are quite heavy, very heavy. They [had] this robot with two arms, and all it does, it's in a cage and it's supposed to pick the cheese up and put it on the line to save the person doing it, 'cause it's back breaking. And it's supposed to pick it up and put it on the line. Well, it was comical. The robot decided it was having a bad day, I'm sure it did. 'Cause it picked this cheese up and it's not supposed to go over the top, and all of a sudden this lump of cheese comes flying out the cage, and we just stood there looking at it, and the robot's got its arms up here [gestures, both arms up high] and the cheese is over there [points metres away], we're saying 'it's not supposed to do that!' 'Nope!' Then it put its arms back down, picked the cheese up, turned round and put it on the belt and just carried on.
>
> *Interviewer: Like nothing happened!*

Patricia: Yeh! Just carried on. And we're thinking, it's not supposed to do that…lucky somebody didn't get hurt, but it was so funny. That's the only robot I've ever worked with [F, British White, female, 60-65].

The factory workers have seen new automating machines implemented and workers replaced. However, perceptions of those machines vary from those who see them as useful tools to make their lives easier (Sonya, who enjoys technology in and out of work) and those who see them as forms of progress which fail, repeatedly:

Patricia: It's automated skillets but you have to put the fruit in and then when it goes down it's basically automated. So you've got ten people there at the bottom just in case it clonks out, because it's not supposed to run constantly, and it gets blocked and then it chucks them all over the floor. Yeh basically what it's already about, we have a few in there what's got automated stuff in it. But to me if you don't get it right first time, why keep trying, line [] is a [cake product] line, it was automated that was, did its own skillets, own sugar white, we've still got ten packers but they're computer packers, still got somebody to pack 'em but it's computerised.

Interviewer: So it's like a touch screen?

Patricia: Yeh. So you haven't got a skillet thing at the top anymore because it broke and either they couldn't be bothered to fix it or it wasn't working. It's a constant line but skillets are like this [gestures constant movement] all the time but it wasn't, you were getting big gaps where there were no skillets...

Interviewer: So there are humans back doing it now?

Patricia: Yeh. Same with the sugar white. The sugar white machine what they had used to [sieve] sugar white but you had to keep

> banging it on the side for the sugar white to go down. Then you had to keep doing it and they got that fed up, or it broke down, I don't know. The next time I went there was somebody stood there with a sieve [gestures sieving side to side action], [F, British-White, female, 50-55]

The implementation of new technology in the workplace, which is perceived to be replacing human workers only to then be replaced by humans, is talked about with humour rather than as a threat or an opportunity for workers. For Patricia, expectations of what technology can realistically do to help her in the factory setting are limited. This contrasts with the talk in the AI and knowledge groups, where the technology is much smaller and sometimes even unnoticeable.

The technology talked about by the AI and Knowledge groups are software such as email and Microsoft Office. The physical machines in these cases were limited to mobile phone and laptops. Broadly, the workers talk about these technologies as everyday, simple tools, as though they are too basic to mention:

> *Interviewer: Could you describe in your current job whether you use any technology and how you use it?*
>
> Catherine: Only really in the most basic way in terms of having a laptop, using a phone and a mobile and in terms of on my computer the things that I use are the really basic things, like email and um, you know word documents and the occasional spreadsheet. So nothing more kind of complicated than that really. I guess we use Skype for calls, that's one element but it feels quite low tech I would say.
>
> [K, British White; female, 30-45]

Catherine's 'low tech' judgement is based on her knowledge of more advanced, useful technology that is currently not being used consistently in her workplace. She describes a resistance amongst some of her colleagues to use Skype and filesharing (worth noting this was pre-Covid 19, as discussed in Chapter One), which she says has 'definitely improved and changed in my working life'. However, she finds that others' working practices have not developed at the same pace which leads to missed opportunities to work better:

> *Interviewer: Do you mean that some people's working practices haven't evolved?*
>
> Catherine: Yeh, so say for example, like really basic example would be like some people in my team don't like using Skype… so then you'd have to use conference call details. So in my mind, yeh you can have glitches on Skype but at the same time it's so much better for a call because you can share a screen, you can see who's on the call easily, there's something about accountability, and you know kind of communication that's made easier. But some people, I guess older people in my team, are less keen to use those things.
>
> *Interviewer: What's your view on the reasons why they might be less keen?*
>
> Catherine: They're just kind of like, a bit set in their ways and they sort of think a dial in works fine so why change it. And really basic stuff like they haven't bothered to, not everyone is issued with a Skype headset so therefore, they haven't bothered to get one or keep one, and I dunno, the potential to even use what we've got at the moment is greater. And I think more collaboration in terms of documents and things like that. Which I think we still work in a quite, everybody

sending around different versions of something, attached to an email…I just think there's like, something needs to change about what basic expectations are of everybody at work in order to ensure to effectively even use what we've got.

Interviewer: Would you say it's about age, you mentioned at the start about age, do you think it has an impact on people's ability to use this or do things?

Catherine: Yeh, age or attitude, I mean, yeh the people I am thinking of are older so maybe there is something in that. But then equally I wouldn't wanna say that as a blanket generalization because then there's plenty of people who embrace what we've got.

Interviewer: What is it about the attitude?

Catherine: I don't know. It's just that not wanting to change necessarily, not wanting, the expectation's not been set consistently enough and them not feeling incentivized you know to do it differently. So I think there is just something about companies baselining basic expectations of how everybody should work …[…]… I think if that was more clearly set out and there were consequences of not doing it then I think that would stick a bit better. [K, British White, female, 30-35]

Reminiscent of Antonia's (K) talk about strong managers having to lead their teams into working better with people from a variety of backgrounds, Catherine puts the responsibility for evolving work practices to take advantage of available technology with managers. Catherine suggests that those who seem less willing to embrace work technologies require more motivation to do take up those opportunities.

Jacqui (K) talks about the rules about installing any software on her work computer. In contrast, those in the AI case have more opportunity to implement tools that may help them if they wish, and some workers are able to contribute to the building of those tools. However, AI workers were often not using tools that automated as there was a sense that those products were not quite good enough yet. In the knowledge case, there is awareness of AI automation tools that could be useful and there is the potential to learn about them to improve the quality of their work (Autor, 2015).

In summary, the different relationships between workers and machines indicate different levels of control in work, which in this thesis is taken as a proxy for class. The factory workers are more obviously impacted physically (controlled) by the machines they work with and have the least agency as they have no choice but to work with the machines to complete their tasks. For knowledge workers, there is a sense of agency as workers seem to have a choice in the extent to which they use some technologies but at the same time, as with the factory workers, other tools are essential to their work (email and Office products, for example). However, the relationships between knowledge workers and the tools that enable them to answer questions more accurately or 'ask better ones' using technology as a collaborator, are also significant in their cyborg potential (Haraway, 1985). Finally, AI workers are closest to technology and talk about automating themselves out of work as part of their everyday work, which allows them to focus their efforts of less-automatable work. While they are more likely to be aware of the third-party technologies that are available to them, they talked about the disappointing quality of those at the moment.

These differences in relationships with machines at work, as well as the other aspects of agency discussed in this chapter form the basis of the different modes of working futures alongside machine intelligence, which will be discussed in the next chapter.

4.6 Conclusion

This chapter has answered the first part of the research question through its focus on past and present experiences of work:

1. How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?
    a) How do workers perceive their working conditions, control and their social position in the workplace?

The chapter began by reinforcing the importance of an analytical approach that can account for the fluidity of temporal zones (working past, present and futures). In workers' talk of their past and present, we are informed of the habitus as discussed in Chapter Two, through which dispositions are 'adjusted' according to social position:

> 'In differentiated societies themselves, a whole series of social mechanisms tend to ensure the adjustment of disposition to position, thereby offering those who benefit from them an enchanted (or mystified) experience of the social world.' (Bourdieu, 2000: 147)

The next two chapters will look forwards, putting the sociotechnical imagination into practice, as developed in Chapter Two, by analysing workers' imaginings about their own personal machine intelligence-laden working futures and then in Chapter Six more generally, for other workers. The themes of agency in the present influence orientations towards those working futures.

This chapter has discussed the significance of work in workers' talk, drawing out the class-based differences in the sources of value and the amount of control in work. It has interrogated the workers' talk about education and the opportunity to act on opportunity in relation to the sense of control over working trajectories. The attitudes to education at home began to highlight the position of those workers at intersections of social divisions where education is considered the opportunity to find a 'way out.' Workers' talk of perceived social divisions highlighted the resulting reduction of agency at the points of the intersections of gender, class, ethnicity and immigration history. The class-based differences in the experiences of control and autonomy, as expected and discussed in the research design found the physicality of the act of working with machines in the factory and then turns the gaze towards the unequal future with imaginings rooted in the past or present and the technology as an opportunity, for some.

This chapter has discussed how forms of agency, the ways in which workers gain or lose control over their working lives, are heavily influenced by their social position and forms of capital. The control or autonomy experienced at work is only one form, itself shaped by the opportunities perceived and taken by workers to increase their sense of control over their working lives. Those experiencing work from the intersections of gender, class, ethnicity or immigration are multiply burdened in their working lives. The sociotechnical imagination is a means to foreground the talk of workers and social inequalities, combining the sociological interest in public and private issues with the analysis of power through imaginaries of technoscience. It renders necessary the turning of the tables to see workers imaginings their working futures, rather than being characters in the imaginings of others. As such, we will now take the talk of the past and present, forward into workers' personal imagined futures with machine intelligence, and the unequal agency therein.

Chapter 5: Unequal working futures alongside machine intelligence

5.0 Introduction

The previous chapter argues that the ways in which workers gain or lose control over their working lives are heavily influenced by their social position and forms of capital. The control or autonomy experienced at work is only one form of capital, itself shaped by the opportunities perceived and taken by workers to increase their sense of control over their working lives. Those experiencing work from the intersections of gender, class, ethnicity or immigration are multiply burdened in their working lives. This chapter describes ways in which workers talked about working futures, which reflect existing social inequalities experienced in working lives and point to hierarchies in machine intelligence futures.

This chapter focuses on answering one of the sub-questions as a means to answering part of the main research question:

1. How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?
    b. What are the imagined working futures and configurations of work for workers using machine intelligence?

The sociotechnical imagination is put into practice here, seeing workers' futures alongside machine intelligence as sociological artefacts. The act of imagining and articulating futures is an act of agency for workers who are so often talked about in the futures imagined by others with more symbolic capital.

Every worker in this study was able to imagine and articulate working futures, as individuals and for society. This research found no deficit in the imagination and technological anticipation skills of workers and there is a rich resource for working futures in the perceptions of workers. However, there are significant differences in the level of agency perceived by workers in creating those working futures for themselves and others. This ranges from workers considering themselves to be contributing to technology development to workers who talk about being controlled by technology development. I recognise and conceptualise this range in perceived agency as machine intelligence capital in working lives, which is unequally distributed and intersects with race, class and gender. Those for whom technology is an opportunity to improve and gain more prestige and income, compared to those for whom technology is an obstacle, rooting them out of their jobs, adding to the sense of being undervalued in the labour market. Machine intelligence capital is a means to gain agency over working futures.

The term ‘machine intelligence’ requires consideration as it could be read as ‘intelligence’ about ‘machines’: knowledge and confidence to perceive benefits for oneself from technology that uses artificial intelligence and/or robotics. This knowledge could contribute to machine intelligence capital, both a product of, and influence on, other social inequalities explored in this thesis. The intersectional lens applied to social inequalities will also be applied to machine intelligence capital, considering whether it is a product of social inequalities and whether it leads to multiple privilege. To address this ambiguity, ‘machine intelligence’ will be used in this thesis to describe technology in the future built on artificial intelligence and/or robotics. Barriers to the mobilisation of capital (Mahbub, 2019) are likely to be present in terms of machine intelligence in those working futures.

The chapter uses the data from the latter part of the discussion guide, which asked participants how they imagine the future of work alongside machine intelligence. As discussed in the Chapter Three, one aim of the guide was to stimulate imaginings of futures, where stimulation was required. I shared broadly negative and broadly positive content about the future of work and machine intelligence as forms of stimulation. I asked participants what they would choose to do if the financial motivation for work was reduced. For example, I described a situation in which they received a Universal Basic Income (Hansard, 2016) so they did not have to work in order to have an income, separating work from money. I also shared visions of the future in which human work as we currently know it became scarce as machines became smarter and businesses invested more in technology. Change, potentials and uncertainties were primary foci as futures were positioned as ambivalent. This helped workers imagine and articulate working futures based on their own social position, which they had already talked about in the previous parts of the interview.

Some workers were more hesitant than others in imagining or articulating those futures. Both the varying levels of confidence and the reasons behind this confidence are dependent on their experiences of intersectional inequalities, proximity to machine intelligence development or machine intelligence capital and the autonomy experienced in their present working lives, itself influenced by the former two factors. The ways in which working futures are imagined are constructed through the shifting relationship between the worker, their social position and the fields in which they go about their daily working lives (Bourdieu, 1984). Bourdieu's thinking has been drawn on by Hodkinson (2008) in his theory of 'careership,' which conceptualised 'horizons for action' defining the boundaries within which we successfully envision while limiting the ability to see beyond. The 'horizons for action' are a useful frame to apply to the different orientations. Depending on the position and field of the worker, these horizons shift, increasing or decreasing visibility compared to others in different positions. Workers who are closer to machine intelligence development expressed clearer visions of longer-term working futures alongside machine intelligence without stimulation.

A further layer in the inequalities of futures can be understood through the concept of 'possible selves' through which people imagine their futures, capture both aspirations and concerns, whilst being influenced by those around them as well as by gender, class and race (Dunkel & Anthis, 2001; Markus & Nurius, 1986; Stevenson & Clegg, 2011). As discussed in the Chapter Three, technological futures, like work, is a site of inequalities because not all individuals 'are equally projective' (Emirbayer and Mische, 1998: 984).

There was a general acceptance that technology would continue to develop and change the types of work that humans carry out. Overall, definitions of perceived relevance emerged as defining factors in workers' orientation towards the future of work. For example, the most confident about working futures were those who talked about the relevance of their jobs or their ability to learn to remain relevant. Relevance is positioned in the future as it captures the expected capacity of the human worker to carry out tasks that cannot be carried out by the envisaged machine intelligence. Definitions of relevance tended to find agreement in terms of non-repetitive work that required increased physical dexterity, intuition or social relations. That is, the workers imagined 'what would be left' or sometimes 'what should be left' in futures where machine intelligence has been implemented in workplaces. For example, repetitive tasks that could be better done by computers were considered likely to be automated and that this would be an improvement for the experience of knowledge work.

Workers' approaches to the future of work fall into one of five orientations, ranging from the most to least optimistic and confident about individual perceived capacity to benefit from machine intelligence in the future of work, as set out in Figure 5-1 below.

Figure 5-1: Introducing the orientations towards working futures alongside machine intelligence

- The Creators' perceived positive working futures are shaped by their existing positions as highly autonomous workers within machine intelligence production. This groups consists of the participants in the AI worker case.
- The Adaptors currently sit outside work that directly results in the creation of machine intelligence. However, their positivity about working futures rests on their existing level of autonomy and confidence in themselves to learn and survive their vision of working futures. This group consists of four participants from the Knowledge worker case and the only male from the Factory worker case.
- The Cyborg Hobbyists envisage that they can benefit from machine intelligence in working futures where they turn existing hobbies and interests into income streams. This group consists of three participants from the Factory worker case.
- The Subsisters consider their working futures to exist in the gaps that are left once machine intelligence is used to replace human workers. This group consists of three participants from the Factory worker case.
- The Future Proof imagine that the work they currently do is largely resistant to the changes brought about by machine intelligence. This group consists of four participants from the Knowledge worker case with high levels of autonomy in present working lives.

The next section will discuss each of these groups in more detail, beginning with a discussion about the language of the future.

5.1 Future Tense

Talk about the future of work necessarily consists of a language of futures. Machine intelligence in this study acts as a bridge to multiple potential futures as well as stimulus to envision those futures. Despite the existence of machine intelligence in some form in the present, it represents unending potentials in this study. This stimulates the workers to imagine what it could become and to work temporarily in that version of the future to articulate their own working futures.

In the talk of workers envisaging their working futures, potential change is perceived as both welcome progress and as a threat, even within the talk of a single individual worker. This reflects the uncertain multiple potential routes of machine intelligence development and interaction. From the position of ‘now’, itself built up of perceptions of the past, Sonya (F) says it is important to ‘imagine, remember before.’ Traversing the temporal zones is a seamless movement, freely imagining futures and reimagining pasts. The future tense is the grammatical tool that allows for these thoughts to take shape and as such, the data shifts into ‘it will be’ and ‘it is going to be’ as the language of becoming shifts the worker into the act of envisaging. The future tense makes space in which change can be perceived, prepared for, and take shape.

Machine intelligence development is talked about by many of the participants in the AI case in terms of what it will ‘become.’ The energy in the talk of futures comes partly in the controlled movement between temporal zones, from past to near past, to now, the near future and the distant future. Creating a sense of controlled change, participants from the factory case could imagine more machines replacing workers but there was also a mid-phase of time between the present and the future in which the machines simply improved and as a result they had a better working experience. For example, if the machines could be more intelligent, the quality of the product might be higher without as much effort from the workers.

> Cat: I think, it could be adapted for each person because everybody works differently. I work differently from [colleague] and [colleague] has had a go on the packing machine and she finds it a bit more scary

> and a bit intimidating but the more practice you have it makes it better. But like height difference or speed difference would help and it all depends on the next person after you, you always have to work with the next sequence of events.
> *Interviewer: So maybe having a personalised machine which knows you a bit better?*
> Cat: Yeh so like I can work faster than [colleague] and [colleague] can work faster than me. [Colleague] panics quite a lot it would be better, more efficient, if the cakes come quicker because she likes that but the packing machine to be that little bit slower. [F, British White, female, 40-45]

This also allowed for some careful planning such as maintaining some jobs for humans such as the 'separate' work for humans as robots take the production tasks:

> Lakshmi: If it's a part [of a job], they can learn how that's working. But they have separate job, for example, a office job or something, they do office job and robot doing, like making product. But that is only a part of the factory, not whole. Human also need to work over there as well. [F, Asian, female, 35-40]

From a developer's perspective, William (AI) talks about the speed of change in terms of managing it:

> William: You've got people looking at something growing exponentially, right and you've got visionaries who sit here and go 'oh it's going to be amazing', so they massively overestimate what's going to happen in the short term and then in the long term they massively underestimate the impact of things. So AI is going to be a bit like computing, you have to ask yourself is there a virtuous circle? So

> computing has a virtuous circle where the more computing power you can get, the more productive everyone is and the more people will be investing in computers so the more people invest in technology and computers, the more productive they get...and it's, and I think machine learning and AI still has the potential for that dynamic, computers would have probably made the entire world redundant if you go back 60 years because everything's changed but it hasn't changed fast enough to make enough people redundant to make it really cause instability. [AI, British White, male, 30-35]

Ida (F) talks about how only recently the supermarkets had only human cashiers but now takes stock of the change represented by the self-checkouts. Sonya (F) compares the near past in the country she calls home with the present and talks of 'progress' as potentially 'beautiful'. She says that if humans are good then the technology developed will be good too, signaling the importance of time to enact that 'good' within technology development. That is, Sonya envisages change but it is far enough ahead, always, to manage that change for the good of humanity.

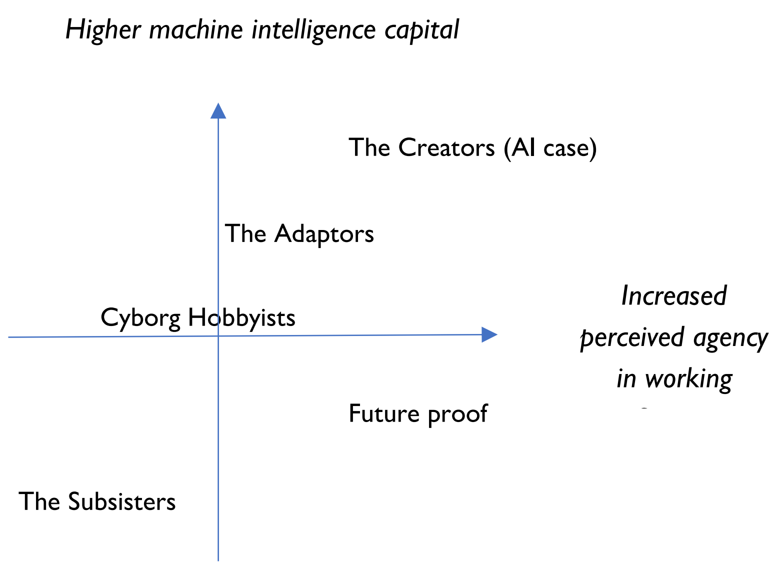
The language of the future in this study, reliant on all temporal zones, can be split into five orientations towards the future of work and machine intelligence found in my analysis. These groups can be understood as related to the proximity to machine intelligence development (or machine intelligence capital) and the agency experienced in work in the present. This chapter is structured by each of these groups in turn. The diagram below summarises the different orientations towards the future based on the level of technology capital (perceived likelihood to benefit from machine intelligence) and level of agency in work. The level of machine intelligence capital is presented here as a range 1-5, where 5 is the highest and 1 is the lowest. The orientations have been ordered by the amount of machine intelligence capital.

Table 5-1 Summary of working future orientations

Orientation	**Description**	**Number and group of Participants**	**Machine Intelligence capital range (1-5)**
Creators	Contributing to the development of automating machine intelligence; defining 'relevance' as the tasks unattainable by machine intelligence	AI: 8	5
Adaptors	Scanning futures and assessing skills gaps, confident in ability to train to remain relevant	Factory: 1 Knowledge: 4	4
Cyborg Hobbyists	Envisaging machine intelligence as beneficial and imagining potential to turn hobbies into work, making the technology relevant to their interests	Factory: 3	3
Future-Proof	Knowledge workers who perceive little risk to their current roles as it exists, high level of confidence in remaining relevant	Knowledge: 4	2
The Subsisters	Factory workers looking for human work in the imagined gaps left by machine intelligence in the future, relevance seen as what the machines cannot do	Factory: 3	1

The different positions of these groups in relation to their technology capital and their perceived agency in working futures is a snapshot of their present perceptions and narratives. While there is potential for movement and transition across the groups, it is not possible to co-exist across more than one of the categories because they are separated by distinct combinations of technology capital and agency. Figure 5-2 shows the relative positions of the working future orientations against axes of machine intelligence capital and perceived agency in working futures.

Figure 5-2 Matrix of working future orientations



The next section introduces the groups, beginning with The Creators

5.2 The Creators

> *David: Certainly for me I don't fear the rise of the machine, I embrace it 'cause I think I'm the driver of the machine rather than the person who will be replaced by the machine. [AI, White, male, 50-55]*

The creators are optimistic in their view of their own working futures because they are part of the inevitable change they perceive. That is, the technology workers are close enough to machine intelligence to be confident they can benefit from the future they envisage in which machine intelligence will dominate work.

This group offered the clearest articulation of a form of machine intelligence capital, connected to social, economic and cultural capital. Machine intelligence capital is expressed here as confidence in the future of work drawn from perceived ability to play a role in shaping futures, and/or to broadly benefit from futures with machine intelligence at work. There was also notable capacity for articulating broader social and working futures amongst this group which will be discussed in the next chapter. This chapter will focus on the ways in which individual workers imagined their own working futures.

Due to this group's sample, which was majority male and experiencing and expecting high levels of autonomy in their work, machine intelligence capital cannot be disentangled here from social and economic capital of the majority privileged. Amongst the five ethnic minority participants or those with migrant narratives within this group, machine intelligence capital is crystalised as capability building as well as capacity building in terms of envisaging futures. It is an additional form of protection against potentially harmful bias in the workplace. Findings are drawn primarily from the accounts of these workers in line with the aim to examine how workers experiencing forms of social inequalities imagine working futures. However, the findings from the rest of the group are also significant in setting the context for the other orientations. As such, this section indicates the majority privileged visions, including the increased machine intelligence capital amongst this group of workers.

5.2.1 More autonomy over ways of working

The Creators are working towards technology that in some way aims to automate and replace human work. For example, Roly (AI) is developing a business which automates administrative tasks. The main block he faces growing his business is the concern of job replacement amongst potential clients. Roly had already experienced this challenge in his previous roles:

> Roly: When I tried to introduce digital in my previous two jobs, everyone saw it as a threat to their jobs. It's multiple factors, it's the idea of the unknown and lack of control, someone else is doing it. [AI, Asian, male, 50-55]

Roly's horizons are bounded by the expectation that machine intelligence will be transformational. The use of the word 'digital' speaks to the corporate language of automation. His working life narrative fits into these parameters, from his aspirations to his motivations and actions. When asked about his ideal job in the future, Roly described a situation that was a more advanced version of his account of his current working life.

> Roly: My ideal job would be running, er, [pause] building, leading a company that builds products that is on the leading edge, that is actually not on the leading edge, it's at the intersection point between application of AI in daily, day to day life, either at a consumer level or enterprise level, and innovation. So I want to be this space where my company, my products would be contributing to innovation. So that just gives me, but at the same not innovation for innovation sake but things that are applied on a day to day basis.
> *Interviewer: What's your motivation for that?*
> Roly: I know, just like internet changed the world, substantially, I believe AI is going to change the world. In ways that we don't even know and I want to be a part of it. Number one. Number two, is I like building new things, so I have this aspiration to innovate, I may not be great at it but I have the aspiration and I want to, I want to be in a place where I have control of where I work, how I work and how long I work. [AI, Asian, male, 50-55]

Expecting that AI becomes central to daily life, Roly can imagine a future in which he is able to fulfil his goals. He also expects that the organization of work will change to his current way of working with very high levels of autonomy. He argues (pre-Covid 19, as discussed in Chapter One) that younger workers who have become accustomed to shared workspaces for remote or freelance work, will expect to continue working without a physical office in which to congregate with colleagues, without even seeing their colleagues. This echoed his descriptions of how he currently works, hiring teams remotely across the world to work on his product.

Malik was also unable to imagine working in any other way in the future:

> Malik: I enjoy good autonomy now, I think I couldn't go back to a job that required me to be somewhere nine to five Monday to Friday. So that's gone now for me, that I imagine is going to be more and more, I want to be able to work from a café in Barcelona relatively easily, I think I can do a lot of my work like that now. So just extending those kind of privileges. [British-Middle-Eastern, male, 25-30]

Working without physical restrictions or expectations is a core part of the Creators' imagined futures, and this itself is based on the extension of existing privileges- a word Malik used to describe the ability to work remotely. The expectation is that technology will continue to develop to support this way of working. The idea of being at the forefront of change, not necessarily driving it but being amongst the first to envisage it, merges with the high levels of autonomy in working life allowing for the day-to-day routine to be tailored according to worker preferences. Creators are empowered and consider themselves to be protected from automation because automation is an aim of their work.

5.2.2 Staying relevant

Much like Roly, who sees a future where AI will dominate the workplace, both Jun and Malik specifically identify the sense that they strategized to ensure they remained relevant in the futures they envisaged:

> Jun: I believe the nature of what will change over time, and I believed that a long time ago but now I'm actually seeing that happen and I, maybe for a lack of a better word, don't want to be left behind. And hence I'm pursuing that because I want autonomy, I don't want to be left behind and be marginalized by the progress. [AI, Chinese, male, 35-40]

> *Interviewer: How did you choose to work, going back a few years, how did you choose computer science and this sort of field of technology to work in, what is it that drew you to that?*
> Malik: Probably an instinct that it'd be the most important skill going forward.
> *Interviewer: Do you remember why?*
> Malik: I don't know why but it was very obvious that everything would be governed by data at some point. Or many things would be governed by data, to navigate the world, to be competent in that field was going to be a really important skill. [AI, British-Middle-Eastern, male, 25-30]

The notion of relevance is significant throughout the groups. However, amongst the Creators, it emerged in the advice that they gave to workers they expected to be negatively impacted by the increase in machine intelligence. As this group overwhelmingly talked about jobs in technology as the most likely to be resilient, relevance tended to focus on jobs that filled in the gaps that machine intelligence could be expected to leave. The imagining of futures of work that fit into the gaps left by machine intelligence is a strong theme in different orientations. In the case of the Creators, it highlighted the importance of removing repetitive tasks and focusing on roles that are 'more human':

> Malik: People need to realise [if tasks] can be done by a machine or, an algorithm of some kind. So that's the only thing I would say, identify things that are repeatable and move steadily away from those, try to get to things that are more human, more nuanced, more, think on your feet kind of roles. Like a plumber. I think plumbers are gonna be economically sound for a long time, all houses are different, got to navigate all houses in a different way, so they're going to be very sound I think! …[…]… There are industries that I think will be a lot better, and I think yeh, some workers, high volume trading isn't one that I'd get into soon.
> *Interviewer: So your advice is for workers themselves to start thinking about future proofing their- becoming more human, like towards tennis coaching-*
> Malik: [laughs] maybe something like that. Just empower yourself. Identify when things are, people can, I think that people can instinctively feel that something can be, could be automated, I think, I don't think people are naïve to that. You know, if a lorry driver's on the motorway and they press cruise control or something, they know that, something, not going to have that much attention on the road, you just have to extrapolate that further. So just empower yourself by recognising things that don't require much cognition will be up for grabs. [AI, British-Middle-Eastern, male, 25-30]

5.2.3 Superpowers

The Creators shared the view that working in AI development already or being a worker contributing directly to the technology industry more generally was the best position to be in. They were likely to advise workers who are outsiders and likely, in their view, to be replaced to get ready for the changes that they expect will take place within the next 10-20 years. For example, Will pointed out that those already working in technology companies are better equipped to benefit from machine intelligence:

> Will: Technology comes along in the workplace you say either you need fire a load of people or you say people we've got can now be ten time more productive, create ten times more revenue through that technology, so I guess it depends on what the business model is of the business in question. Is it the kind of business that is able to use that technology with the existing staff to scale up the amount of value they can create? Or is it the type of business with a fixed market share that they've already kind of saturated and technology just means they can do what they're already doing with less people? …it's more like, if you have kinda, creative jobs, where there's some element to be creative, like 'I've got these new tools, new technological tools' well those workers have got some autonomy to say 'I can create some value with these tools, something I wasn't able to do before'. [AI, British White, male, 30-35]

The potential to benefit, according to Will, depends on working for a company endowed with the ability to extract value from technology and the worker having the autonomy to recreate their tasks as a result of the technology implementation.

William, another CEO and co-founder of a machine intelligence start up, said he was looking forward to the future that he imagines will occur because a fundamental aspect of his work and core interest - setting up businesses - is expected to become easier.

> William: From my point of view I'm just looking forward to, I can see really clearly, in a few years' time, it will be really easy to, I can actually see how since I started [own company] it's become easier to

> set up and run businesses, especially from a technological point of view. Just like kind of, I was actually reading about again, business failures, one of the reasons for a $100 billion, $150 billion investment failure was that they founded their business in the early 2000s, 2003, 2004 and they had to build all the SAS Softwares and Service stuff from scratch, to help monitor accounts and do things like that. And now the types of components they had to build from scratch ten fifteen years later is a £100, £200 plug-in here, a £500 plug in here and it's a small service here. And I'm kind of looking forward to that, more, more super-powered. So the coolest applications you have are ones that slightly make you feel like you've got superpowers, like being able to speak to someone by video no matter where they are. I'm just looking forward to superpowers. [AI, British White, male, 30-35]

The next mode of working futures to be discussed focused on a group of workers, mostly but not limited to knowledge workers, who are confident that they have the capacity and opportunity to adapt for the futures that they envision.

5.4 The Adaptors

> *Jacqui: But I sort of imagine it'd be great, it'd be like sitting in the bridge of the star ship enterprise and sitting in the captain's chair and just shouting out questions to the computer and it would just give me answers. [K, British-Chinese, female, 30-35]*

The Adaptors expect that machine intelligence in their future workplace could put their jobs at risk but are confident they can 'future-proof' themselves in order to survive in work despite the perceived risks of those expected changes. Unlike the Creators, the Adaptors are not looking forward to reaping the benefits of working futures but instead see machine intelligence as a risk to be managed through their adaptability in work. This group is based primarily on the talk of four participants from the knowledge case (Jacqui, Antar, Alabi and Paul) and the only male in the factory case (Max).

5.4.1 The Survival Instinct

Experiences of social inequalities of race and/or gender are present in four of these participants' imaginings. Paul (K), a British White, middle class male amongst the Adaptors, stands out in his perception of technology as a potential 'collaborator' and his confidence in both the need and his ability to adapt to machine intelligence in his day-to-day work. This appears to be driven by the awareness of perceived change and a risk to his type of work, which in his imagining, could be drastically changed by machine intelligence.

The imaginings of Jacqui, Antar and Alabi, similarly based on the awareness of perceived change and risk of replacement, are set against backdrops of outwardly negotiating race, class and gender in the field of their work (Bourdieu, 1986), which are majority privileged workplaces. Much like ethnic minority participants in the AI case, for these three, and to a lesser extent, Max, working futures are extensions of an internalized proactive effort in the present and past towards building up layers of protection against potential racism, discrimination or bias that could become or have been barriers in the workplace. The Adaptors from ethnic minorities do not take their present position for granted, are primed to be aware of changes around them and to develop survival plans because, fundamentally, they consider themselves at risk of losing in the game and field of their work because of their position as ethnic minority workers (Bourdieu, 1986). This may be stronger amongst workers who have experienced racism, and have been regularly reminded of their position as an outsider:

> Alabi: Susan Boyle is this phenomenon when she was on Britain's Got Talent and she came up on stage and she was ridiculed by the judges 'cause they asked her question, what do you want be? And she said she wanted to be the best-selling opera singer, and they looked at her

and they laughed at her because she didn't, she couldn't, she didn't look like an opera singer. It's ridiculous, that was, she's got a thick Scottish accent, she was ugly for want of a better word, not as good looking and not polished, and she had a heavy highlands, Scottish accent, which I assume was an element of classism, for them to say that, if she looked like Katherine Jenkin- anyway she sang and everyone was like 'oh my god', this is that Susan Boyle moment, 'what a gem, I can't believe it, I'm completely shocked by this because, and I'm allowed to be shocked because it's my perception which is my reality that means that I can properly be shocked and not realise that I have some kind of issues in the first place.' And therefore in my career I have a lot of that. I have indirect racism, maybe direct racism. Like when I first joined, the perception was 'how can *he* be replacing him?' I've had things where I take a client out for dinner and taking old white men out for dinner, or middle aged-ish men, you know, ask for the bill and they always give the bill to the older person or the white person. That happened two or three days ago. …There's a great book by Malcolm Gladwell called David and Goliath I think. And in the book it talks about the success of the underdog, naturally you're not really an underdog. And he talks about David and Goliath which is probably the most prominent story about the underdog. And it says, actually, if you look at the facts of the story, David was not underdog. Goliath was heavy in armour and in those days they'd fight with a sword so he was expecting a close up fight. And David took him down into a quarry which was long, so he turned it into a contained fight but a distance fight. And then he had a weapon that was, at high speed, killed lions, essentially he had a gun. So he brought a gun to a sword fight. So David wasn't really an underdog. So Malcom Gladwell says that what underdogs do, is that if you find yourself into a situation, you change the rules of engagement to suit your skillset. [K, Black British, male 40-45]

Alabi's working reality is continuously split between what he thinks others see and what he sees himself. Jacqui and Antar also described having to think about themselves as ethnic minority workers and choose the most appropriate strategy to negotiate the majority privileged field from their positions. As such the Adaptors inhabit multiple perceived realities at any one time, from social interaction to interaction, and are comfortable imagining machine intelligence working futures in which they can use their skills to survive – as long as they prepare before and better than the majority privileged workers in their field.

5.4.2 Data and the future of knowledge work

In this mode, workers are proactively learning or planning to learn new skills to work better with machine intelligence, with the self-assurance that they have the access and ability to do so, to continue to take part in the labour market when machine intelligence led changes are rolled out in their areas of work. The perceived speed of the changes influences the urgency expressed by participants. There was a sense that action is not required at present but that it is likely impending. For this group, time was perceived to be on their side because they had seen the changes before others and the learning they identified could be done before it became fundamental to success in the labour market. This longer term view and positivity about technology allowed planning and research to understand how technologies could potentially be rolled out in their line of work, and how their work could be improved as a result. The Adaptors were already thinking about ways they could make changes to their work, skills and knowledge in order to 'not be left behind' by implementation of machine intelligence, despite not working directly in technology development. To these workers change is inevitable but manageable with foresight to think about what and when to learn to adapt. For the knowledge workers, this is based on an understanding that their work around the interpretation and utilisation of data will not be replaced but enhanced as well as their capacity to imagine themselves working well alongside machine intelligence.

> Jacqui: The analysis I'm thinking about, when we first started doing this in like 2011/2012 it sometimes used to take us overnight to run the dataset because we had particularly slow computers and we didn't have the IT. Over the last few years we bought more powerful computers and the data analysis itself is better, but it's still a bit clunky. So if you've got smarter sort of data analytics, AI, then hopefully that could be really quick and you could literally ask the computer a question, or even ask it in a more sort of spoken way or the way you write rather than in the particular computer query. And then anyone can use it. But ultimately you still need someone who understands the results and you can't just say the computer says this is answer and that's it. You need to make sure whatever you say makes sense. [K, British Chinese, female, 35-40]

Alabi, who is overall less trusting of technology than Antar and Jacqui, nevertheless envisages that his job could benefit from machine intelligence but raises the concern about decision making:

> Alabi: So if I look at my job which is possibly people think can't be automated, having a benefit of a machine would make perceived, make better decisions based on data. The problem is, that's the only way machines help, is for you to make better decisions, alright?
> *Interviewer: What if they're making the decisions? What's the difference?*
> Alabi: Exactly, that's the thing. You've seen where the gap is, the gap is where they're helping you make better decisions and the perception so human decision still outweighs machine decision [K, British Black, male, 40-45]

Antar describes how a 'well-deployed AI' could improve his work, although not the work of all workers such as those in factories. Antar looks ahead to AI significantly improving forecasting and scenario modelling with predicative capacities and more scenarios with increased accuracy. In particular, he imagines the AI to have capacity to perform retrospective and routine evaluations of the effectiveness of those models, something which he says is currently not done in the organization in which he works. Having noticed how policy work and the tasks of data analysis changed, Antar proactively became involved with projects beyond his direct remit to learn and think about how new technologies can be implemented in work:

> Antar: I realised that the world of work is changing quite radically, and I don't want to look back on my career in ten years and realise I've become obsolete because I haven't picked up on these things as they're happening. And it's…it's better to be involved, if I can be involved in this way, in shaping how things are introduced then I learn about those things, then I'm expert, I'm probably in a better position to adapt to those things as they happen. And potentially to move elsewhere, greater opportunity to move outside this current role if, if they come up. I don't want to be, I am conscious, if I were beginning my career I think I might feel different because you've got more room to adapt, but if these changes roll out in the next 5, 10 years, I'm going to be in a position where in my middle age I'm not going be as well positioned to take time out to learn about these new technologies. (K, British Asian, male, 35-40).

Antar imagines the 'other work' that he could do if the technology automated some existing tasks and if that that technology was 'harnessed.' Antar's outlook is positive with overall improvements to working experiences and outputs. However, the 'other work' that Antar talks about hang on a series of 'ifs' such as if the worker upskilled, if the technology is good enough or if it is deployed well. The act of imagining the work that could be done, or in Antar's case imagining the work that would be relevant and powerful in the future (to protect his career), is a crucial step in the preparation and creation of that working future. Antar witnessed the changes brought about by increasingly large datasets and the launch of a new software (Microsoft BI) into his organization and imagined a future of work in which the 'other work' he could be doing would be the work that is required. As such, he has attempted to move into areas of work, new projects that are outside his day-to-day remit, in order to position himself at the forefront of those changes. Antar is preparing for 10-15 years' time when he hopes to be in a more senior position in an organization that harnesses the technologies he sees being introduced today. This is in contrast to the organization currently, which he describes as 'behind' due largely to 'ignorance' of the technology but also to the defensiveness of particularly more established experts in the organization who do not want to adapt or change. Antar points out that it is more important for junior people to be thinking about how work will change in the future and to be spending more time on future facing projects.

Paul (K) imagines a machine intelligence that could benefit strategists such as himself and pre-empts the design of systems from the expected (e.g. to provide calculations, or answers) to instead imagine a system doing something different, more useful in his work:

> Paul: I guess what I'm saying is there's a central thing that appears to be at issue with these things which is the difference between data and creativity um and obviously, if you've worked in, as you have and I have in creative strategy, you're always trying to find narratives that explain the data in a way that opens up possibilities and I think what's interesting about the creative process often it is a process of swapping metaphors and swapping models 'til you find something that explains the data and also opens up the possibility space for you. And I think the way that we are, tend to design systems is to provide definitive answers whereas in our line of work what you really want is set of possible metaphors. I think it would be interesting to have a system

> with that in mind…as a collaborator, rather than an answering machine [K, British White, male, 40-45]

5.4.3 Proactively retraining for a welcomed future

While the knowledge workers talk about using machine intelligence to make better sense and use of the large amounts of data they are expecting to handle in the near future, Max talked about his proactive and technophilic move from factory work towards running his own business as a certified electrician. Max's talk about the future is rich with his own interest in technology and positivity.

> Max: That's the future, that's what's going to happen. Imagine this, you've got like rollers in your window, you can close them by pressing button on your phone. You can set your tele on, it's actually now comes true, you can do it so easily at the moment. Let's say you want to watch a movie in the evening so you want to make it more like a cinema. So you can dim your lights and you can do that automatically, you put your movie that you want to play on and all of that will happen fully automatically. It will recognise that have put your movie on, it will dim the lights, it will bring the popcorn as well if you want it to…[…]…Let's say you're coming out of your home you can easily lock you home with the press of one button. You can make electric gate recognise you're coming to your gate, at the moment you press a button but you can make your gate recognise you're coming and open the gate automatically. You can automate it all. So the people who're inventing that stuff, it's great. [F, Polish, male, 30-35]

A high sense of agency and technological positivity defined this mode of looking towards the future of work. Max was the only male in the Factory case and the only participant to share a category with workers from a different case. His interest in technology, his ease in imagining future technology and the changes that they might bring, works with his male privilege to remove perceived barriers to proactively retrain as an electrician to benefit from the business that machine intelligence products in the home might create. Like the other Adaptors, Max envisages an inevitable and unavoidable change in work, but unlike the rest of the (female) Factory case, Max has the confidence and agency to pursue a different line of work. It is important to note that Max is also younger than most of the factory workers, which could also have influenced his decision to retrain. However, his social position requires him to carry out other full time paid work to support himself through periods of study. As such, he is perched between two worlds of work- the present as a delivery driver experiencing some elements of the expected autonomy of self-employment and also the future as an electrician with his own business, installing machine intelligence products into homes.

Temporal dexterity is common across all the Adaptors, with those from ethnic minorities being particularly accomplished at strategizing survival for futures in an at times perceived hostile field. The next section will discuss those more hesitant to make changes in the present to benefit their working futures.

5.5 The Cyborg Hobbyists

Every worker in the factory case expressed how important it was to continue being able to work, even in a scenario where financial pressures were removed. Factory workers in this study describe how they have seen their jobs can be automated and their hours reduced, wages limited or lost altogether and envisage difficulty finding other paid employment. Radtha, the only participant close to retirement age, talks about the value of work for her as she describes a potential version of her life without work:

> Radtha: Work little bit like discipline. Get up, go work, come back, talk to people, routine. Talk to people, how was your day, then come back again next day, sometime nice day, sometime bad day. And you no go work and maybe stay in the house miserable sometime, oh my god, why stay home, like that. No [too] many people, no faces, always look

> around my face in the mirror [laughs]. That's why missing work. [F, Asian, female, 60-65]

As retirement looms, Radtha represents a potential further mode of working futures that warrants further research: not simply consisting of age but also the particular angle taken towards the future horizon. From the edge of working life, Radtha imagines working futures not as her own but that of colleagues specifically at the factory from which she will soon retire after more than two decades of work. As such, in imagining working futures she imagines that of colleagues:

> Radtha: The future, nearly ten years' time, many people no work because machine cover up and everybody study hard, hard and everybody own job…you find own business, or you make different things, some people make clothes, some time you make different, what is that, make badge or something like that, some hobby. [F, Asian, female, 60-65]

Radtha's version of the future of work is one in which workers who want to work will need to 'study' and better understand how to benefit from the technology or create work out of their hobbies. Radtha's personally disconnected view of working futures alongside machine intelligence points to two modes of working futures in the factory group which rely on a sense of entrepreneurism. One group of these workers, the Cyborg Hobbyists, displayed optimism or a sense of agency in being able to learn, which led them to imagine taking risks and using new machine intelligence capabilities to turn an interest or a hobby into an income opportunity. The second group is the Subsisters which will be discussed in the following section of the chapter.

5.5.1 Imagining technological potential

Cyborg Hobbyists imagine machine intelligence tools that could help them achieve their goals by overcoming the knowledge or skills-gap. The Cyborg Hobbyists imagine work alongside machine intelligence, illustrating some level of positivity and perceived benefit in the potential technology. Ela and Ida both enjoy sewing and imagined that machine intelligence could make it easier to produce results with limited knowledge and without having to train. Working futures had the benefit of reduced barriers to trying new areas of work.

> Ela: I never thought of this way where there's- I think it's something like fashion, more into, yeh fashion. More fashion because I kind of got interested in fashion as well. So just if I had the vision of making a dress or something and maybe the machine can make it for me, the design and everything. So something like this…Or even designing a house or something…I think I'd be a designer, definitely. I'm not good at sewing and this kind of stuff or drawing even but if I had the machine to do it, then maybe it would make my life easier to draw than to get the fabric and stitch and this kind of stuff. [F, British/Middle-Eastern, female, 25-30]

Here, the hobbyist imagines cyborg potential from machine intelligence, not only perceiving its potential to provide a boost but imagining themselves reforming as a self-employed worker *with* machine intelligence. There is an underlying assumption that achievements made through technology are not as much of an achievement as without, as though it is in some ways too easy. In this way, machine intelligence capital appears in the talk of these workers as a privilege and it forms part of the vision for those who can and do imagine benefiting from that machine intelligence boost. However, the difference in the structure of their working lives in their futures is that of working for themselves, a significant shift from their roles as workers in a factory experiencing very low autonomy. They imagine machine intelligence in a way that both removes barriers to follow their own interests, supercharged, and to experience autonomy for the first time in their working lives. However, the past and present weighs heavily on these workers, whose imaginings are tethered to a critical understanding of how technological progress can impact their work and those of others.

5.5.2 Imaginings grounded in doubt

The Cyborg Hobbyists can imagine benefiting from machine intelligence at the same time as raising concerns about human workers becoming 'lazy' (Lakshmi, Radtha), not being able to enjoy the 'reward' of hard work or learning things for themselves (Ela) and getting easily bored in short amounts of time (Ida). While machine intelligence might provide more 'confidence' and make workers 'more comfortable' to try new things and 'reach faster' (Ela), the removal of the challenge also removes the 'fun' of trying to achieve your goals. That is, the potential boost of machine intelligence is perceived as a short cut leaving these workers with negative implications for the experience of being a human worker.

In contrast, the Creators who also imagined benefiting from artificial intelligence for example, did not share any sense of lesser achievement if they were to achieve through the use of that technology. The privilege – possibly in the form of the head start that technology could offer- is clearly read by the Cyborg Hobbyist but invisible amongst the talk of the Creators. That is, if the Creators felt the machine intelligence capital privilege as a form of 'super power' (William, AI, 30-35), it was implicitly a privilege that they had themselves contributed to in the creation of technology itself. Compared to the Cyborg Hobbyists, the Creators were not preoccupied with the meaning of hard work and learning in order to achieve goals. Instead, amongst the Creators, it is common sense that if technology can be used to improve work, to remove manual tasks, to free themselves up to other tasks, then it should be and that to not apply technology in that way would be unfathomable.

Reaching goals faster through technology was clearly not a concern to the Creators, in striking contrast to the Cyborg Hobbyists.

Ida imagines machines in future would not only automate tasks but make it easier to try new work without learning the pre-requisite skills:

> Ida: If you have an opportunity to choose job you like with all those machinery, I think you can start anything, what you wish to do. Not exactly with your qualification because you will have so much machines and technology will help you. So at the end, normal worker, they will not, I don't have to have all those trainings and schools to do the job. But on the other side, you can say but, if I don't have to learn new skills, I would, I would feel a little bit stupid really, if you know what I mean, without schools and trainings and everything. From one side it's great, I would come to the job, push the button and everything is ready. I would start whatever I wish to do. But the other side, if I will have to start something else I will not be prepared physically- mentally- for that. And that would be hard. Even with the machines. Even if you could choose, yeh, but after two, three months, ok I can do, I can work with this environment, with this industry, with that machines but in the next couple of months I could say, nah, it's too boring, I would like to try something else. [F, Polish, female, 30-35]

In this talk, Ida imagines how it might 'feel' to work with intelligent machines. While she also imagines being able to use machine intelligence to boost her sewing skills, the way that she and other workers in the factory case talk about the possible implications of machine intelligence on the way the human mind works shows more scope for dystopian visions, hinting at distrust in the technology they imagine will take shape. As such, these workers are entrepreneurial and have enough agency to use the machine intelligence to their benefit but nevertheless are critical, questioning its impact on being human. For example, Ida talks of feeling 'stupid', unprepared for starting the next new thing and finding work 'too boring.'

The machines that Ida imagines take on manual skilled tasks such as sewing, whereas the design and business skills required to turn the hobby into a business are not mentioned in her talk. These perhaps are likely to remain 'human'. However, such human-only tasks are barely visible in her talk of her own working futures compared to her suggestion that 'human' work should be maintained in the future. It is as though an artificial intelligence sewing machine threatens to make Ida feel, as a manual skilled worker, redundant because she would no longer be a manual skilled worker carrying out that task herself. This is distinct also from the Adaptors who were cautious in terms of ensuring a human had oversight of data interpretation and decisions. There is a careful balance for the Cyborg Hobbyists, to imagine without being consumed whole by the machine intelligence of their working futures.

5.6 The Subsisters

The factory workers are the group with the most orientations towards working futures. Apart from Max, who shares the Adaptor mode of working futures, and the Cyborg Hobbyists who can imagine merging their hobbies and existing skills with machine intelligence, another group in the factory case grasp their working futures by asking themselves 'what will be left?' The Subsisters are unable to imagine paid work opportunities alongside or with machine intelligence.

5.6.1 Human work only

Within the factory, machines are being used to replace workers – 'they're doing away with people' (Patricia, Factory, British White, 50-55). Therefore, imagining increasingly intelligent machinery does not equate to imagining better or different work within the factory.

In this view of the future, human work is filling in the gaps of machine intelligence work (Woolgar in Bijker et al 1987,1989). The topic of what work will be left lends itself to existential questions about what it means to be human without work. However, it was still necessary for workers to keep their own interests and hobbies central to their visions. Instead of working with machine intelligence like the Cyborg Hobbyists, these workers seek gaps in what machine intelligence might be able to do that also combine with their interests.

> Patricia: I'd rather work, I'd get bored.
> *Interviewer: What would you do?*
> Patricia: Depends what was going around without a robot! [laughs]
> *Interviewer: What do you imagine that might be? What would be left?*
> Patricia: Not a lot really to be honest. 'Cause I mean [pause] dog walker…I can't imagine, I can see a robot walking a dog but not actually telling it what to do. [F, British White, female, 50-55]

Patricia has little hope that she would be able to find work alongside machine intelligence but quickly imagines a job that she would enjoy and she expects would be available. Cat on the other hand has already been developing a sideline in crafts and she imagined she would be able to improve and grow this business:

> Cat: I would do crafting and concentrate, try and make it better, quicker to do and I would make it more individually so people would want it. I would do it and do crafting and go out for days out and do different things, just to keep active. [F, British White, female, 40-45]

Patricia and Cat however, do not imagine using machine intelligence in those working futures but do perceive an opportunity to focus on work that is more in line with their own interests, working for themselves. Similarly, Lakshmi imagines running her own shop, like that of her relatives, to give her the freedoms she perceives in self-employment:

> Lakshmi: I like to open a shop, a local shop. That is better because all my relatives are doing that, that is better and they are earning more than this factory life. And that is, make like a feel I am the boss, I am the owner, everything I am, so that I don't want to work under pressure or anything. [F, South Asian, female, 35-40]

For the Subsisters, work is an essential part of being human and they do not imagine benefitting directly from machine intelligence in their working futures. Partly because their hobbies and interests lie outside the potential influence of machine intelligence, and partly because they do not consider machine intelligence as anything other than a threat to their current work, the Subsisters maintain a distinct human/machine boundary in work imaginings. There is a disconnect between machine and human, which is echoed in the final group – The Future Proof - but for very different reasons.

5.7 The Future Proof

This group of workers perceive themselves to be protected in their work because their tasks primarily have a human focus, for example based on relationships and their social capital. That is, they perceive their jobs to have low vulnerability to automation despite the prevalence of machine intelligence in their workplace. The Future Proof imagined that there would always be a human focus in their job (beyond the intuition required to interpret data analysis as described by Antar and Jacqui) because their work was about building relationships and partnerships. All the workers in this case are British White, female, university educated and mostly in senior management positions in knowledge work.

5.7.1 Better tools, same job

When asked to imagine technology that could exist in the future to improve the experience of work, Catherine (Knowledge, British White, 30-35) imagined technology that could summarise documents. However, couched in the everyday experiences of technology failing to live up to expectations such as automated bank call services, checkout kiosks at airports and supermarket self-checkouts that require attendance regularly, as well as a sense of not having considered it enough, Catherine says that she cannot imagine widespread job replacement, particularly in her work and the service industry in general. Instead, she imagines intelligent machines will be tools but importantly has not already been thinking about this and preparing for it like the Adaptors:

> Catherine: It's probably due to my ignorance but I find it quite hard to think of anything too radical…[…] But it feels like it would be about presenting the basic materials that are needed to do the job and then human beings to do the job but I don't know.
> *Interviewer: You think it is more likely to be a tool?*
> Catherine: Yeh but that could be down to, I dunno, a lack of future thinking about it, I guess. (K, British White, female, 30-35)

While the Adaptor mode is a proactive approach through which workers apply technological foresight and technological confidence to prepare for an envisaged future, the future proof mode is based on the talk of workers who talk about their work as human, as resilient in machine intelligence futures which are not imagined to be drastically different to the present.

> Antonia: So my job is interesting because I don't have that many repetitive things or if it is, so I might do a phone call with a new potential partner, lots of times but each of those feels really bespoke and unique because every partner is so different. I suppose the actual activity itself is a phone call with a series of questions but you can't,

> you can't even standardise those questions because it depends where the conversation takes you. So it's quite a, I think it'd be very difficult to automate what I'm doing this role in partnerships because it's all about relationships and empathy and identifying commonality or creative opportunities in places that might be very unexpected or unlikely and that's based on my subjective, and somebody else's subjective take on something. So I feel like it is very hard to identify a way that a machine would be able to that. [K, British White, female, 35-40]

These workers might also see themselves as having to adapt to keep up with technology in their workplace but, distinct from the Adaptors, this is not based on the need for survival, itself rooted in the burdens of social inequalities which have ingrained a sense of having to prove oneself to fulfil potential. In contrast, the Future Proof consider their work, specifically due to the concentration on relationship building, communication and understanding human behaviours as largely irreplaceable. This group of workers do not imagine that their main skills are at risk from significant change as a result of increased implementation of machine intelligence. This reveals the perception that the future will include the same sorts of jobs that exist now but in doing so also shows a lack of proactive or critical preparation for those working futures. The articulated job security may be a sign that these workers have not engaged with the topic of technology use at work. However, this itself, this state of being relaxed rather than considering how to survive changes in the workplace (like the Adaptors), may to some extent reveal less anxious working futures for those with high autonomy, social capital and no experiences of racism.

5.8. Conclusion

The previous chapter, Chapter Four, discussed how social positions and forms of capital influence the forms of agency workers have in their working lives. Chapter Five, the present chapter, set out to contribute to the answering of the main research question through a focus on the second sub-question on the future:

1. How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?
    b. What are the imagined working futures and configurations of work for workers using machine intelligence?

This chapter set out different orientations towards the future as five distinct groups of workers, focusing on the way individual workers imagined their own working futures with machine intelligence. The five groups differ in terms of agency in their present working lives in the form of autonomy. Additionally, they differ in their level of technological capital, here machine intelligence capital, which consists of:

1) knowledge about machine intelligence ranging from producing it, awareness of it, consideration of social impacts and ethical implications;
2) confidence in capacity to learn to use machine intelligence tools and technology; and
3) capacity to articulate imagined machine intelligence forms in the future.

Workers who are most likely to imagine positive working futures alongside machine intelligence, benefitting from the technology they imagine, are using their machine intelligence capital to do so. This capital is influenced by other forms of capital, particularly social and economic capital. The Adaptors show that it is possible to invest in and increase machine intelligence capital – it is not fixed, which suggests it could also decrease (for example if a worker in the AI group did not keep up to date with changing technologies). The Cyborg Hobbyists show that having only some of the elements of machine intelligence capital is enough to create a cautiously positive imagining of the future of work. However, this form of technological capital also appears to be strengthened at intersections with other forms of capital, particularly economic, which allows financial investment directly in the production of machine intelligence such as in the group The Creators.

Fundamentally, the data in this chapter suggests that positive working futures are about increasing perceived relevance as human workers. The workers in the AI and Knowledge groups perceive themselves as relevant in current roles, either through adaptation or human relationship focused work. The Creators have prioritized remaining relevant and consider work within AI and technology the safest place to work in the future, ensuring continued relevance. The majority of the factory workers envisage their working futures will take place outside of the factory. The factory workers are limited in terms of working futures inside the factory where they have already seen technological shifts towards automation. These are the workers who in their imaginings are most distant from their present situations. They describe generating incomes from their hobbies and interests, working outside of the structure of paid employment and experiencing autonomy for the first time in their working lives. As such, attention is directed to these groups as containing the most potential for dramatic change, requiring policy support in shifting working worlds.

Crucially, the factory workers are not without machine intelligence capital. The Cyborg Hobbyists show that the factory workers expecting to be replaced and who are distant from technology creation can imagine working futures where they benefit personally from machine intelligence. Overall, they share this possible, albeit cautiously, with The Adaptors who are also outsiders to technology development but confident that they will be able to learn to survive in their workplace as it changes over time. Together, the Cyborg Hobbyists and the Adaptors experience social inequalities of class, gender, ethnicity and race and perceive a risk of replacement in the long term. They apply their relative machine intelligence capital to develop survival strategies to manage the perceived fragility of their working lives. However, the Adaptors who experience high level of autonomy in their working lives, are proactive and have started adapting already, whereas the Cyborg Hobbyists currently experience very little autonomy and appear to be waiting until it is necessary, possibly requiring support to begin such a shift in working lives.

The Subsisters and The Future Proof maintain focus on the human tasks in work, but from very different social positions. The Subsisters, as factory workers, do not expect their current work to exist in the future whereas The Future Proof are confident that most of their tasks will be unchanged. While the Future Proof did not articulate a future that was very different from the present, the Subsisters' futures were far removed from today, a world in which robots and AI could do most jobs that they could imagine existing. As such, the Subsisters, along with the other groups, also envisage work in terms of what will be relevant in the future.

The Future Proof group did not articulate fragility of employment in the face of technological development. While tools might improve, the tasks they carried out were expected to largely remain the same. Although the Future Proof did talk about experiences of work as women, they did not articulate a future in which they required a form of survival planning to remain relevant as found amongst the other groups. This made the Future Proof unique in the groupings. However, there was also some talk of being unprepared in terms of engagement with the future technologies that might be implemented in their work. As such, there is a hint of another theme within this orientation of the Future Proof that to have confidence in a future imagining, there is a need to feel informed about technology development.

The workers' talk of concerns and hopes about machine intelligence, changes in the structure and significance of work and the risks of inequality offer a deeper understanding of the ways in which social position and experiences of inequalities influence imagined working futures. The next chapter will explore the broader, societal themes that emerged in the data, providing the context for the five orientations to the future of work, developing the concept of machine intelligence capital further.

Chapter 6: Machine Intelligence and Collective Working Futures

6.1 Introduction

The previous chapter discussed the five orientations to working futures as found in workers' imaginings about working futures alongside machine intelligence. The current chapter discusses the talk of workers' imagining the collective working futures, focusing on the third and final sub-question guiding the thesis towards answering the main research question:

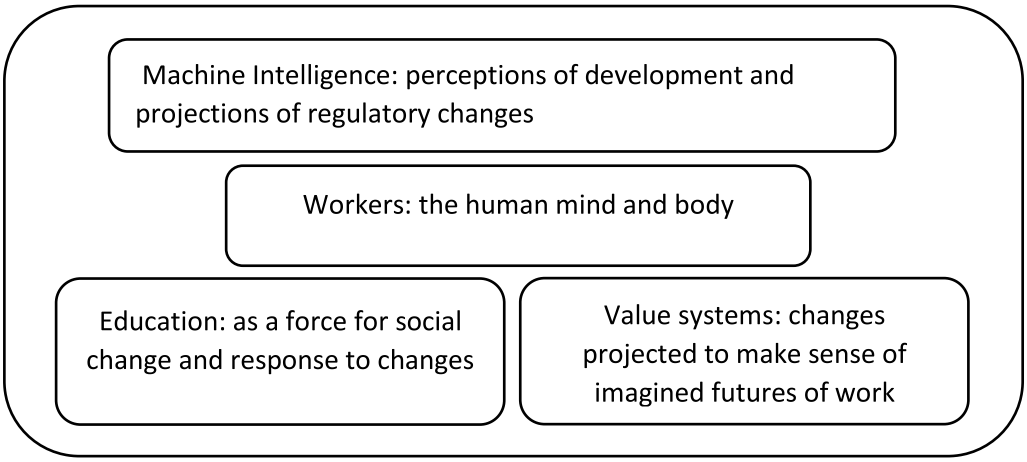
1. How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?
    c) How do workers describe machine intelligence, its development and potential for socially beneficial consequences?

Section 5.2 considered the use of the future tense to articulate individual working futures. Here, the future tense expands to map out individual workers' imaginings of work for everyone else. These views of the future are the expressions of the sociotechnical imagination through which the workers' visions are connecting the personal with the public. As discussed in Chapter Two, the construct of the sociotechnical imagination opens up technological futures, ordinarily confined to elite imaginaries, to the everyday experiences of workers. The connection between imagination and action highlights the inequalities within futures which then must be positioned as both a public issue and a personal trouble to understand how the experiences of inequalities shape the way workers imagine their futures.

The chapter is interested in the ways in which experiences of social inequalities influence workers' projections of collective futures and their views about the technology development overall. It asks if the level of comfort and confidence in articulating those visions is shaped by the experiences of inequalities. The language of social futures engages with imagined change, transformations or the perpetuation of existing patterns and hierarchies (Sardar, 2013; Delanty, 2021; Fowler, 2020) within which these workers partake in economic life.

Using the future to mobilise change is not new (Sardar, 2013) and in this chapter working futures point to what workers say could change (potential) and what should change (actions). If futures represent the past and present and the expectations we have based on social positions and aspirations, futures exist today in our actions and inactions (Sardar, 2013). This chapter focuses on the content of workers' visions and the 'dimensions of change' (Bain et al, 2013) as well as the projected experiences of human workers, all explored through the languages and images of history and popular culture. Figure 6-1. sets out the four dimensions, communicated through language and images from history and popular culture. Education, value systems and to a narrower sense, machine intelligence development emerge as levers for social change to protect the future human workers' agency, which is talked about with a sense of pessimistic ambivalence.

Figure 6-1 Schema of imagined collective futures and social changes



The chapter begins with a consideration of the different positions the workers approach futures from, building on the orientations developed in the previous chapter. The five groups differed by the level of autonomy in present working lives as well as the level of machine intelligence capital, which is used by workers to imagine positive working futures alongside machine intelligence.

Machine intelligence capital consists of three elements:

1) knowledge about machine intelligence ranging from producing it, awareness of it, consideration of social impacts and ethical implications;
2) confidence in capacity to learn to use machine intelligence tools and technology; and
3) capacity to articulate imagined machine intelligence forms in the future.

The concept of machine intelligence capital in this chapter develops in relation to visions of collective futures, and as such becomes more than a resource to imagine, and move towards, positive technological working futures. Untethered to the individual future yet shaped by the individual experience of work, machine intelligence capital is potentially one form of capital, one resource, that offers opportunities to imagine social change, even transformation.

Bourdieu's forms of capitals account for how social positions are perpetuated and solidified through the adaptation of one capital to another. However, his theories are open to change and social transitions, for example when a collective future-oriented action developed as the working class became an urban, industrialised society (Fowler, 2020). Machine intelligence is a form of capital influenced by existing forms of capital, particularly social and economic, and as such, is a resource to adapt and to perpetuate social positions. However, in the talk of workers' collective futures, it is a possible lever for social change, being perceived and talked about as developing rather than determined. The perspectives workers bring to working futures are influenced by their (in)/experiences of intersectional inequalities.

6.2. Collective futures and machine intelligence capital

This section briefly addresses the idea of machine intelligence capital being reflected in the capacity to articulate imagined collective working futures. In the present study, some workers pinpoint their concerns about machine intelligence with developers of the technology. Some workers talk about how governments need to prepare workers for the huge changes that they expect will take place. Others describe the changes needed in the economic system of the day, capitalism, with machine intelligence acting as one axis of change in the structure of work and its centrality to identity, salary to value, in this society.

The AI developers with the most machine intelligence capital, talk about being part of the change that machine intelligence is seen to bring. For example, Will, a machine learning research engineer talks about the change that he is contributing towards.

> Will: …part of my job is to try and imagine technologies not only make our lives easier but make other people's lives easier as well. [AI, British White, male, 30-35]

Will explains that he works with applied researchers who consult businesses to find out what products are required but that his current role is more academic than consumer focused. However, his work is not only future focused in the sense of those in the Knowledge group who are looking ahead to develop strategies but also in the act of contributing to technologies which he imagines will improve lives or make 'lives easier.' This is in contrast to his dark vision of the future based on human behaviours, regardless of AI.

> Will: I guess all of human society we've had to work, and the work has got more abstracted away from the physical is the last hundred, few

> hundred years but if we don't have to work at all that would change human society a lot. It's not like we would never have to work at all, there'll always be work but maybe not as much of it to go around. We'll probably just all kill each other from wars, nuclear weapons, global warming so before the AI comes along there'll probably be some kind of apocalypse, that's my theory [laugh] …AI can't solve the problem of what humans being do to each other. [AI, British White, male, 30-35]

David is also in the business of developing technology and describes himself as someone who is 'creating change, about building the future'. David does not fear displacement but states that his view is based on his position within the technology industry as a keen technologist. He interprets the history of technology as: 'mankind will adapt.' He follows the 'nothing is new, everything has happened before' line and sets his opinions in the context of the past (that life is better now than before) and in the present (that life is miserable now for many). Change, something that this participant creates, is considered as certain but the response to it is described as an act of individual agency.

Roly, an AI developer and founder of a start-up talks describes his aspiration to be part of the changes he foresees as a result of AI, linking it to his working style preferences. As a founder and CEO of his own 'applied AI' start-up, following years of working for large organisations and businesses, he seeks complete control over his work. The experience of working towards foreseeable changes whilst having autonomy in that work is not a unique combination for CEOs and founders. However, in terms of future visions, it creates a refuge from which to project and imagine, with the perception of relative safety from job replacement and a sense of inclusion in the processes of AI related change. This machine intelligence capital- involvement in the development of the technology and the sense of a role for themselves in creating or shaping the change they see as inevitable, as well as the experiences of autonomy in their working lives, influences how they see the FOW as largely being there for the taking for those who recognise and adapt to those changes.

Other workers match the AI workers' adept articulations of futures of work, albeit with less machine intelligence capital due to their work outside of AI development. Paul articulates another dark vision of working futures drawing on a popular culture reference:

> Paul: Have you seen the South Park episode? You either have a really positive future or an apocalyptic future. But the South Park episode I thought was brilliant commentary just on America generally. It was like, um, these like people with big heads just started arriving, teleporting in, a bit like Terminator to the present-day South Park. Turns out they're workers from the future, the future is so terrible that they have to come back to the past to find work. But they're like white Americans from the year 2050s and all the locals start treating them like immigrants and getting racist against these people from the future but like the blokes, basically, they want to do jobs…[…], actually what if the future is really terrible, what would that mean? It's a thought experiment, workers from the future coming back to get a job and treating ourselves, literally our offspring, as immigrants and what that would do to us. (K, British White, male, 40-45)

In the extract above, Paul observes that the cartoon series uses the future to comment on the present. This is a common use of futures, as being more about the present then an imagined state of existence. Fictional presentations of futures such as Utopia by Thomas More (1516) can be read as criticisms of society, or a challenge to present day readers rather than as a blueprint for an ideal society. Humour is also used in *Utopia*, as it is in Paul's talk about South Park, providing a cover from which to criticize. All talk about the future is a 'thought experiment' but there is a difference between those who are comfortable enough with both the future and their imagination to conduct and articulate such experiments. Paul can imagine and articulate different forms of the future, without necessarily resting on a single vision. He is a confident thought experimenter, playing with the future as a tool to push his imagination further in problem solving. In Paul's talk, the future is malleable and he shifts between past, present and futures swiftly, drawing on popular culture to articulate answers to questions about machine intelligence and work.

Alabi also uses a popular television programme to articulate a dark vision of AI.

> Alabi: Have you ever watched Black Mirror?
>
> *Interviewer: I'm not up to date with that.*
>
> Alabi: You should because the last episode was all about AI. I truly believe that two things are going to happen. One, when I worked at [large media organisation] I met this journalist guy who used to wrap his phone in foil, it's an investigator, he was a person in Syria, he did exposes on when the British sent espionage weaponry to Kenya and all of that, and it's massive. And he said that he reckons that very soon, very, very very soon and they're doing it now, there'd be crime by automation, the reason why he had his phone wrapped in foil is he said that there's constantly systems trying to connect phones with each other, so if you're being seen and you're on the list it'll pop up and next to yours it'll automatically connect, and then I'll be on the list. And he says over time there'll be able to predict if you're a terrorist, based on the people you hang around with, based on your profile, based on everything and you'll be in prison before you've even done anything. So in Minority Report, big big thing. And if you think that's not possible, if you look at history, people have been in prisons throughout history for being friends with someone, they put them in

> prison straight away because the perception they're going to be a problem, automation is now the proof [K, Black British, male, 40-45]

While Paul and Alabi, along with others in the knowledge case, are confident articulators of futures who value the process as crucial to business strategy, the Creators' proximity to technology development places them in a position of power in terms of shaping or perceiving that they shape future. In comparison, the Adaptors are left to visualize the imprints to be made by a technology that they do not talk about having agency over. As machine intelligence capital decreases, the visions may become more fearful. For Patricia, a Subsister, the future is divided between the machines and the workers like herself:

> Patricia: I have an image in me head, and that's another film, and I'm just thinking, computers are going to get too smart for their own good and they're going to outsmart people and then we're going to be in trouble. If a computer can outsmart a person, yeh, I think we are going to end up in trouble in future. [F, British White, female, 50-55]

Patricia says she does not trust 'computers' and she is not alone in terms of trust in AI (Sullivan et al, 2022). As a factory worker who has seen machines changing and replacing human tasks and sees her own working future as searching within the gaps left by machine intelligence, Patricia's visions are based on films and fear. Elsewhere, a technology enthusiast in the factory worker case, talks of the future with intelligent machines as unavoidable, that 'you may not like it, but you can't avoid it' (Max). Technological change such as that shaped by the work of participants in the AI case fall to workers in the factory case as a future to prepare for rather than contribute towards. The lack of agency felt or expected in working lives in the present for factory workers, in addition to visions within films, forms the basis of imagined working futures for those workers.

The next section considers how workers reimagine work and talk about agency in the implementation of machine intelligence.

6.3. The reimagination of human work: agency and choices

The factory workers who experience the least autonomy at work articulated bleaker working futures than the knowledge workers and AI developers. Even if they had not necessarily imagined a negative working future for themselves, or had successfully imagined possibilities around unemployment in a future with machine intelligence, this adaptation did not easily translate to imaginings of workers as a whole in those futures.

Sonya was one factory worker who did not imagine that machines could have a devastating impact on human employment, instead pointing out that people will always be needed to make and fix the machines. Similarly, Ida said:

> Ida: If you have that robot that can learn everything, what people say, you will always have some kind of errors. Human doesn't have- you have bad days- but you can't just broke so easily like the robots. So I still think the humans, you need a human everywhere and someone has to make the system for the robot. [F, Polish, female, 30-35]

Based on their own experiences of working with machines that regularly break down and require fixing, they imagine more of the same and thus the role for the human worker is limited to that of fixing the machines. Max, an Adaptor, shared a vision for his own working future with machine intelligence which was quite positive towards technology and his ability to work alongside. However, given the possibility that the technology could keep on developing, his talk about human work in that future is more doubtful than his own future.

> Max: Artificial Intelligence. Well just automation. It's just making the things smarter, making the things improve themselves so when you got to think about artificial intelligence, it will be something similar to humans, something that can make decisions, which can do things on its own. So once again it's trying to automate some certain things, at a higher level. At the moment, you can automate the individual task but if you think about you can automate the whole process itself, it will be a level higher.
>
> *Interviewer: It's interesting what you say there about 'improving itself'.*
>
> Max: Yeh, sounds scary doesn't it!
>
> *Interviewer: Where's it going to end? Are you optimistic about technology overall?*
>
> Max: I am optimistic, it's a good thing but it's also got some downsides 'cause if you opitimise everything and everything will be so intelligent and everything will be making things on its own, what are people going to do?
>
> *Interviewer: Be travel writers?*
>
> Max: True. But how you going to earn money? What you going to do for life? You've got one hundred people who write reviews all for one place, you won't read all of them, there won't be much demand for that kind of business so it is good but if you look at the statistics, we've got more and more people on earth. It's not like a depleting population, it's increasing, there's more and more of us. If you automate more of that stuff what are we going to do? Where's it going to end up?
>
> *Interviewer: What do you think will happen? Take the two jobs you've, you've already said the line production can be easily be-*
>
> Max: Automated, and I'm pretty sure it will be in most cases.

> *Interviewer: So what's remaining in that area - people to look after the machines?*
> Max: That's it but then you need one person to look after the machine that would take over 20 people, so it's like ticking another 20 work places off. It's great because it's fully automated, it's cost effective for the production side but not for the people who work there. [F, Polish, male, 30-35]

Considering Max's orientation to his working future being that of an Adaptor, he accepts that what he sees as forms of machine intelligence in that future are forms that he can work with and benefit from as a worker. Max talks about being a travel writer if he did not need to work for money but that was a playful attempt to imagine working if he did not need to earn a salary to survive. Comparatively, when asked about other workers, such as those he worked alongside at the factory, his tone shifts and becomes questioning, doubtful. In his own imaginings, the technology that he is optimistic about is also threatening, and more vividly because he has seen jobs being replaced already in the factory. Working futures with machine intelligence, a developing technology that is both developed by humans while developing humans, becomes perilous. Human workers are more controlled in work because that interdependency mutates into a relationship of cause and effect, between two agents: the optimised, independent machine and the humans. It is a challenge for Max to reconcile his sense of agency and positivity in his own, personal, working future with the unsettling experience of witnessing colleagues, or once having expected himself to be replaced by machines in the factory and having to plan to survive the drive for production efficiencies he agrees must take place.

6.3.1 The human body

As discussed in Chapter Four, the female workers in the factory case talk about the human body whereas workers in the other case do not. Lakshmi and Radtha both consider the future for the human body without work or if technology is used in a way by humans that they are stationary.

> Radtha: Everybody, easy, sit down, press it [indicates button], bring it, everything lining up, no people, all working machine. Put the sponge, put the cream, mousse, one person operate it and good thing. People got no job, make computer- robot making [cakes] and people, give the people the money. People sit down, stay home and eat. That's all. Robots. And everybody stay watching television. Unhealthy life. That's why, ten years time, coming, I think about [F, Asian, female, 60-65]

Radtha's vision of the future of human bodies is based on the experiences of her own work in the cake factory where she describes machines might soon exist that actually make the human work so 'easy' that most workers are left out of work and 'unhealthy.' Similarly, Lakshmi lands on a similar concern about the human body: its place in the world, its state of health and finally, its purpose on Earth:

> Lakshmi: Maybe, you say if smart technology has more advantage so it can do automatically everything. It ok, but people, I'm afraid people will be getting like a patient, everyone a patient, they will have to stay in a hospital or a home in the bed…People have to work. Without work it's not worth- machine coming- why is the human on this world? We don't need any human then like that.
>
> *Interviewer: So how do we save humans?*
>
> Lakshmi: [Laugh] Humans must work. [F, Asian, female, 35-40]

For Cat, the robots she imagines in the future were closely related to the ones she has worked with already. When asked what changes she would like to see in the future, her answer is preoccupied with the benefits for the human body:

> Cat: I think as long as they didn't affect your quality of living then any changes would be ok, and anything that means that, my job is a repetitive job, and like when you're old you might have arthritis from doing the, effects of the job, anything that you do to make the quality of life better when you retire, if you get to retire, would be a good thing. Any robots and stuff for helping people get up and move about, if there was something there to help them that would be good. [F, British White, female, 40-45]

The physical and repetitive work of the factory arguably emphasizes the human body in futures, both as benefit and cost.

Ela's talk connects technology and human laziness in the home. Ela describes the pervasiveness of technology's helpfulness in everyday life from the perspective of a Cyborg Hobbyist who does not assume that technology making things 'easier' is a positive. When expanding her view to that of collective futures she remains suspicious and questions the need for technology that reduces the effort in tasks that are already done by people.

> Ela: I'll give one example, Alexa, which I see on TV, the commercials, Alexa turn off my light, Alexa do research for this, Alexa this. And I kinda think what they're selling is poisonous, do we really need that machine to tell us, tell them to open the lights, can't you just walk there and open the lights yourself?...[…]…If you need necessary machines like medical, for medical for other things, yes, that's good.

> But sometimes, technology's too much of where it's you don't really need it but it's just there so it's like 'oh that's very nice, I'll have it'. It's actually making you more lazier. [F, British/Middle-Eastern, female, 30-35]

Ela's imagined working future for herself is broadly positive as she talks about being able to benefit from machine intelligence to pursue her hobbies as the technology would remove barriers by providing her the skills that she says she might lack. However, even in that vision of her own possible, she questioned whether she would feel fulfilled if she had the benefit of machine intelligence rather than the experience of slowly but steadily studying and building up her own skillset in time. She suggests she may even be bored if the learning is not needed because the technology is able to do those things for her (such as drawing clothing designs). Her talk of technology futures invokes human choice and agency: judgement of what is needed rather than what makes things faster.

> Ela: We do need machines and we do need the technology. But it depends how we use the technology. If it's going to be something that we can do already and it's just making us do it faster, maybe some point it's not a good idea. But in sense of other sections, like medical kind of view, hospitals we need this kind of machines so for them it's helpful and we need it straight away. For normal stuff, maybe we can do it ourselves in some part. [F, British/Middle-Eastern, female, 30-35]

Ida (F) and Lakshmi (F) also imply there is human agency in the development and implementation of machine intelligence in the workplace. They suggest that some human work could be protected by humans. Ela's talk suggests there could be choices about what is really needed. However, there is no sign in the female factory workers' talk of perceived influence over these choices, despite the projected changes being tightly bound up with their bodies.

6.3.2. Who drives the machine?

While there is perceived choice in the extent to which machine intelligence is implemented, none of the factory workers describes that choice as their own. None describe any expectation that they would be part of the debate, that they would contribute to those choices that they foresee. To some extent, this could be a limitation of the interviews which did not probe each participant's view of the citizen's role in technology development. However, the way the factory workers who envisaged that better choices could be made but did not envisage themselves as part of those choices sits in this study alongside the talk of some workers in the AI developer case who have placed themselves within that debate through way of specialist skills, knowledge and their own networks – utilizing forms of capital.

David (AI) talks about being secure in his position as someone who is 'driving the machine' and therefore, he does not fear its rise. This personal standing and that of his business colours his articulation of the broader horizon of futures as a whole:

> David: So running with nothing is new, everything has happened before, you know what would people have done in the days of cotton [gin] or the weaving machine or something like that. So there you were someone who picked cotton or something like that and then the machine comes along and that's going to pick cotton and I suppose in the absence of knowing a real answer you would look back to see what people would've done in the past…options include, learn how to drive the machine so you become and operator of the machine or learn how to move your job to a higher level so you're designing the

> patterns that the carpet making machine will make. Or find another job or move to another city or something. So I think the idea might be, you know… change is unlikely to be instantaneous but I would think that if you're smart you would try to figure out what change the machine would make and see how you would be a net beneficiary of that change. So… if my machine can do literally in one second what a lawyer fusses around to do in three days, and I go to talk to lawyers and some of them go, yes I'd love to use your machine and others go, I'm going to keep doing what I'm going to do, the machine's not going to change anything, the writing's on the wall…[…]…I would think the lawyers who go 'we will build a different type of business, it can't be the same business, 'cause I can't charge by the hour if four days become four seconds' …[…]…So I think the idea is to look at the changing world after the machine and see how you can benefit in that space. I guess, you know when you look at any time there's a significant change, it might be in a war people are put in a concentration camp, or in a regime change a company that had a Tsar becomes communist, in every scenario like that some people in society thrive and other people wither[…]…, those who are enterprising will embrace changes and those who expect the state or someone else to provide will not do as well. [AI, non-British White, 50-55]

Without the context that David has already described himself as a 'driver of the machine' (because he contributes to the creation of an intelligent automation product) his talk above masks the role of the technology developers in the inevitable changes that technology will drive. Therefore, it is important to contextualise his talk of collective futures in his social position and his forms of capital, from economic through investment in technology development, cultural capital required to appropriate the machine intelligence and also the social capital from his role as a CEO and technologist.

David talks as though the changes are inevitable having already said they are also ‘driven’. From this position, those who ‘do not prosper’ are explained by their resistance to change or their perceived expectation for ‘someone else to provide.’ David’s view is that workers who work hard and embrace technology will inevitably be more advantaged than those who ‘think society will provide for them.’ Individual agency is absolute in his dichotomous idea of society. Relative disadvantages are disconnected from structural cause. As a longtime successful worker in the technology field, David attributed his achievements to his long hours, doing what he finds most interesting and his positivity towards technology.

In this talk, human agency in the shaping of technology is heavily weighted towards the Creators, the technology developers and the ‘drivers’ of change. Human agency is not present in the uses or the implementation of technology but instead sits small and makes choices to mutate, to take a shape that allows survival in working futures alongside that technology. The same sense of a bending to fit into leftover spaces is also fundamental in two orientations towards the future- the Adaptors and the Subsisters.

In David’s talk, the imbalance of opportunity to prosper is a built in, longstanding feature of human history. Alabi (K) articulates a similar sense of inevitable imbalance of both benefit of and control over the technology but from his position as an outsider to machine intelligence development as well as having experienced both class and race based inequalities:

> Alabi: The way it would work if you look at the industrial revolution, this is just my perception, is that technology will be used to control. So, the good in the technology will be taken by a minority and the bad in a technology will be given to the majority.
> *Interviewer: And who is the minority and who is the majority?*
> Alabi: In the same way it’s split now, the top 2% or top 5% vs the 95%...[…]…in the same way we said chicken and egg, they have the

> wealth to define what they want technology to be so if they want to build, if they want to build a thousand cars and convince people to drive in these cars, while they're driving in their own car, that's perfect…[…]…Drug dealers don't do drugs (K, Black British, male, 40-45)

The future vision articulated by Alabi is a continuation of his views about the present. While some workers experience proximity to technology development which impacts others and creates a sense of security from negative consequences of AI, others have bleak future visions based at least partly on the absence of agency in that technology development, despite their capacities in projecting futures.

The next section considers the talk of workers who talk about the possibility of a change to the systems of value, which in the context of these bleak outlooks, render visible a glimmer of hope that human workers' agency could be protected.

6.4. Changes in systems of value

As David (AI) looks to the past to articulate collective futures, Jun (AI) does the same but with a different purpose and result:

> Jun: I think more and more, the way I see things is that we know we can't beat the machine, the same was as, as how we can't fight automation, so say for example industrialisation, pre-industrialisation, people were making everything manually by hand, so hand made. But I think it's about how we value the human relationship so therefore, I think industries or fields where it's really more about human-to-human relationship becomes even more valuable I think, that's my view. Because I think that's something that at least right now I can't

> see how that can be replaced because we don’t exist purely for utility. I think around existence, around doing things purely for utility, becomes less important and it’s really more around, around I guess the soul, if there’s such a thing. […]…
>
> *Interviewer: So if you’re doing things more for fulfilment and for the soul of society, for other people, what happens to capitalism?*
>
> Jun: I think, that has to evolve, I think going back to my Star Trek notion, I think the only way it’ll work where it’s not a dystopian world, where you have a super-rich overlords who control all the robots, who are suppressing the humans, the only way for that to happen is really for us to change the way we value, the way value things, to change around ownership, to change the way government thinks about money, I think that will probably take some time. [AI, Chinese, male, 35-40]

Jun, drawing from Star Trek (which he says contributed to his interest in Computer Science and eventual move into machine intelligence work), offers an option to avoid an otherwise certain dystopian machine intelligence future.

> Jun: So there was an episode, I don’t remember which episode necessarily, in Star Trek where they, so there’s Jean-Luc Picard played by Patrick Stewart and I think there was a time travel element because it’s Star Trek so there’s always a time travel element. And I think they somehow imported someone from the 21st century to where they were in the 24th century. I still remember this quote form Jean-Luc Picard and he was telling this person from the 21st century, you know in the 24th century, we no longer have money and therefore a lot of the issues, the wars and fighting for money, economics no longer exists in the sense of money. And I guess that is a utopian future, that eventually we move beyond money and it would be lovely …[…]… we

> need to reshape society's relationship to wages, which has always been the reason why we all work since the Industrial Revolution, has always been about money. [AI, Chinese, male, 35-40]

Imagining a world without money forces a rethink of the coupling of work and wages, and the representation of value in a society. Will (AI) is open to considering radical ideas but in comparison it is very much in line with the existing systems of value:

> Will: I'm sure there's a lot of valid fears as well, yeh I really don't know on the political question. I think we should be prepared to consider radical ideas, not that one is necessarily a winner. People talk about universal basic income, people talk about different ways of structuring society in a world where a lot of stuff is automated. People still need work, right? People still need to feel useful. Maybe it's new kinds of job. People use the example of how many social media managers are there now? Like five or ten years ago maybe that wasn't a thing. Maybe not the best example to use but maybe new classes of jobs created, whether those jobs, how useful those jobs, I dunno, maybe we'll all be doing vanity jobs all about making people feel good or selling people things or creating a need, like advertisers have always done, like creating things that people didn't realise that they needed before. Like they've got all the basics of life kinda automated for them so I don't know what it is they're going to persuade people that they need!...[…]… I guess the idea [universal basic income] is you give people enough to survive and if they want something they need to find a way to earn more for luxuries. Yeh, I don't know. I mean, it's an interesting idea but it's got problems. At least considering these radical ideas, I think just more of the same with capitalism, I don't know how well that's going to work. Already starting to see issues with democracies starting to be undermined and, yeh it will be an

> interesting time to live in but I don't really have any expertise in what's going to happen here. It's like, find a political scientist or economist. [AI, British White, male, 30-35]

Will struggles to articulate a full view of his vision of the future, touching on 'radical' ideas but ultimately avoiding any conclusive comments, stepping aside for the experts in political science or economics to comment instead. Paul on the other hand, is open to talking about change and talks about the value of objects being influenced by the prevalence of machines in the workplace:

> Paul: More obscurely, the value of having a human made product or a human picked product versus a machine made or machine picked product. Can you ever imagine there being a sort of price premium? Once AI becomes absolutely everywhere, I can easily imagine that there would. [K, British White, male, 40-45]

Going further, he imagines how AI could help individuals benefit from this redefinition of value:

> Paul: I definitely imagine a role for AIs generally for individuals which is about brokering the value that they have in time they're not using, or resources they're not using, I dunno, renting out their kettle or their flat or, and find [an] optimizing market rate and checking people's trusted [ratings], do you see what I mean, tied with the insurance system [….] I think that's a vision where you're using AI to empower someone as a trader of their own assets and resources as opposed to AI being owned by the employer to attract employees. I mean I don't feel like this is being done at the moment, but what would AI look like if it was employed by unions as opposed by employers. [K, British White, male, 40-45]

While Paul reimagines the worker as a ‘trader’, Alabi’s futures are more fixed as technology is perceived as a product of capitalism- while data is a currency, the fundamental point is the same value systems which he sees as reproduced, endlessly.

> Alabi: Technology at the end of the day is a capitalist thing. It’s for people to make more money. Why is Facebook obsessed by data? The more individual, the better the quality of data, the money they can make and the more control they have. [K, Black British, male, 40-45]

Similarly, Antonia (K) also does not reimagine the system in which work is carried out and valued but instead questions if any of the systems that make it up can ever change:

> Antonia: I worry bringing in automation slims down the people required on the planet which ultimately just doesn’t serve the needs of the number of people on the planet! So it seems like an odd thing but it comes back to the whole capitalist model that we live within, which is this constant… this constant need for growth, you have to be chasing more, more, more the whole time. Actually maybe, what’s enough? Can we just stay in a steady state and not feel like we have to keep making more money? But then that’s the way the whole system’s set up isn’t it? Pensions systems, education system, everything. [K, British White, female, 35-40]

Visions of change, radical or otherwise, while hinted at did not emerge in Antonia’s talk. Jacqui (K) takes the approach of explaining why the better choices are not likely to be made for society.

Jacqui: I think the problem is everyone's focus is always on what's the most cost-effective way of doing something.

Interviewer: What's the reason for that?

Jacqui: Because everyone's always thinking about how much money. So in my particular organisation it's about our budget and how much money we've got to do things, and if you've got to do you've got to try and get the cheapest possible, and the view the cheapest possible is you can't do all these nice things or have a nice work environment or think about you Corporate Social responsibility. You'd probably just do a little bit to tag it onto the side because you want to demonstrate you're a good person, a good organisation for society. And in a commercial company again, if you're on the stock market you're probably focused how can you derive profits, and again it's trying to go for the cheapest suppliers you can. Whereas if you think about it on the whole, yeh I do agree, and I think that's where you get those little companies that can try and do a bit more – they're smaller and so they're not so focused on trying to make the biggest margins available to help those people who invest in them. I think it is a good direction but at some point those companies are going to grow to a point when they then tip over and go 'actually no, we need to make sure that we make massive profits' and the stuff to go first will be the nice to haves. Buying paper from a more ethical provider but it will cost more money. And things like that. [K, British-Chinese, female, 30-35]

There is a sense that change is possible but it is of note that the most fully formed vision that avoided either doom or continuation of existing systems of value to the detriment of human workers was based on Star Trek in the 24th century. The future may need to be much further away for visions of social transformation to be imagined and articulated by workers.

Roly (AI) talks about the past repeating itself and that changes will happen but that workers will react rather than be led through the changes by government, using Brexit and the US Election 2016 as signs of job losses not being managed:

> Roly: In terms of all the people who used to flourish in the world of manufacturing plants today saying, "guys my job has gone away, you might be doing very well somewhere else, my jobs are going away, it's because someone else has taken my job, I want it back, I'm going to go against everything that, all the changes that you've done in the past two or three decades. If you want NAFTA, shove the NAFTA." So they're holding up all the changes that society, and the economic changes that have happened in the last thirty years responsible for the state that they are in. And part of it is because the leadership, the society leadership, haven't, hasn't explained to people, let's say in the north of England, that this is going to happen, it's inevitable, and how they can manage that change themselves. So, that's a reflection on what's happened in the past and my view is again going to happen again in the future. When overall the world will come out in a better place with AI, the parts of it, everyone is not going to come out as well as everyone else. And if we do not manage that change in society it can build a groundswell of resentment, negativism, a dystopian view etc, which could be counterproductive to society. I would argue the Brexit is an outcome of the impact of globalisation and the inev- or the failure of the political leadership, both parties, to actually manage the communication of the impacts of globalization and therefore, the poor people from Eastern Europe are being held responsible for the change that was inevitable because that change was never communicated by both the parties and the benefits were never communicated- and it was also not managed, people were losing jobs up north. What are

> they going to do?...[…]… you would say that people would learn and do a better job next time but that requires someone to take a long view of the technology change and lead the country, the society through that long view. I don't see that happening, I hope it happens, but I don't see that happening. And therefore, the risk is AI is gonna be inevitable, it's gonna happen, it's gonna benefit the society as a whole, it's gonna benefit a large segment of that society but it is not going to benefit some parts of society. And to the point about inequality, it is going to create further inequality if not managed well. And I don't see, unless the technology leadership, the leaders from the technology world say, we gotta manage this better this time. [AI, Asian, male, 40-45]

For Roly, a Creator, it is inevitable that there will be AI led changes but that these changes need to be managed by governments so that workers are not resentful. There is no reimagining in Roly's talk -only that of educating out of inevitable inequality, which will be discussed in the next section.

6.5. Educate out of inequality

In Chapter Four, education was discussed as a means to gain agency over working lives. Here, at a macro level, it is discussed as a means to ease inequalities that AI could exacerbate. For the developers in the AI case, it was clear that there would be inequality repercussions of widespread AI implementation, such as significant changes or loss in work for some groups. In modern capitalist society class positions still shape expectation and life chances (Platt, 2011; Savage et al, 2013), class restricts or emboldens expectations and possibles (Bourdieu, 2010). A stratified society means inequality of opportunity from birth, designating futures as significant in understanding the structures, experiences and effects of inequalities.

> William: Yes if you work hard and you've got a goal, you can achieve something, if the aspiration is there, then I think the UK is as good a place as any. Do I think it's universally applicable to everyone? I don't because I don't believe the UK is actually very good at evenly encouraging people, so giving people the right aspirations. So actually thinking that is possible, and then also I don't think society is particularly equal and I get very upset how unequal, so, people who start businesses are predominantly white men, white middle aged men from wealthy backgrounds, for instance, that's who starts businesses, it's people exactly like me. [AI, British White, male, 30-35]

William imagines devastation if the government does not prepare well for machine intelligence. In particular, he talks about the immediate need to invest in education to avoid exacerbated inequalities. His talk is based on self-awareness of belonging to the group in society most likely to succeed.

> William: It's all about education. If you've got companies paying billions and billions and billions investing in machine learning and AI, it's basically investing in physical capital, you know, machines. There needs to be a corresponding investment in humans to help them keep up or retrain and it's actually about inequality. Fundamentally, it's entirely about inequality because you've got two factors going on. Someone who's not trained in any particular skill, who works on a repetitive task, replaced by a machine loses in two ways. They lose their job and they also lose economic control of a tiny corner of the economy. Whoever own the factory or owns the machines which replaces that person, it's back to Karl Marx and the proceeds to the [] so technical, so when I did my business [interrupted by someone wanting the room] so basically the biggest problem coming is inequality and the way to tackle that is breaking up monopolies and investing in education. [AI, British White, 30-35]

Roly (AI) spoke about how manufacturing jobs have been replaced by services but that the change was not managed, causing resentment amongst workers. He said that if the leadership unwilling to explain to those likely to be negatively affected by AI that this is likely to happen again.

> Roly: …especially as AI is more, um, [pause] there's a higher dependency on education, on a good quality education, you will create- you run the risk of creating not only the have and have-nots but can and can-nots. [AI, Asian, male, 40-45]

Roly's talk about the need for management and preparation for AI as a society reflects his own experiences of inequalities and his belief that education allowed him to take part more successfully in the workplace:

> Roly: AI is inevitable, it's how we manage the inflection of AI, will make the difference between a successful society and…Key is education, education as a preparation but key is also bringing the society, those who do not have education or those who happen to be in parts of the country where it's just going to be difficult to take part in the AI economy, how do they get, what is the role, be clear about the role they play in an AI led economy and how do you bring them along? [AI, Asian, male, 45-50]

These views contrast with Paul's (Knowledge, British White, 40-45) view of a university education being more likely to provide value through the networks and social capital than the knowledge gained:

> Paul: Social mobility has actually reduced in the country over the past ten years and we're below other countries in Europe for social mobility. So, and there's an awful lot of interlocking factors around access to capital, as well as access, in terms of finance but also in terms of social capital, access to networks and all sorts of things, that actually tend to compound one another, so if you have a higher amount of it you tend to create more opportunities and if you're low, you end up getting locked out more. We're talking a lot about university but I think that is increasingly expensive but also I would say, an opinion rather than a fact, probably more worthwhile for its network capital rather than its actual ability of a degree to transform somebody, rather than the knowledge itself being the transformative element. [K, British White, male, 40-45]

When the Creators are talking about education to prepare for machine intelligence futures, they are talking specifically about education that will help people do jobs alongside machine intelligence. In contrast, Paul is stating the social capital that is gained from attending university. Roly talks extensively about education and is clear that is linked to class:

> *Interviewer: And what do you define as class?*
> Roly: Um, [pause] it is, er, a network cemented by long time of bonds created by wealth, proximity to power, education. [AI, Asian, male, 45-50]

Despite his understanding of education being linked to social capital – which he says he did not benefit from as someone without a British education- when Roly talks about education in the context of working futures alongside machine intelligence, he very specifically refers to subject choice – Computer Science:

Roly: I'm slightly cynical because inequality in this country and the complete degradation of the northern economy, it's been going for decades and neither party has ever taken, made an effort to change it. So you, especially as AI is more, um [pause] there's a higher dependency on education, on a good quality education, you will create- you run the risk of creating not only the have and have-nots but can and cannots. Say even if you, say the, well, "ok guys, we're aware of it" and now there's a whole generation coming out of schools and universities without very basic maths and science, even if you try, you can't, what are going to do? And I think there's another interestingly, I have a view where the current education system in my view is going to further worsen the gender difference.

Interviewer: Really, in what way?

Roly: Go to girls schools, both private schools and state schools and see what the girls are going to do after school, how many of them actually do hard science, hard maths etc. My kid has just done, she's done 11+, I've just been going around looking at girls' schools and looking at, it's there on their website, they're doing the same subject they would've been doing 40 years back. There still being, I think in this society, there is still a view that the girls, the schools prepare girls to get married and do their home work. If you look at what they're being taught, I having arguments with the headmistress of my elder daughter because, and they're like very good school, they take kids who are really, really good at maths, all of them but they're even trying, they do a, you know when you select the GCSE subjects, I went to a parents are invited, for all the different subjects teachers talk about the subject, basically they're trying to sell you the subject. And all the teachers from arts to history actually talked about geography, history, all of them I wanted to go back to school afterwards. But computer science? Absolute…[shakes head] so coming out of that all the girls were saying 'I'm gonna study history, I'm gonna study arts, I'm gonna study arts,' no-one was doing… [AI, Asian, male, 40-45].

For Roly, education should be explicitly linked to building machine intelligence capital, with the idea that this will help to balance out the perceived inevitable exacerbated inequalities. As a Creator who himself has at times faced class and racial inequalities, studying the machine is the more plausible way to benefit from machine intelligence in working futures.

The next section will discuss how workers who do not have close proximity to technology development talk about it.

6.6 Perceptions of technology development

This section focuses on the talk of workers in the factory and knowledge cases when asked to describe what they imagine developers of machine intelligence technologies take into consideration. Ida and Cat describe a perceived disconnect between the ‘progress’ the developers might think they are making and the impact on people’s jobs:

> Ida: I think they are so happy that they are making some progress maybe they don’t even think about the future and how it can be, how all of that new stuff can impact workers’ life. [F, Polish, female, 30-35]

> Cat: I think that the people that are making it, I think the impact they’re thinking about is the more positive side of it and they’re not worried about the concerns of other people like at the lower level who might be, who rely on their jobs, in case something comes along and their job’s taken or replaced by technology, they’re not seeing that side of it, they’re just seeing how efficient it is to get the job do faster and better...[…]…They think that there will be a bit less waste if it’s automated and stuff. [F, British White, female, 40-45]

Max, the only Adaptor in the Factory case, agrees that there are two things at play with developers – creating something 'cool' and those who want to improve a process to make a profit:

> Max: I think that the people are split in two categories. The people who make the machines to make money, to make a profit, have to improve the process. And there are people who build the machines because they are like that's really cool, and that's the future. So, I think the other part to make things to help us, to improve our lives, that's a good part. And, do you know Kickstarter, there are so many inventions there, there are young people who invented things there and if you go through them, the most common thing is automation. At the moment we're experiencing an absolute revolution in the home automations. It's getting so popular now. I even went for it. I been actually trying how does it work, can find out if I can do it on my own and not buy ready made solutions. [F, Polish, male, 30-35]

Kickstarter, a crowdfunding platform, points to technology being developed at a smaller level for public benefit. This contrasts with, for example, the Amazon Alexa referred to by Ela (Factory, Turkish, 30-35) in her view that the industry does not think about the social impacts of their products (in this case, Ela talked about Alexa making people lazier). Max's knowledge of the projects developing in Kickstarter is important to understand his view of technology developers potentially being people who are not too far removed from himself – someone with an idea to try and automate homes.

Jacqui, a knowledge worker made use of her social network which includes people who work in technology development to help articulate how technology developers think about their work and society.

Jacqui: My experience of looking at people in the tech sector- especially people who develop these things, they usually come up with a solution because there's a really specific scenario where they've got a particularly skilled solution and then that solution is adopted to other things and get misused. I kinda hope that they think, when they come up with this idea, initially, how it could be misused, so they sort of, they put those warnings in in the first place because I think a lot of times when we discover later on that these things end up doing something terrible, it's because they hadn't quite anticipated this in the first place. And someone going, 'oh this is a really good idea, I can use this for this other thing' and that's where it goes wrong. [K, British Chinese, female, 30-35]

Antar, a knowledge worker who has become more involved in diversity projects at work as a result of realizing ethnic minorities were less likely to be promoted where he works, is anxious about biased data but 'hopes' somebody has oversight ultimately:

Antar: I think some of them think about it, I hope they do. It depends on what level of that food chain you're at, not sure people involved in writing the codes that go into these things are, some of them are thinking about it. Sure that a lot of them are focused on their task in hand and making it the best they can at doing the job they want it to do. Really gotta hope that some people higher up the food chain are overseeing it, some big decisions at least are bearing these questions in mind. There are at least some people who are doing that, you hear about ethics panels being appealed to, hope that then evolves into a matter of course rather than just a select group doing those sorts of things. All the stuff we talked about is about data, past data being

> used as a predictor of the future in other circumstances, you have to find a way of acknowledging and understanding as well as being fully aware of the prejudices that are being built into that data and things that are revealed within that. I've only read a few articles but the stuff about things being used for calculating sentences in the US justice system and how that's based on prejudiced data so you're already going to be perpetuating those problems. [K, British Asian, male, 35-40]

While Antar's talk is not overly optimistic or trusting of existing structures in place to ensure developers consider the social impact of their work, Paul's view is based on his perception of 'Silicon Valley' workers.

> Paul: I don't really know any developers of this technology actually. I suspect they're coming at it from a place where they are reasonably well aware of some of the perceived threats, I imagine there's a high crossover between the people who work in this field and people who have consumed a lot of science fiction about this world so I feel like they're well versed in that. I expect that they are also emotionally coming from the Silicon Valley type of place. My perception of that would be that they are a sort of, have a sort of evangelism about the idea of disruption and that disruption always leads to a positive outcome which I think is almost never actually the case. …[…]… I sort of think, I suspect they have a very benevolent purpose but I also think there's a certain sort of spiritualism around some of this stuff that can lead to unforeseen consequences because you spend all this time focusing on the positive side of human nature and not on the negative side. And maybe people's own perceptions, I mean we talked a lot earlier about privilege, which I'm sure you designed on purpose, but people may be unaware of that privilege actually or they may be looking at the world from a particular, like an embodied viewpoint rather than the viewpoint of an outsider. You know, I think, you could

make a strong argument that the history of the last, the history of the whole, certainly of American history but probably global history is about failing to appreciate or understand structural inequalities in how things are delivered. It's like [some British institutions] you know come from a nineteenth century idea about universalism, like universal NHS libraries, but actually society doesn't grant equal access to all groups, so those universal things will usually end up benefitting some groups more than others and I suspect that might also be the case with AI in the way is been designed, who it's being designed by. [K, British White, male, 40-45]

These views suggest that structures, such as regulation, could be formed to ensure that machine intelligence does less harm than it otherwise could do in society.

William: You know Aesop's fables, the Scorpion and the Toad? It's the, I think it's the scorpion and the frog or something, the scorpion says can you swim me across the river, and the frog goes oh no you'll sting me, and the scorpion says oh I won't sting you because we'll both drown. And they get half way across and the scorpion still stings the frog. Frog's like, what? And he said I'm a scorpion, what do you expect? … I don't know, businesses aren't, you know, getting businesses to self-regulate doesn't, doesn't work. [AI, British White, male, 30-35]

Paul (K) talks far more cautiously than William about the need for regulation. For both, it is talked about as a necessity but for Paul, there is also a need to talk about why, the reach of the technology into everyday lives and the potential impact of that.

> Paul: So part of their power to disrupt comes from the fact that they are extra-national corporate bodies, they have no, the public has no power over them. And governments have limited power over them…[…]… I suspect people would probably view creating that sort of governance or oversight of something as maybe anti-competitive or heavy handed but I wonder if, if something has the power to effect all sorts of aspects of the way we live, and I think you would look now at, I think it's reasonable to say that our digital technology overall has a vast amount of reach into our daily lives and the systems, like the fantasies, like cultural robots like Mr Robot or Hacker type things, I suppose you could look at the Russian government, well, some people believe they hacked the US election, whatever. There's an awful lot of, it's true there's a reach of digital technology into society, so um, the creation of software agents, tools that are able to make decisions independently that could ultimately affect all sorts of applications I think it's reasonable to question whether there should be some form of international oversight of that. Maybe not over the development of that or of the patenting of the technologies but over the legal approval and weighting of some of those things…[…]… not to restrict but to balance and to pose implications of Artificial Intelligence technologies and how they might apply in a variety of circumstances thinking about interest groups, parts of society that may not be being considered because they're not currently within the perspective of the profit motive. [K, British White, male, 40-45]

In Paul's talk there is an acknowledgement that regulation (if too heavy) may restrict the development of artificial intelligence. Paul talks about the potential for a means to 'balance' and consider the implications on different groups in society.

> Jun: I'm optimistic that the government will evolve to rebalance that, to start to think about everything from taxation, to funding to rights to legislation, to ownership, ownership is a big issue, for example intellectual property, why should one company own intellectual property to an algorithm? I mean intellectual property laws were created in a different time to protect something else and usually, I believe the, the laws where there to create, to protect the interests of the wider society, it's always been social, and I think if that's no longer the case for very large multinationals controlling everything then it needs to be changed to be the case. And I think it feels like large companies know that too, they don't want to be broken up, they don't want to be hamstrung, they're starting to regulate themselves but obviously they haven't done such a good job. But I'm optimistic about that, yeh, I like think that the human race is not that stupid but that's just me, I might be wrong. (AI, Chinese, male 30-35)

Jacqui (K), as an engineer with knowledge and proximity to technology discussions, promotes more public knowledge to help regulate developers, suggesting that the lack of public engagement with the questions of technology gives developers too much freedom in which they can do harm that they otherwise would not be able to cause.

> Jacqui: I always just think everyone should really question, how does this world work, why does it work, and just not take it for granted. And this comes from my perspective being an engineer because for me when I hold an object I want to understand how it works, and understand these are the physical products, these are the minerals and this is the impact on the environment for the things that contribute to your smart phone for example. And people just take it

> for granted without having to do any of the [] because it's all consumers rather than creators. I just feel like it's really important that we understand how the world works around us. …[…]…I think if people were more aware of it people who write those programmes would have to think more hard about the data and how they use, and things like that because at the moment they can get away with quite a lot because they assume no one can question it. But if there's greater visibility in what they're doing and what they're using, they might have to be a bit more careful about what they do. (Knowledge, British Chinese, 30-35)

These workers have experience of working within regulated industries and consider regulation in their work either in the past or present. It was easier for these talkers to think about this angle of the future of machine intelligence and work because of their existing experience. This section has described the perception of technology development and highlighted the possibility of structures, such as regulations, or a more engaged critical public as a means to increasing the likelihood of benefits from machine intelligence for society.

6.6 Conclusion

Following on from the last chapter's focus on workers' imaginings of their own futures, pasts and presents, the current chapter gazes further afield to encompass the visions of collective working futures with machine intelligence. The present chapter has focused on the third sub-question about development and potential for socially beneficial consequences of machine intelligence. These visions of collective futures are tempered by workers' interpretation of not only their own pasts and presents but their views of the history and their current social structures. This chapter provides the visions of workers talking about other people's work, rather than simply being referred to within the talk of others who yield more symbolic capital to be heard. It is the result of the sociotechnical imagination which resists technological determinism and encourages engagement with the experiences of everyday work to explore structures of power.

Machine intelligence capital lends itself to slight optimism in the collective futures, influenced by the same in the individual futures as set out in the five orientations in the previous chapter. The potential for social transformation is grounded by the experiences of intersectional inequalities – the painful realities of social structures that already exist- as well as the distrust of machine intelligence developments, heightened for workers who have witnessed the 'vulnerability' (Jetha et al, 2021) of human workers and the physical impact of machines.

The talk of workers as they imagine working futures offers a glimpse of the perceived parts within the social structure that are not determined or fixed in those collective possibles. The idea of transition that finds its way into this talk points to the potential for social change within the modes of reproduction in which the dominant perpetuates social positions over time, moving between forms of capitals. Futures can be used to analyse of symbolic power:

> 'Whose visions of the future are built into the underlying models, who controls them and what social groups are capable of "gaming the system"?' (Suckert, 2022)

As such, Bourdieu's account of social reproduction must be understood within his theory of change (Fowler, 2020) to elucidate the meanings of futures of work with machine intelligence as influenced by social positions.

The next chapter draws the thesis to a conclusion, beginning with a recap of the research questions and approach before discussing the findings and original contribution to knowledge.

Chapter 7: Conclusions

In Marx's philosophy, as discussed in Chapter Two, the essence of humanity, or the *species-being*, is fettered through estrangement created by wage-labour (Marx, 1844, 1992), separating the worker from the object they produce, alienating them in the act of production and mediating relationships with themselves and others. Work – or 'life activity' (Marx, 1844, 1992: 328) and the experience of work is at the core of humanity, what it means to be human. The topic of the future of work (FOW) and machine intelligence quickly becomes a question of what it means to be human for some of the workers in Chapter Five and the cyborg relationships we are made up of, as discussed in Chapter Two. This thesis is made of talk of work, working futures and machine intelligence, having acknowledged in the first chapter that these everyday experts of working experiences are absent from wider discussions on the topic. Here, they have been placed at the centre to imagine and articulate their experiences with work, central to the *species-being,* and relationships with machine intelligence.

Suckert (2022) reviews the potential contribution that imagined futures could make to sociology and writes that with only a few exceptions, scholars are yet to explore 'how future orientations are intertwined with structural positions of power' (26). My research has encouraged and treated imagined working futures as spoken by workers as sociological artefacts. This thesis contributes the development of imagined working futures as a perspective that encourages new ways of seeing old research problems, such as that of experiences of structural inequality. My research sought to find out how social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures. To answer this, I brought STS to the sociology of work, drawing on Bourdieu's relationality and symbolic capital through an intersectional lens. This final chapter draws on the evidence presented in the thesis to highlight that futures point to the social positions of workers burdened with perceived obstacles from social divisions, while exemplifying the exertion of symbolic capital, or power, of other workers. The following sections conclude the thesis with the overarching findings which focus on intersectional agency in working lives. The rest of the chapter posits the original contribution made by this thesis – particularly its combination of the two sub-disciplines of Sociology – to knowledge. The chapter will also consider the limitations and areas for further research.

The chapter begins by recapping how the research questions put the sociotechnical imagination, conceptualised in Chapter Two, into action.

7.1 Recap of the research questions and approach

> How do social inequalities influence workers' experiences of the presence or promise of machine intelligence and their projections of working futures?

This question assumes futures matter, drawing on STS analysis of imaginaries as well as Bourdieu's ideas of expectations matched with social positions, as discussed in Chapter Two. Some people's imagined futures are rendered more plausible and more likely to be designed into reality. Therefore, to answer this question, I operationalised the sociotechnical imagination to encourage working futures, which are valuable sociological artefacts. Twenty four semi structured interviews were conducted in 2018 in England across an intersectional sample of three groups of workers: 1) developers who work in the field of machine intelligence, 2) knowledge workers with some future focused aspect in their everyday work and 3) factory workers who work with physical machines and have experienced their work change and be replaced over time by machines. The sample selection was instrumental to answering the research question as the groups included the voices of workers at intersections of gender, class and race as well as proximity to technology development. Bourdieu's capitals and habitus elucidates differences between the workers.

Class is difficult to operationalise (Savage, 2011) and I have taken the level of control experienced at work as an indicator of class, as described in Chapter Two. The workers who experienced high levels of autonomy at work, those within the AI and knowledge cases, also expect such autonomy. The factory workers who talked about feeling devalued at work with little self-actualization within the workplace or options to progress, as well as perceiving limited options for work in the labour market, also talked about forms of control over their work tasks. However, one commonality to some extent is the stability offered by having permanent employment in the present at least. Within the groups there are differences in the level and type of that job security, with some workers focusing on keeping up with changes so that they do not become redundant while others fear replacement. Nonetheless, at the time of the interviews, all participants were in paid work.

The main research question was broken down into sub-questions focusing first on the past and present before moving to the future, providing a manageable temporal structure to the project.

a) How do workers perceive their working conditions, management control strategies and their social position in the workplace?

This question most clearly delineates the workers in the study by class. I asked questions about the tasks that they completed at work, the sense of control they have over the way they work and flexibility. To encourage talk of the past, I asked questions about education and previous jobs. To explore talk about perceived obstacles, I asked questions about the idea of meritocracy and confidence in job applications. The discussion guide is available in Appendix 1.

Workers in the factory case talk of experiencing mechanisms of control over the ways in which they work, their body at work, and how they work alongside machinery, to an extent that is not heard in either of the other cases. The Knowledge and AI cases are familiar with notions of autonomy but do experience masked forms of control in work, such as likelihood to receive a promotion. Perceived relevance or the means to remain relevant in the FOW with machine intelligence differentiates the five orientations found in Chapter Five. This relevance factor is shaped by the forms of capital held by the workers including machine intelligence capital. Machine intelligence capital is seen in knowledge about machine intelligence, confidence to learn to use it and capacity to articulate imagined machine intelligence forms in the future. The workers in the factory case (apart from Max, the only male in the group who was interested in technology and was an Adaptor) formed two orientations to the FOW alongside machine intelligence: the Cyborg Hobbyists and the Subsisters. Apart from Max in the factory group, the workers in the knowledge group who were from ethnic minority backgrounds as well as one British white male worker formed the Adaptors. Other workers in the knowledge group formed the Future Proof. All those in the AI case formed the orientation of the Creators.

The next section will zone in on the sociotechnical imagination, which was developed in Chapter Two.

7.2 Working futures as sociological artefacts – the sociotechnical imagination in action

The second and final sub-questions focused on the future of work:

b) How do workers describe machine intelligence, its development and potential for socially beneficial consequences?
c) What are the most positive imagined working futures and configurations of work for workers using machine intelligence?

Chapter Two of the thesis conceptualised the sociotechnical imagination for the task of bringing together machine intelligence with the FOW and social inequalities – emphasising this as a single topic, bound and seen whole in workers' futures, which are fundamentally powerful sociological artefacts. Thinking about the FOW with machine intelligence was, for the participants, a thought experiment as part of an academic study which sought them out and asked questions about their working lives. In public, others who answer the questions regarding the FOW are doing so because it is their job to do so as experts or public policy makers, forming the 'elite sociotechnical imaginary' (Smallman, 2020: 592), resistant to public perspectives. Such futures are imbued with symbolic capital, indicating that futures are ripe for power analysis. This thesis reclaims futures from the elite to become a means to unpick social inequalities, seeing futures built out of social position, capital and habitus (Bourdieu, 2010. 2014).

The concept of the sociotechnical imagination developed from the interaction of the two sociological disciplines where this thesis originated. The sociology of work's preoccupation with the lived experience of work, centring on the voices of workers and the contribution of control in the context of power structures, makes it finetuned to investigate working lives relationally. Through STS' insistence that technology is neither determined nor deterministic, and the weight given to futures and democratisation of technology development, the sociology of work gains a nuanced view of the relationships between workers and technology at work. Sociotechnical imaginaries are collectively held 'languages of power' compared across states, considering how 'actors with authority to shape the public imagination construct stories of progress (Jasonoff, 2015: 25). While sociotechnical imaginaries have been used to embed science and technology processes in studies of power, imaginaries must be made more open to questions of inequality- who has symbolic capital, and how it is created. The disciplines together forefront inequalities within working futures, which are positioned as both a public issue and a personal trouble in the concept of the sociotechnical imagination. This positioning of working futures assists with the task of connecting technology and the power of imaginaries with relational perspectives of workers. The sociotechnical imagination bridges imagination - how workers envisage their working futures based on their social positions - with action - how machine intelligence is developed, implemented, regulated, represented and how workers as well organisations consider how to benefit from the technology.

Therefore, the first significant contribution of this study is the conceptualisation of the sociotechnical imagination and its operationalisation to gather the artefacts of workers' working futures alongside machine intelligence through an intersectional lens. This thesis has presented evidence in favour of opening up futures with machine intelligence so that some futures are not rendered more possible than others. It has applied intersectionality's 'power conscious lens' (Collins and Bilge, 2020: 226) to project futures in an act that challenges that elite imaginary. Who shapes the future has power and the first step is the act of projecting, articulating before it can be made into a form of reality, which then stimulates change and shapes how we live. The future matters and it is not simply the analysis of workers talk that matters in this thesis but the very act of workers projecting working futures alongside machine intelligence.

The next section considers the contribution of the intersectional lens on the analysis of the data and the emergence of machine intelligence capital.

7.2.1 Intersectional lens on machine intelligence capital

The concept of machine intelligence capital is grounded in my analysis of workers' talk of working futures. My analysis developed five orientations towards the FOW alongside machine intelligence, reflecting the interacting social inequalities of class, gender and race. The study prioritises the voices of workers who experience working lives at intersections of those social inequalities. Existing research as discussed in Chapter Two has shown that machine intelligence may exacerbate existing inequalities and that a lack of diversity in the developer community leads to biases in the technology. In Chapter Four and Chapter Five, the talk of these workers indicates how agency in present working lives erodes through the multiple burdens of class, race and gender inequalities. The way in which the workers imagined their futures are tied to their present working conditions and experiences of control as much as their upbringing, background and education, all captured in the habitus (Bourdieu, 1997). The intersectional view has a magnification effect, zooming in on the experience of those burdens eroding agency in work.

This thesis has shown that an intersectional lens is essential to unpick how machine intelligence is an additional capital that can sit across social divides, interacting with and alongside other forms of capital. Without an intersectional lens the orientations might have masked machine intelligence capital, failing to spot the opportunity for machine intelligence capital to exist in some form for workers in weaker social positions, despite experiencing little autonomy in their present working lives and/or experiencing multiple forms of social inequalities. The next section will discuss evidence from this thesis to answer the research question.

7.3 Agency in work influences but does not determine working futures with machine intelligence

Chapter Six showed that when workers were asked to describe the collective future of work with machine intelligence that there is space for transition, even possible social transformation. The structures of society are not talked about as fixed but, through the possibilities of technology development, open. While tempered by social positions and differentiated by machine intelligence capital, fundamentally, workers in this study did not see the future of work as determined and this space of possibilities is distilled in the talk of their own working futures.

The most direct answer to the thesis' research question comes from the factory group of workers. This group has the least forms of capital in the study. The way the workers in the factory case articulate their working future is most overtly shaped by how they experience work in the present with machines and their experiences of intersectional social inequalities of class, gender and race. All but one of the workers in the factory case are female and all but two talked about their ethnic backgrounds impacting their working lives. Workers in the factory case do not have autonomy in work. The managers set the speed of the lines in the factory while the machines dictated how the worker should stand or move to carry out their tasks. These workers did not talk about a role in decisions about how technology should be implemented but instead witnessed human workers being moved, maybe replaced, by new machines taking over, task by task. They had little influence in how they work or how they are controlled and talked of feeling frustrated and being treated like machines. The factory workers were witnessing their own vulnerability to replacement by machines, itself a form of control and talk included feeling redundant because of the machines.

However, this absence of autonomy in work in the present does not preclude imagined futures with more autonomy. The data shows that this is partly because the factory workers talk about separation and freedom from work outside of the factory. They cannot take work tasks home with them but at the same time, they do not take themselves fully into work. Most of the talk of work and identity in this case is limited to the social aspects of work, being able to make friends is the main benefit of this work within the talk in this study, alongside earning enough money to remain financially independent – or not dependent on Universal Credit. Furthermore, machine intelligence is not determined and it is not possible for anyone else to determine how workers respond to it. The work they imagine in the future is not their own, which is envisaged to be replaced with roles for humans to fix the machines, as there are now. Stepping outside the factory in visions of future work, these workers imagine autonomy at work for the first time because of how they perceive machine intelligence.

The Subsisters, as much as the other orientations, preclude any imagining of the future to take shape without being influenced by the perceptions and relationship to technology. The Subsisters – those who imagine falling into the gaps left by machine intelligence, imagine they will have to offer only what machine intelligence will not because there is little confidence that they would be able to work with the technology collaboratively. The social division of age alongside class and gender is likely to play a factor requiring further research because of how age may influence perceptions of technology. The way workers have experienced machine intelligence guides their imagination in drawing out their working futures alongside it. The different orientations- with workers experiencing forms of social division envisaging ways for themselves to benefit from machine intelligence, albeit in different forms of work than the present- offer hope that machine intelligence capital is ultimately more open and less determined by social position than other forms of capitals, such as economic and cultural.

The possibility for imagining better working lives is dependent on the worker's attitude to machine intelligence and their perception of future chances for them to benefit from it. The starkest of contrasts comes against the AI case, those who feel closer to the helm of shaping the future. The battle to remain relevant is for all workers but some are more likely to be determining what relevant means than others. The notion of staying relevant was discussed by workers across the groups, particularly the Creators who talked about their choices to learn computing to stay relevant, and the Adaptors whose talk was also preoccupied with planning to avoid becoming irrelevant. However, it was felt by the factory workers because it was something they had seen themselves already. As a result, when the factory workers imagined their working futures alongside machine intelligence, they were carrying out a reimagination of the structure of their work and lives. Workers in this group experienced the deepest intersectional inequalities of race, gender and class and felt they had limited options for other employment in the future. As these workers could not imagine work in their current form existing simultaneously with machine intelligence, and how they imagined machine intelligence based on their experiences of machines so far at work, they instead imagined work beyond that workplace, from being full time employed to working at their own pace for themselves, from having no connection to their own personal interests and motivations within the work they carry out to drawing on their hobbies and skills to keep working. From having very little experience of agency at work to having choices.

This reimagining was rooted in the experience of work in the present and experiences of agency afforded by their work. Above all, one benefit that the factory workers had compared to the other workers was the ability to switch off from work for four days. Physically demanding and often stressful work that the group described was finished at the end of a four-day shift pattern. In those four days out of work the group talked about being able to do things that they found interesting, to learn new skills or to retrain. When asked how they imagined a working future alongside machine intelligence, it is in these four days off that the workers sourced inspiration. With such little agency in the workplace there was little room for these workers to imagine a way to adapt to machine intelligence in the factory. They could not imagine a wholly positive future with machine intelligence. However, they could imagine, in different forms, means to continue working.

Further work in the field is required to reach the potential of seeing this hope become reality for workers- least of all, opening up intersectional conversations about work and machine intelligence to workers and efforts to build machine intelligence capital.

7.4 Agency in working lives eroded by burdens of social divisions

This thesis has shown that when inequalities of race, class and gender are taken together, the talk of being devalued at work becomes more complex and more reflective of experiences of workers. The workers in the factory case who were from ethnic minority groups were all first generation immigrants who had immigrated to the UK between ten to forty years previously, some with qualifications that they felt had been devalued here. This contrasts with the workers from ethnic minority groups in the knowledge and AI case, some of whom had not been born in the UK, whose education was described as something that was highly valued, even to the extent of it helping them fit in at work better. The British white female workers in the factory case also described feeling badly treated and uncared for by their employer. However, those at the intersections are multiply burdened with thoughts such as that they are considered ‘just another immigrant’ (Ida).

Similarly, the workers from ethnic minority groups in the AI and Knowledge cases did talk about their experiences of being from ethnic minority groups in the workplace. Overall, the sense of agency felt by these workers over their working lives is eroded by the burden of having to consider how majority ethnic perceive them as a worker from a different ethnic background. In these worker groups the workers experience high levels of agency in terms of autonomy and opportunity to decide how they carry out their tasks. Instead, the forms of control they experience are masked such as through pay, rewards and promotions. The socially constructed and maintained divisions nonetheless act out in these groups of workers and broadly shape the orientation to the futures imagined with machine intelligence.

A key finding was that the Adaptors (all but one from ethnic minority groups) are adept at survival, planning and preparing how to manage perceived risks. Adapting provides some protection against the threat of bias, discrimination or racism in the workplace. This is emphasized among the talk of the ethnic minority workers in the AI case – that learning machine intelligence would offer them some protection. The workers in this group talked about agency at work from the social position of being an ethnic minority, within the context of structural inequalities, which itself erodes the sense of agency, being out of the control of the agent. The workers talked about not fitting in, using education as way to be accepted (because their education was valued), a sense of imposter syndrome, feeling foreign despite being born in the UK, being aware of the systemic discrimination that takes place in the workplace, having to consider how others perceive them as an ethnic minority and acting more like a white person. The most despondent data in this thesis is the talk of these experiences with acceptance of the sheer weight of these thoughts and the need to strategise to survive for workers from ethnic minority groups and those at intersections in the factory group. There is no talk of expectations that these situations will improve, only that they can be managed.

The habitus of these workers is in dissonance with the field of work and the symbolic violence that results in holding themselves back, or not feeling as though they belong where they are. Much like the workers at intersections in the factory case, the self-perception as an outsider reduces the sense of agency felt by these workers in deploying the forms of capital they have at work. This was described by Antar as both feeling as though he is held back and holding himself back from progress or opportunities. Lakshmi and Radtha in the factory case talked similarly of seeing opportunities and not taking them due to a belief that they would be prevented from success. The perception of machine intelligence is based on this habitus but is not shaped by it alone. Instead, it is absorbed into the habitus and within such a context seen to potentially equalize inequalities. Unlike their ethnicity and/or gender and/or class, machine intelligence is something that these workers see potential to gain some agency through. The next section will conclude the thesis' findings of how the way the workers imagined working futures are formed, drawing on Bourdieu's concepts of habitus and capitals and further developing the thesis' concept of machine intelligence capital.

7.5 How orientations towards the future are based on agency at work and experiences of social inequalities

> 'When powers are unequally distributed, the economic and social world presents itself not as a universe of possibles equally accessible to every possible subject – posts to be occupied, courses to be taken, markets to be won, goods to be consumed, properties to be exchanged – but rather as a signposted universe, full of injunctions and prohibitions, signs of appropriation and exclusion, obligatory routes or impassable barriers, and, in a word, profoundly differentiated, especially according to the degree to which it offers stable chances, capable of favouring and fulfilling stable expectations. Capital in its various forms is a set of pre-emptive rights over the future; it guarantees some people the monopoly of some possibles although they are officially guaranteed to all (such as the right to

education). The exclusive rights consecrated by law are only the visible, explicitly guaranteed form of this set of appropriated chances and pre-empted possibles, which are thereby converted, for others, into *de jure* exclusions or *de facto* impossibilities, through which present power relations are projected into the future, orienting present dispositions in return.' (Bourdieu, 1997, 2000: 225)

The findings in this research pointed to a form of technological capital, here machine intelligence capital, conceptualized as a form of cultural capital. Machine intelligence capital is one element that shapes the orientation taken towards the FOW, shown in a decreasing order below.

Figure 7-1 Future work orientations showing decreasing machine intelligence capital

Decreasing machine intelligence capital

THE CREATORS

THE ADAPTORS

THE CYBORG HOBBYISTS

THE FUTURE PROOF

THE SUBSISTERS

Overall, machine intelligence capital is seen in the extent to which the worker has the capacity to imagine benefitting from machine intelligence in working futures. Three factors affect the level of machine intelligence capital held by a worker:

1) the cultural capital (education, skills and knowledge) to work creating and designing forms of machine intelligence;

2) the economic capital to invest in machine intelligence; and

3) the agency in working lives to be able to learn how to use machine intelligence.

Those with less machine intelligence capital were more likely to question the consequences of the technology for society and humans overall and less likely to talk about being actively interested in technology. This is evident in the talk of those workers who articulated a gap in their knowledge – an ignorance – of what future technologies may come into their own workplaces. This gap was explained as a lack of engagement with technological development, pointing to a relationship between that engagement and an ability to confidently discuss futures. Claussen and Osborne (2012) use Bourdieu's notion of cultural capital to assess the pitfalls of science education showing the different approaches in what could be taught depending on the goal – primarily to teach future scientists rather than future citizens who must interact, live with the science. Machine intelligence too could be taught to be relevant to those who must critically engage with the development, implementation and uses of the technology and not just those who will be the future machine intelligence developers.

The thesis has shown that machine intelligence capital can be increased through education (cultural capital) and proximity to machine intelligence development. Through actions to increase machine intelligence capital, there is the potential, at least perceived, to reduce the impact of other social divisions on working life. This is seen in the five orientations which were shaped by the perceived relevance of their work to the future and the experience of agency in working lives overall. The Future Proof suggested that they could engage more with the developments of machine intelligence and consideration of how it might impact their work. While they share confidence that their work will remain relevant with the Creators, the reason for that confidence is very different. The Creators are confident that as the 'driver of the machine' (David) that they will be shaping how the future looks, and are well placed to benefit from the technology. In contrast, the Future Proof thought the bulk of the tasks they carry out in work are resilient to replacement by machine intelligence. While they had the autonomy to learn more about machine intelligence and new tools that might be useful to them, the Future Proof had not been motivated to find out more. The Adaptors on the other hand, focused on the need to boost their opportunities in work, talk about actively finding work opportunities that will allow them to learn more about machine intelligence and to become more involved in how it is used. Specifically, Paul imagines the technology being created to suit his needs as a knowledge worker rather than simply applying what is created. Antar and Jacqui, other Adaptors, also talked about the need to restrict the autonomy of the machine intelligence in decision making by always having a human involved. As such, the Adaptors show a confidence in their capacity to learn, manage and even benefit from machine intelligence in the workplace. Driven by the need to survive and the identity of an outsider, machine intelligence is seen as a potentially valuable means to overcome or balance out forms of systemic bias and discrimination in work.

The Creators have the most machine intelligence capital and the ability to deploy it in the field of work – to develop 'superpowers' (William). The Creators talk about seeing Artificial Intelligence from a young age as the future and wanting to be prepared for the transformation they envisage. In the present, these workers expect the highest levels of autonomy at work, whether as CEOs of their own start-ups or as workers within an organization. At the same time, there was talk of tight controls over the work that is done through means of project management tools, with the potential for surveillance (Malik). Much like the knowledge workers, this group downplayed the tools that they use everyday at work (such as Microsoft Office) using words such as 'basic' to describe them.

Meanwhile, the Cyborg Hobbyists expressed dissatisfaction at using technology to help them learn something or carry out a task that would have been more of an achievement if they did it alone. The use of technology as a head start, or a form of advantage, was talked about by the Cyborg Hobbyists whilst acknowledging they would be able to benefit from such a boost in their working futures. Compared to the Adaptors, the Cyborg Hobbyists base their futures on experiences of machines in the present- they see machines failing and have talked about being disappointed, teaching themselves how to use and even fix the machines to carry out their tasks. Cyborg Hobbyists have therefore, experienced a limited form of agency through large physical machines which control how they work whereas the Adaptors have the autonomy at work to learn more now to benefit them in the future. This means the Adaptors talk about already making moves and preparations towards the futures they imagine whereas the Cyborg Hobbyists (and the Subsisters who do not envisage benefiting from machine intelligence in their working futures) have darkened horizons expecting the worst (replacement of their jobs) and lack the agency within work to find the means to adapt. Instead, faced with perceived limited job options due to intersecting inequalities of class, gender and race, the Cyborg Hobbyists and Subsisters' futures rely on entrepreneurism.

Articulations of technological futures are imbued with symbolic capital and those with proximity to machine intelligence are more likely to be closer to influencing futures for everyone. However, this research has found that other workers imagine futures alongside machine intelligence drawing on their habitus, including experiences of agency and technology, showing that machine intelligence capital (which influences symbolic capital imbued in imagined futures) is more than proximity to the development of the technology or knowledge of it. Instead, machine intelligence capital is also present in the likelihood that a worker can imagine benefiting from machine. This was seen in the orientations of the Cyborg Hobbyists who envisage being free to pursue their interests, the Future Proof who imagine tools improving for them to do their jobs better, or even the Adaptors who see opportunities to mitigate perceived inequalities.

Therefore, as machine intelligence develops, there is opportunity to imagine and reconfigure how the future of work alongside it plays out. As described in Chapter One, there is an urgent need to see machine intelligence futures as open. Machine intelligence futures are influenced by existing inequalities yet contain the transformative potential of machine intelligence capital which, through the eyes of this intersectional sample of workers drawing on everyday working lives, is based on relationships with technology, is malleable and a potential source of agency, of hope. Furthermore, machine intelligence capital – the perception that one will benefit from the technology that is always becoming- is a based on the habitus of workers, which is shaped by their experiences with technology in work and outside work. While machine intelligence capital – which can turn into symbolic capital when articulated, and into other forms of capital when acted upon, is influenced by existing social inequalities, it is not determined by them.

A key finding of my research is that the relationships workers have with machine intelligence is informed by their experiences of technology in their past. For example, the AI workers talked about valuing technology and innovation from an early age and wanting to be part of it. Jacqui (K) talked about having a role model when she was young who made engineering seem accessible while Catherine (K) wondered how different her career choices might have been if in school technology had been framed as a career path for young women. Max (F) was always fascinated by electronics and this led him to forge a connection with someone who could direct him towards routes of qualifications. Sonya (F) appreciated the changes that technology could offer as potentially 'beautiful.' While my findings are based on the working lives 24 interviews with workers living in the UK in 2018, its conclusions are generalisable outside that specific context and time because the themes of work and imagined futures through an intersectional lens are fundamental to understanding the experiences of work and relationships with machine intelligence. However, further research would be needed to understand work experiences and futures with machine intelligence at intersections of other social inequalities, such as age, disability and sexuality that have not been within the scope of this study.

The orientations suggest relationship with technology at least in the form of the possible or the becoming, such as machine intelligence, is a pliable aspect of the habitus, a part of the narrative of working lives, of how a worker sees themselves in the world. The contribution of the relationship with machine intelligence – always in a state of becoming for the future, technology that is mirrored on humans, with the potential to replace human tasks- to the habitus is recognized as the fundamental drive (or lack of drive) in achieving machine intelligence capital. While this capital is influenced by background, it is not determined by it because technology is not deterministic. It is only by recognizing the imprint that the relationship with machine intelligence (in whatever form it is experienced, whether imagined or partnered) leaves on a worker's habitus, on their bodily dispositions, is it possible to grasp the cyborg state of workers. It is not possible to separate the worker, the human, from the technology – which is why it is not possible to separate the social from the technoscientific. Machine intelligence capital then reflects the habitus' inclination and capacity to create and claim it. That habitus contains within it the web of inequalities or the context of the social position of each person – the motivation described by the Adaptors to stay relevant in case their ethnicity is a barrier to progress, a shortcut to replacement. The way we think about technology, specifically technology that could become superhuman, is intricately bound up in who we are, how we work, what has made us, where we are placed but it is not determined by that as much as it is by experiences with technology, proximity to its design and development, capacity to articulate its futures – all these aspects of machine intelligence capital are pliable, not fixed, not inevitable, interacting with existing social inequalities but not determined by them. Therefore, there is hope.

7.6 The mutual contribution of Science and Technology Studies and Sociology of Work

This thesis has brought together the often-separated areas of STS and sociology of work to position futures as sociological artefacts to be analysed through an intersectional lens to better understand agency and structure in working lives. The application of Bourdieu's theory of capitals foregrounds social positions and inequalities in the study of future technologies and elucidates the symbolic capital in futures articulated by a select few. The development and protection of the elite sociotechnical imaginary by governments (Smallman, 2020) as discussed in Chapter Two reflects Bourdieu's symbolic capital:

> 'While some of the impetus for this approach is likely to be the desire to insulate decisions from other 'political' perspectives (Ezrahi, 1990), by ensuring decisions are made by those holding this elite imaginary, direct authority is given to this technoscientific point of view that tends to separate and marginalize social and ethical issues. At the same time, by locating decision-making one step further away from politicians (and arguably the democratic process), it becomes doubly difficult for alternative perspectives to be heard. Finally, how these bodies draw upon science to come to a resolution further reinforces the imaginary of science as an arbiter or risk and a problem solver. A former CSA [Chief Scientific Advisor] described how they had recently designed and set up an intergovernmental organization on a particular environmental issue, deliberately giving design power to the scientific, rather than other, stakeholders.' (Smallman, 2020: 599)

'Design power' in the STS context is the agency of designers to imbue designs with values or politics (Winner, 1980). Drawing on a Bourdieusian framework, design power appears as a cultural capital that is given to a specific community and a dedicated ‘technoscientific’ lens which does not consider social issues within scope. Through a Foucauldian lens, design-power is read as a form of power-knowledge, which sharpens the focus on the relationship between power and knowledge. Akıncı et al (2020) deploy this notion to an infrastructure project in Turkey incepted in the 1970s, which they argue was designed to eventually integrate Kurdish communities into the mainstream. Integration being the goal here whereas, on Robert Moses’ car friendly bridges in New York City, the goal may have been division though racial and class discrimination (Winner, 1980). Architecture and city planning lives on beyond the designers, shown also forty years later in Akıncı et al (2020) study of technology in regional development, and exemplifies the potential scale and influence of those bestowed with design power. It showcases the inextricable connections between design, technology, everyday lives and social position:

> ‘…the design is based not on knowledge of the region, but on the depiction of the region to which these designs are brought, from dams to social development projects, in terms of what it lacked: work, order, understanding, and a future. Accordingly, the region could be transformed from its condition of being a “pre” (e.g., pre-modern or pre-developed) through new infrastructures and technologies like the building of new material and social environments. So could its people; they would become modern citizens who think and behave like Turks. We refer to this focus on design for the creation of development as design-power. This design-power is not only based on power-knowledge, but also created through the production of what is not allowed to exist.’ (Akıncı et al, 2020: 187).

Juxtaposing the above use of design-power (developed with a Foucauldian lens) with that of Smallman (2020) shows the significance of futures, what is at stake in futures and how they are influenced by capital, particularly symbolic. This power is bestowed on the technoscientific community to cushion those with governmental powers from challenge and reputational damage from controversial decisions, allowing them to point to scientific evidence as rationale. The technoscientific community in this instance is merely borrowing symbolic power from the elite who require the scientific opinion to maintain their own symbolic power:

> '…the state mystifies the concerns of the dominant classes, discreetly concealing their wider class interests behind the theatrical display of power'. (Fowler, 2020: 446)

Here technoscience is mystified through the exclusion or side-lining of public views (Smallman, 2020) and risks being little more than a tool for the elite sociotechnical imaginary to maintain existing structures of power, to reproduce social injustices and allow them to exist as though misrecognised as doxa (Bourdieu, 2014). If technoscience can be used to maintain structures of power, this thesis' sociotechnical imagination is an attempt to showcase the potential for the human workers' relationships with machine intelligence to encourage and stimulate social transformation.

As described in Chapter One, machine intelligence has potential to impact most aspects of life and work. Investment into machine intelligence illustrates how highly it is prized as a means of securing the country's international competitiveness. Bourdieu argues social change is possible in times of crises and could most likely come from the arts and sciences through a symbolic revolution:

> '[A] symbolic revolution turns cognitive structures upside down and sometimes, to a degree, social structures.' (Bourdieu, 2013: 13 in Fowler, 2020: 450).

By emphasising the relationship between workers and machine intelligence not as determined but as influenced by social positions, and showing that imagined futures of work are shaped by past working lives, habitus and level of agency, this research has shown there is a need for a wide range of workers' voices in the design, development and implementation of technology that offers the potential for a different working experience. It has also shown that amongst workers there is capacity to reimagine work, along with machine intelligence, and to imagine social change.

This thesis has advanced knowledge through the original conceptualisation of the sociotechnical imagination to challenge the elite sociotechnical imaginaries. It has also contributed the five orientations towards working futures consisting of amongst other things, machine intelligence capital, developed here as a capital which is neither fixed nor determined, offering hope that the habitus can be shifted, that social change is possible. In making these contributions, the thesis also calls for more use of imagined futures in sociological research to explicitly analyse power structures broader than within STS, which itself must consistently apply an intersectional lens to reflect the realities and possibles in our cyborg relationships with machine intelligence.

The widespread use of advanced technologies such as those contained in the palm of our hands in mobile phones, and experienced at work, in shops, games, cars, financial services, healthcare, education, in every sphere of social existence means that there is an essential need for citizens to be involved, closely reading and critically engaging in technology development. This is likely to become more important as AI develops. This study aims to encourage further action in this area to consistently incorporate workers across a range of social positions in working futures. Experiences of social inequalities such as the fundamental division of class, are shaping and shaped by experiences of technology at work – there is no division between society and technology only relationships to unravel. Specialist language, expert knowledge and a technology community present technology as though for the few to concern themselves with. This thesis adds to the existing body of literature by positioning machine intelligence laden working futures as open but influenced by social positions, exploring possibilities for the reimagination of work through the talk of workers themselves. Meanwhile, STS can benefit from incorporating an intersectional view of workers' lived everyday experiences of work for democratisation of futures that become designs of reality.

Design, development and the implementation of machine intelligence in work must be opened up because the stakes are high – the life activity of the *species-being* (Marx, 1844, 1992), the character of humanity- and the ways that work could change and the consequences of the technology are not inevitable or determined. Even amongst those with the least agency in their working lives, the ones facing the most social disadvantage in the face of replacement job threats, there is agency within the sociotechnical imagination. The discussion and the processes themselves must feature workers who experience social inequalities at intersections – not for consultation but collaboration, with design power being recognized, acknowledged and redistributed to include workers if the potential for machine intelligence capital is to be fulfilled. Futures must be seen as contested, shaped by social positions and forms of capital. This understanding sharpens the study of work, machine intelligence and society but more importantly, it prioritises the voices of workers in those futures.

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Appendix 1: Discussion Guide

I'm going to begin with a few questions about your work. We'll then move on to think about robots and artificial intelligence now and in the future, including what you imagine your own working future will be like in workplaces with more machine intelligence than today.

Section 1. Working lives

1.1. Employment status. Can I just check whether you would describe yourself currently as being employed, an employer or self-employed?

1.2. Job Title. Please could you tell me your job title?

1.3. Job description. I'm going to ask a few questions now about the sort of work you do in your current role.

A. Thinking back to yesterday, could you describe the sorts of tasks you did at work? (follow up - would you describe this as a typical day for you at work, and if not, why not?)
B. How often do you carry out short, repetitive tasks?
C. What do you think about the level of variety in your job?
D. Can you think of any automated technology that helps you do your job? (Prompt: software, machinery that does repetitive tasks).
E. Can you imagine any technology that could be implemented to help you do your job and make you enjoy it more? (Prompt: it might not be invented yet!)

1.4. Control. In what ways do you have influence over the way that you work?

[Prompt: for example, in the tasks you do, the order you do them or they way you complete tasks, deciding the time you start and finish work, where you work?]

1.5. Flexibility. How comfortable would you feel about occasionally taking an hour or two off during working hours for personal or family matters?

1.6. Supervision. How do you feel about the level of supervision or management you currently have in your job?

Prompt: in what ways are you supervised? If not currently supervised, do you currently supervise or manage other people?

1.7. In your working life, what is your experience of seeking work-related advice and support informally from your colleagues, managers and work friends?

Section 2: Working past

Thank you. Now we will move on to talk a bit about your working life so far before moving on to imagine the ideal working life to aim for in the future.

2.1 History. Now that I know a bit about what you do at work, I'd like to ask how you ended up in your current job?

Prompt: How did you choose this field of work?

2.2. Education. What is your highest level of qualification? Follow up if necessary: and in which subject was that?

2.3. How important would you say education was at home when you were growing up?

2.4. How do you think that your education prepared you for the job you are currently doing?

Follow up - what is your experience of professional training and on the job training opportunities?

2.5. Who do you consider your role models for working life? Why?

Prompt: who inspired you when you were starting out, who do you look up to or respect in working life and why?

2.6. Thinking back to when you have applied for jobs, how confident were you that you that you had just as much chance of getting the job as other candidates? And why do you think that was?

[Follow up for managers: Do you currently have hiring responsibilities? If yes, what sort of qualities would you look for in your ideal candidate?]

2.7. What are your thoughts on the view that today in Britain, if someone works hard enough and has merit that they can achieve their goals, no matter what their background is?

2.8. So, would you say that you have had as much opportunity to achieve what you want to achieve and to do as well as everyone else?

Follow up: Have you ever felt that you were being held back or that opportunities were not so open to you as to your peers?

2.9. Thinking back to when you left school, how would you say you have done so far compared to what you expected then?

Section 3. Imagining the alternative ways of working

Now I have a couple of questions about alternative ways of working.

There are different ways to structure work. For example, some workers work part time or freelance, or have more than one job, others have short term zero hours contracts or are long term contractors, others use temp agencies or work remotely from where the organisation is based - for example, from home or in another country through business outsourcing. Some set up their own businesses or retrain and change careers altogether, perhaps seeking more flexible working hours to suit family or personal needs.

3.1. What do you think about all these ways, and others I might not have mentioned, of structuring work?

Probe: Have you ever experienced or considered working in a different way?

There are a few different scenarios for the FOW alongside AI and robotics. One scenario could be that the technology isn't developed any further. Another possible scenario could be that in 20 years from now some jobs will no longer exist due to AI and robots and the technology will complement some workers but not others. This means that some people will outperform and benefit more from the technology than others.

Let's imagine a different scenario where workers harness the technology to work in new and better ways that means more people experience jobs that let them fulfil their potential.

3.2. I'd like to ask you to imagine your perfect job - maybe you already have it - and ask you to describe it to me. Imagine that you did not need to work for money. Imagine that all the technology you needed was at your fingertips. Can you tell me in this ideal world situation, what sort of job you would do and how you would structure your work?

Probe: who would their colleagues be? managers? ideal number of working hours and why; ideal location (home or office or public space) and why?

Section 4. Machine Intelligence and work: existing social futures and current understanding and expectations

In the next section, we will talk about AI and robots in terms of how you perceive these technologies, how you imagine they might develop, what your first thoughts are about them and where those ideas come from. There is no wrong or right answer - I am interested in your opinions and expectations.

4.1. What do you think of when I say 'artificial intelligence'?
4.2. How about 'robots'?

If answer is about films, ask: how do those films make you feel about the potential of the
technology?

[If stimulus required] I'd like to show you a couple of short clips now. Humans need not apply (C.P Grey, 2014) and What Will Automation Change (Mckinsey, 2018) (first 3 minutes each)

4.3. Thinking briefly about people who design, develop and sell AI and robotics technology - how do you imagine they think about the implications for society, workers and user of the technology?

For technologists: how would you describe the technology you develop in your project/current job/business? Could you describe what sort of user you have in mind for it?

These final questions are about how you imagine your working life in the future. We will consider a couple of scenarios that describe how work could change in the future - say in [ten OR twenty] years time.

4.4. Imagining a scenario where AI or robotics is rolled out more across a wider range of organisations and businesses, how could more intelligent technology improve the way you currently work?

[Prompts: Can you imagine any alternative ways to work using the potential of intelligent technology? Would you consider working in a different way? Can you envisage any of your tasks changing with the introduction of robots or AI?]

For technologists: how do you think the products you create will change the way people work?

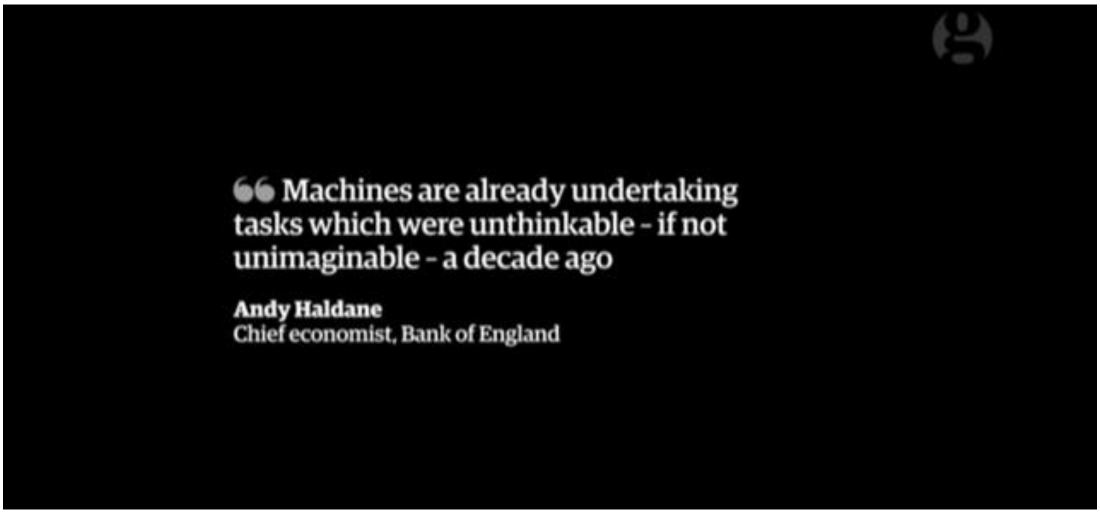
4.5 Significance of work. One version of the future with machine intelligence is having a lot more leisure time on our hands as the machines do more of our work. Would you say you'd miss work if this happened? What is it about work that you'd miss?

4.6. And finally, considering the potential of AI and robots to help change work for the better, what are the ways that you think people in work could benefit most from robotics and AI?

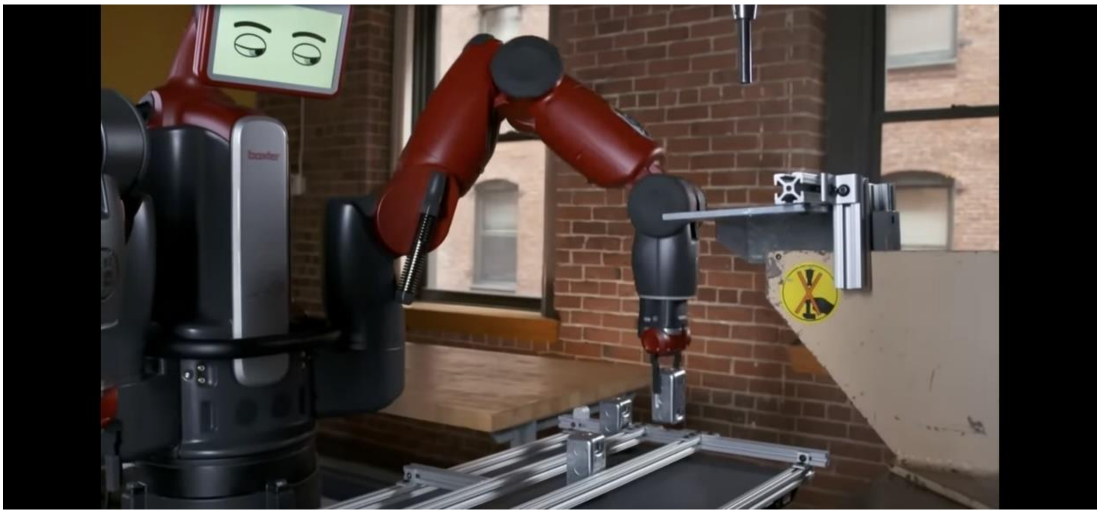
Thank you, close

Appendix 2: Screenshots from stimulus videos

McKinsey and Company (2017). The digital future of work: What will automation change?



[Humans Need Not Apply, C.P Grey (2014)]



Appendix 3: Research Ethics Approval

University of Nottingham
UK | CHINA | MALAYSIA

Faculty of Social Sciences
School of Sociology & Social Policy
University of Nottingham
University Park
Nottingham
NG7 2RD

30/10/2017

Reference: 1718-014-PGR

Dear Vahini,

Your application for ethical approval from the School of Sociology and Social Policy

On behalf of the Research Ethics Sub-Committee, I am pleased to confirm that your project "*Machine Intelligence and Inequalities in Work and Working Futures"* has been reviewed and approved and you are now welcome to begin your data collection.

If you propose to make any amendments to the approved project or supporting documentation, you must first send details of the amendment along with any supporting documents to the Research Ethics generic email address, LQ-ResearchethicSSP@exmail.nottingham.ac.uk for approval. Please do not use any unapproved or amended documents or procedures before these have been reviewed and approved by the Ethics Sub-Committee.

If you have any queries during your project, please contact either the Research Ethics administration team or your academic supervisor(s).

Good luck with your project!

Kind regards

Dr Alison Mohr
Research Ethics Sub-Committee Officer

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Appendix 4: Consent Form

School of Sociology and Social Policy

University of Nottingham

Participant Consent Form

Machine Intelligence, Work and Working Futures

Researcher's name:

Supervisor's name:

In signing this consent form I confirm that:

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me.
- I have had the opportunity to ask questions.
- I understand the purpose of the research project and my involvement in it.
- I understand that my participation is voluntary and I may withdraw from the research project at any stage, without having to give any reason and withdrawing will not penalise or disadvantaged me in any way.
- I understand that while information gained during the study may be published, any information I provide is confidential (with one exception – see below), and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published.
- I understand that the researcher may be required to report to the authorities any significant harm to a child/young person (up to the age

of 18 years) that he/she becomes aware of during the research. I agree that such harm may violate the principle of confidentiality.

- I agree that extracts from the interview may be anonymously quoted in any report or publication arising from the research
- I understand that the interview will be recorded using electronic voice recorder
- I understand that data will be securely stored
- I understand that the information provided can be used in other research projects which have ethics approval, but that my name and contact information will be removed before it is made available to other researchers.
- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Officer of the School of Sociology and Social Policy, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.
- I agree to take part in the above research project.

Participant's name (BLOCK CAPITAL)

Participant's signature

Date

Researcher's name (BLOCK CAPITAL)

Researcher's signature

Date

Appendix 5: Information Sheet

Working Lives, Robots and Artificial Intelligence

My name is Vahini Sangarapillai and I would like to invite you to take part in a study I am conducting for my PhD in Science and Technology Studies at the University of Nottingham.

I would like to interview you for around one hour about your thoughts on robots and artificial intelligence (AI) and the future of work. This topic is talked about a lot in the media, often by policy makers and economists. I want to find out how you think this technology could affect your work now and in the future.

There is currently a knowledge gap – we don't know enough about how people think about machines that appear to think. I will also be interviewing people who currently work in the AI or robotics industries as well as those working in places which have implemented some form of these technologies. I hope this study will contribute a better understanding of the experiences, expectations and hopes of working with these technologies.

It is completely up to you if you volunteer to take part in this study. There are no foreseeable risks to you if you choose to take part in this research. However, it will not in any way impact you negatively if you choose not to take part. If you do choose to be interviewed but then at any point before, during or after the interview you change your mind, please let me know and I will make sure any data I have collected from you is destroyed so that it cannot be used.

I will use what we talk about in the interview, along with interviews that I conduct with other participants, to look for any themes and patterns that address my research aims. I will then write this up into a PhD thesis. I hope to share versions of this, for example as journal articles or presentations with interested parties, such as other researchers and policy makers. I will be happy to share my findings with you too so please let me know if you'd like to hear how the research develops after your interview.

Contact details

Researcher:

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Supervisor:

Professor Tracey Warren
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Complaint procedure

If you wish to complain about the way in which the research is being conducted or have any concerns about the research then in the first instance please contact my supervisor. If this does not resolve the matter to your satisfaction then please contact my School's Research Ethics Officer, Dr Alison Mohr (tel. 0115 846 8151, email alison.mohr@nottingham.ac.uk or LQ-ResearchethicSSP@exmail.nottingham.ac.uk

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