Problematising speed in and around organisations: struggles over the temporal commons in the British Artificial Intelligence field

Baird, Christopher H.F.

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Problematising Speed in and Around Organisations: Struggles Over the Temporal Commons in the British Artificial Intelligence Field

Christopher H.F. Baird

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University of Edinburgh Business School

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DECLARATION

This is to certify that the work contained within has been composed by me and is entirely my own work. No part of this thesis has been submitted for any other degree or professional qualification.

Christopher Baird

April 2021

ABSTRACT

In recent decades, speed has emerged as a significant social scientific concern, including within the field of management and organisation studies (MOS). However, the literature on speed in MOS has developed according to several problematic assumptions and agendas, namely: it assumes speed is predominantly a good thing, should be evaluated in relation to economic value, prioritises managerial perceptions of speed, privileges the antecedents to speed, and often treats speed as a general ontological premise from which to theorise. By contrast, this thesis proposes a set of alternative assumptions and agendas regarding speed research: taking full stock of potential speed pathologies, adopting a stakeholder view to evaluate speed, considering the speed experiences of marginalised voices, studying how speed is actively resisted, and questioning the perceived omnipresence of speed. To explore these critical re-conceptualisations of speed, this thesis undertakes an in-depth empirical investigation of the British Artificial Intelligence (AI) field. Drawing on Bourdieusian sociology, the British AI field is conceptualised as a structured social space where various actors with different and often conflicting agendas and power resources (i.e. capital) struggle over the field's 'temporal commons,' that is, the set of values, beliefs, practices, and structures regarding time and speed which are considered 'appropriate.' Through an analysis of 33 interviews, micro-ethnographic observation at 20 AI-events, historical-archival documents, and significant secondary data, the major lines of conflict and division in the field are theorised under the temporal parameters of 'techno-scientific time' versus 'deliberative-democratic time' and 'machine-instantaneous time' versus 'human-reflective time.' Under each parameter, a range of speed advantages and speed pathologies are explored and theorised. The power relations underpinning these struggles are also uncovered and historicised. This thesis contributes to the theory on time and speed in organisation studies as well as to more general debates regarding the sociology of speed. It builds and extends the use of Bourdieu's conceptual framework in MOS. Finally, it is of value to the formation of policy and practice in the British AI field that is both empirically- and theoretically-grounded.

LAY SUMMARY

Helga Nowotny (1994, p.6) notes: ‘Everyone is a practitioner and theoretician of time.’ We all use time, and we make sense of it in quite different ways. In this thesis, I explore how organisational and management scholars have typically made sense of time, and in particular, of speed—that is, of ‘doing things quickly, of speeding things up.’ I argue the literature relating to speed has developed according to several problematic assumptions and agendas, notably that: speed is positive, speed should be evaluated in relation to shareholder value, managerial perspectives on speed matter most, research should focus on ways to mobilise speed, and finally, that speed is an ever-present and necessary imperative for organisations. I contend that alternative ways of thinking about speed are necessary, namely, that we should: consider pathologies of speed, adopt a stakeholder approach to evaluate speed, consider the views of marginalised voices, study how speed is actively resisted, and finally, question the idea that speed is necessary or all-present.

In this study, I move these alternative assumptions regarding speed forward through an in-depth empirical investigation of the British artificial intelligence field. Specifically, I explore how different individual and institutional actors in this social arena (e.g. ‘big tech’ firms, government policymakers, civil society pressure groups, etc.) make sense of time/speed and struggle to have other actors recognise their views as legitimate. In particular, I explore differences in how actors perceive the appropriate pace at which to research and develop AI and the processing speeds of AI systems themselves. Findings reveal deeply contested meanings over the value and

importance of speed. While military, economic, and political actors broadly emphasise positive-enabling aspects of speed, those situated in civil society pressure groups, and to a lesser extent universities and professional bodies, emphatically stressed dangers of speed. The dangers included: AI R&D outpacing the ability of democratic institutions to effectively steer it; AI systems organising decision times at speeds beyond the feasible realm of human reflection or intervention; the curtailment of safety precautions and ethical deliberation to meet demands for greater speed in AI R&D; and finally, a relationship between compulsive imperatives for speed and an environment of fear and instability around AI.

In addition, I unpack the power resources actors bring to these struggles, exploring how speed has come to gain so much value and legitimacy within the British AI field (and broader society). Findings reveal how the commercialisation and militarisation of AI R&D and its embeddedness in a global interconnected market has crystallised a particular set of norms and dispositions where speed is largely viewed as positive, necessary, and incontestable. These assumptions and dispositions regarding time and speed are not inconsequential. They have important implications for the conditions under which AI is developed and they shape AI algorithmic systems themselves—their safety, security, and controllability. At the heart of this thesis is an understanding that speed and pacing matter; speed affects our very being in the world—our capacity to experience it, act in it, and manage it.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1.
INTRODUCTION

1.1. RESEARCH AIMS AND OBJECTIVES

Over the past few decades, speed[1] has emerged as a significant, if not central, social scientific category (e.g. Perlow et al., 2002; Rosa, 2010; Virilio, 1986; Wajcman and Dodd, 2016). Arguably no discipline has paid the theme of speed more attention, or had more to say about speed, than Management and Organisation Studies (MOS). Indeed, speed has been central in the works of some of the earliest social, economic, and organisational theorists. It was Weber (1922/1978) who observed bureaucracies displacing other forms of organisation because of the (relative) speed with which they could function; Taylor (1911) who viewed the worker as a speed machine to be made maximally efficient in every movement; Marx and Engels (1848/1975) who pointed to the enmeshment of speed and constant transformation with capitalist ways of organising. A century later, and mainstream MOS concepts such as high velocity-environments (e.g. Eisenhardt, 1989; Oliver and Roos, 2005), time-based competition (e.g. Stalk, 1988; Jones, 1993); first/fast-mover advantages (e.g. Lieberman and Montgomery, 1989; Hawk et al., 2013); hyper-competition (e.g. D'Aveni et al., 2010), dynamic capabilities (e.g. Teece et al., 1997), Red Queen effects (e.g. Derfus et al.,

[1] A full discussion of how to define speed and features of its definition is provided in chapter 2, section 2.4. For now, it is the understanding of speed as denoting rapidity and the related concern with 'doing things quickly, speeding things up' (Grey, 2009,p.27) which is central.

2008), continuous morphing (e.g. Rindova and Katha, 2001), time-compression (e.g. Jiang et al., 2014), and time-famine (e.g. Perlow, 1999), all speak to the theme of speed.

However, MOS research related to the topic of speed has accumulated based on particular assumptions and agendas. In this thesis, I undertake a 'problematising review' (Alvesson and Sandberg, 2020) of research relevant to speed in MOS, critically reflecting on some of its limitations and suggesting alternative lines of inquiry. Alvesson and Sandberg (2020) initially proposed the 'problematising review' as an alternative to Elsbach and Van Knippenberg's (2020) argument for 'integrative reviews.' Whereas the integrative review regards reviews as a '*building exercise*' where knowledge is cumulative and the research domain is more or less given, the problematising review regards reviews as an '*opening up exercise*' that aims to re-evaluate existing understanding of phenomena with a view of challenging current ways of thinking about them. In the current thesis, I problematise the MOS speed literature as a means of identifying and challenging assumptions underlying existing speed research, and based on that, formulating more informed and novel research questions on the topic. By problematising, my goal is to move beyond 'gap-spotting' as a means of constructing research aims and questions as this tends to leave the assumptions underlying existing literature unchallenged (Alvesson and Sandberg, 2011; Patriotta, 2020; Sandberg and Alvesson, 2010;).

Through a detailed reading and problematisation of 65 key texts pertaining to speed (see chapter 2 for an analysis; appendix 1 for a list), the current study commences by identifying, articulating, and critically evaluating five key assumptions and agendas in MOS speed research: (1) believing that speed is predominantly a good thing, (2) assuming speed should be evaluated in relation to economic value, (3) amplifying top executives' perceptions of speed, (4) privileging the antecedents to speed and, (5) treating speed as a general ontological premise from which to theorise. Inherent in these five problematisations are ideas for rethinking the existing MOS speed literature and opening up new lines of inquiry. Specifically, this research proposes and elaborates five alternative assumptions and agendas: (1) taking full stock of potential speed pathologies, (2) adopting a stakeholder approach to evaluate how speed affects a range of organisational interests, (3) considering the speed experiences of marginalised voices, (4) studying how speed is actively resisted and contested, and (5) questioning the perceived omnipresence of speed.

The goal of the current study is to move these five alternative assumptions and agendas forward; to open up new and hopefully better ways of thinking about speed in MOS. Toward this end, two main research questions are presented:

First, *how do differently positioned actors with different agendas and power resources experience make sense of time/speed within a socio-organisational context?* The aim here is to disrupt the one-sided thesis that speed is predominantly a good thing and to negate the over-representation of economistic and managerial perspectives on speed.

Second, *how is speed reproduced/resisted within this socio-organisational context?* The purpose here is to allow space to consider the speed experiences of both dominant and dominated voices, to study how speed is actively contested and resisted, and finally, to question the perceived omnipresence of speed.

These questions are explored through an in-depth empirical investigation of the British Artificial Intelligence (AI) field. Over recent years, AI[2] has become a matter of growing scholarly and societal concern, both within the MOS field (e.g. Fleming, 2019; Lindebaum et al., 2020; Raisch and Krakowski, 2021) and in related fields (e.g. Agrawal et al., 2018; Bloomfield, 2018). However, despite calls for contributions to this area from management and organisational scholars (e.g. Phan et al., 2016; Moore, 2018, Kellogg et al., 2020), there remains a relative paucity of empirical studies, particularly empirical work examining the *production* of AI systems as opposed to their *consumption*. Thus, whilst the theoretical aims of this research are predominantly focused on speed and temporality, by exploring questions of speed and pacing within the AI field, this research aims to contribute to a more empirically and theoretically grounded understanding of the (British) AI field.

Finally, this study draws on the methodological and conceptual tools of Pierre Bourdieu. It asks: how might the theoretical constructs and methodological tools of Bourdieu be deployed to enrich our understandings of AI and research on time/speed in and around organisations? In the next subsection, I summarise the methodological aspects of this study for the purpose of orienting the reader to this Bourdieusian approach. A full explanation of the method and its strengths is offered in chapter 3.

[2] In chapter 3, I discuss issues defining AI. However, in the broadest possible terms, AI refers here to: 'machines performing cognitive functions that are usually associated with human minds, such as learning, interacting, and problem solving' (Raisch and Krakowski, 2021, p.192).

1.2. METHODOLOGY

1.2.1. Research method

The current study follows a Bourdieusian approach to methodology in presenting a theoretically framed and historically situated case in which Bourdieu's concepts, together with concepts derived from my critical reading of the speed literature, are used to engage with the empirical world (Bourdieu, 1998; Leander, 2008; Kerr and Robinson, 2016). Addressing the theoretical issues outlined above (and elaborated in my problematising review in chapter 2) required the investigation of a multi-actor research site where various stakeholders with different and often contrasting interests and power resources make sense of speed and struggle to produce and impose the 'legitimate' temporal orientations.

The current research presents the British AI field as an excellent 'extreme case' (Eisenhardt, 1989; Yin, 2014) in which to critically explore and elaborate these issues. It is 'extreme' because competition and struggle between actors over what Bluedorn and Waller (2006) call the 'temporal commons'—that is, the set of values, beliefs, behaviours and structures regarding time and speed which are considered 'appropriate' by a culture carrying collectivity (p.355)—is more visible in this social arena than in other contexts (Pratt, 2000). The temporal commons includes the extent to which the field emphasises, and strategises for, speed, and values it positively (Bluedorn and Waller, 2006).

The thesis draws on Bourdieu's notion of 'field' in order to conceptualise and empirically explore the British AI field. For Bourdieu, a field denotes a structured social space, a (semi-)autonomous domain of activity with its own rules/logic where different actors with different power resources (i.e. capitals) struggle for the transformation or preservation of the field. As such, a Bourdieusian perspective on the British AI field helps us to see the field as relationally constituted by various actors competing for power to change or preserve the field according to opposing agendas and interests (Emirbayer and Johnson, 2008). This conceptualisation of the field sets it apart from common understandings of fields as 'particular branches of study or spheres of activity or interest' (Oxford Dictionary), as well as other forms of field theory (e.g. DiMaggio and Powell, 1983; Lewin, 1951).

Following Bourdieu, I conceptualise the British AI field as a dynamic, relatively autonomous space of relations between various individual and institutional actors, i.e. AI researchers, large supranational technology firms, private sector organisations, venture capital (VC) firms, defence institutions, universities, the British government, consultancies, civil society pressure groups, and professional bodies. These actors are positioned in the field in terms of their relative power and positions-taking. For the purposes of this thesis, I highlight two frontiers of differentiation and struggle between British AI actors in regard to time and speed, i.e. those oriented toward the intense temporalities of what I call 'techno-scientific time' versus the slower-going temporalities of 'deliberative-democratic time,' and those positioned toward increasingly fast, 'machine-instantaneous time' versus slower, more open-ended 'human-reflective time.'

Techno-scientific time is predicated upon the idea that the British AI sector is in a competitive race where accelerated innovation and limited (self-)regulation are the appropriate organising principles. Conversely, *deliberative-democratic time* is underpinned by the notion that the frames and broad directions of British AI should be set by inherently slow deliberative and democratic processes. *Machine-instantaneous time* is predicated upon the idea that more and more decisions should be turned over to algorithmic systems which can calculate, predict and execute decisions 24/7, and in near real-time. *Human-reflective time*, by contrast, is underpinned by a belief that decision times should not be organised at speeds beyond the feasible realm of human consciousness, reflection and intervention. It is along these four dimensions that the temporal commons in the British AI field is, to quote David Harvey (1989), 'right royally fought' (p.231).

These principles of division are drawn on the basis of significant empirical evidence gathered for this thesis (see 1.2.2. below) as well as literature specific to the AI field (Cave and ÓhÉigeartaigh, 2018) and to social fields more broadly (e.g. Rosa, 2010, 2015; Scheuerman, 2004). Using each of the four temporal parameters as 'orienting concepts' (Layder, 1998; Özbilgin and Tatli, 2011), I map out the positions of key institutional actors across the British AI field. Under each of the temporal parameters, I draw on actors' rich and detailed accounts to shed light on differences in the value and meaning of speed and how these differences manifest in various strategies and practices. Furthermore, in order to explore the power relations and mechanisms through which speed is reproduced/resisted in the British AI field, this research examines the trajectories and changes in the structure and volume of the 'capital' held by actors oriented toward the different temporal regimes. As a mediating concept between the poles of field and capital, the research also draws on Bourdieu's concept of habitus (i.e. internalised dispositions) to examine the reproduction of speed in the British AI arena through socio-material mechanisms.

By drawing on Bourdieu's particular methodological approach, this study helps to answer calls for a more relational approach in organisation studies (Emirbayer and Johnson, 2008; Emirbayer, 1997), to pay increased attention to historical dimensions of socio-organisaational life (Greenwood and Bernardi, 2014; Zald, 1989), and to overcome dichotomist paradigms of structure-agency, past-present, and technology-society (Shimoni, 2017). The use of Bourdieu is a central aspect of this thesis. By applying his concepts to an under-examined field (i.e. British AI), and to the topic of time/speed, I aim to build and extend the use of Bourdieu's conceptual framework in MOS (see section 1.3 below).

1.2.2. Data collection

To investigate how differently positioned actors experience time and speed in the British AI field and the reproduction/resistance of speed in this social arena, this study draws on various sources: 33 semi-structured interviews with key institutional actors in the British AI field, non-participant observation at 20 British AI events and conferences, 14 historical-archival books and reports,[3] and lastly, the written and verbal accounts of approximately 250 British AI actors (accumulating to over 2000 pages) collected as part of the 2017 'House of Lord's Special Committee on AI.'

[3] The study also draws on numerous company/organisational reports to help unpack the power relations underpinning the field, e.g. company size, financial resources, computational infrastructure.

Interviews aimed to unpack and in turn, to map the (temporal) perspectives of differently positioned actors in the British AI field. The criterion for selecting informants was to ensure that key actors' perspectives in the British AI field were represented. *Non-participant observation* at various conferences and events, totalling 15 days, was important for gaining insight into the temporal orientations and strategies of various actors in the field—in Bourdieusian terms, their 'feel for the game' (Bourdieu, 1998, p.25). *Historical-archival books and reports* provided accounts of key events, key actors, and their respective positions and position-takings throughout the field's history. Finally, the *secondary data* obtained from the Special Committee on AI was beneficial for the purposes of greatly extending the volume and diversity of perspectives represented beyond what I could reasonably achieve as the sole investigator. This Committee issued an explicit call in 2017 to members of the British AI community to comment on the 'pace' of AI R&D (among other issues).

By collecting and analysing data from multiple sources—a hallmark of Bourdieusian methodological approaches (Leander, 2008)—the current study was able to generate more robust analytic themes by confirming their emergence across the various data sources; a process known as 'data triangulation' (Voss et al., 2002; Yin 2014). In addition, the research draws on the particular strengths of different data sources: the depth and richness of meaning conveyed in interviews, the representation of facts in historical-archival documents, the ability to confirm or dismiss themes through observation, and the opportunity to amass many additional reflections on the research themes through pertinent secondary data (Pettigrew, 1990).

1.2.3. Data analysis

Analysis of the data broadly followed a Bourdieusian field analysis approach (e.g. Hilgers and Mangez, 2014; Leander, 2008; Özbilgin and Tatli, 2011). For Bourdieu, a decisive part of social research is the initial carving out of one's object, i.e. the choice of theoretical stakes; the decision of which things to approach in depth and which to sketch; and the choice of what the most pertinent principles of division are within a field (e.g. Bourdieu et al., 1991, p.33–55; Bourdieu and Wacquant, 1992, p.220–4). Despite the difficult nature of these choices, Bourdieu himself noted that 'the division of a field…entails a genuine qualitative leap' (Bourdieu and Wacquant 1992, p.104). This not accomplished in one bold, broad stroke, but rather, is a 'protracted and exacting task accomplished little by little' (Bourdieu and Wacquant, 1992, p.228).

The process through which I arrived and subsequently divided the British AI field along the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time was similarly gradual, occurring over a 30-month period (from Sep 2017-Mar 2020). To implement Bourdieu's theory of fields, I engaged in three main operations as suggested by Hilgers and Mangez (2014, p.18-21): (1) evaluate the degree of autonomy of the field, i.e. identify to what extent actors from other fields have power and influence there; (2) describe the symbolic order, i.e. identify the connections and oppositions between different schools, movements, polemics, and battles; and (3) reconstitute the structure of positions, i.e. examine the relative means (i.e. capital) actors have at their disposal in these struggles. These three stages are superimposed onto one another to produce the analysis.

In line with Hilgers and Mangez (2014), my analysis proceeded by (1) identifying the key institutional actors within the British AI field, both historically and presently; (2) elucidating the main struggles between different actors within the field. It was at this stage that I became aware of actors' struggle over the temporal commons, specifically, over the 'legitimate' pace of AI R&D and the processing speeds of AI systems. These struck me as potentially fruitful themes to investigate and encouraged me to (3), begin reading and problematising the MOS speed literature and related texts. From here, I realised the accounts being articulated by my respondents demonstrated the potential to address theoretical shortcomings and move forward alternative assumption grounds regarding speed. In this way, the key codes and lines of division along the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time were the outcome of my critical reading of the (MOS) speed literature and a reflection of key tensions which I observed in the accounts of my informants. As per Layder (1998) and Özbilgin and Tatli (2011), the analysis corresponds to a point between middle range and grounded approaches, being both theoretically sensitised and generative of theory during the research process itself.

For the final stage of analysis, I (4) utilised thematic and open coding (Braun and Clarke, 2006). Thematic coding was conducted by disaggregating the data corpus across the four temporal dimensions. Within each parameter, open coding was used to examine emergent issues in my respondents' accounts, giving space to their voice and examining their priorities. Coded data was collated into further themes and sub-themes pertaining to the specific research questions. Given the importance of power to shaping the temporal commons, I analysed not only the meanings and agendas of my respondents, but their relative power (i.e. capital) in the AI field. This final element of the analysis is consistent with Hilgers and Mangez's (2014) suggestion that investigators must reconstitute the structure of positions within a given field.

1.3. RESEARCH CONTRIBUTION

By critically interrogating the literature pertaining to speed in MOS and empirically exploring struggles over the temporal commons in a Bourdieusian analysis of the British AI field, this research makes four focal contributions: (1) Problematising the MOS speed literature, (2) Comprehending speed pathologies, (3) Building and extending the use of Bourdieu's conceptual framework in MOS, and (4) Informing policy and practice in the British AI field.

First, by *problematising the MOS speed literature,* this thesis contributes to MOS by opening up new lines of inquiry and offering an alternative agenda for scholars interested in speed, temporality, and related areas. *Problematising* may be viewed as a form of 'provoking theory' where the aim is to show alternative, eye-opening ways of seeing phenomena rather than simply add to existing theories (Sandberg and Alvesson, 2020). Through a critical interrogation of 65 texts (chapter 2) this thesis identifies five problematic assumptions in the mainstream MOS speed literature and offers five counterpoints and alternative agendas. The essential focus of this thesis is to move these alternative assumptions and agendas forward. In addition, by presenting a 'problematising review' (Alvesson and Sandberg, 2020), the current thesis responds to calls from organisation scholars for more impactful review pieces (e.g. Patriotta, 2020; Breslin et al., 2020) as the limitations of 'gap-spotting' and 'gap-filling' become more evident (Sandberg and Alvesson, 2010).

A second contribution of this thesis is toward *comprehending speed pathologies in the British AI arena* and offering new insights. The aim of 'comprehending theory' is 'to develop a meaningful interpretation of the social world, or some significant part of it…so that people may have a clearer understanding of their world, its possibilities of development, and the directions along which it may move' (Blumer, 1954, p.3; see also: Sandberg and Alvesson, 2020). This thesis presents various 'thick descriptions' (Geertz, 1973; Ponterotto, 2006) to explain how individual and institutional actors with competing agendas and interests experience and make sense of speed in the British AI field. While the findings suggest speed is experienced both as a positive-enabling force and a negative-oppressive one, MOS has typically overlooked, ignored, or suppressed the dark, more pathological side of speed. To date, the focus has been on speed as it relates to economistic concerns (e.g. Perlow et al., 2000; Kiss and Barr, 2017). Thus, a key contribution of this thesis is to understand how speed and speed logics may be implicated in the production of various socio-political harms in and around organisations. This is not to say that the thesis argues for an 'ethic of slowness' as a solution to speed pathologies (Vostal, 2014). Rather, a main theme running throughout this thesis is the need to problematise *slow* too. I argue that comprehending speed pathologies in the British AI field requires an understanding and potential pacification of macro-level engines of speed and acceleration which often exist 'behind the backs of actors' (Rosa, 2013, p315). Attempts to decelerate without disrupting extant power relations are likely to worsen inequalities and deepen socio-economic crises. As such, the thesis brings together the literatures on speed in MOS with perspectives on 'post-growth' and 'alternative organising' (e.g. Banerjee et al., 2020; Parker et al., 2014; Rosa et al., 2017). These perspectives are explored as potential opportunities to overcome escalatory logics in the realm of speed in and around organisations.

A third contribution of this research is to *build and extend the use of Bourdieu's conceptual framework* by investigating an under-examined field (i.e. British AI) and applying his concepts to advance theorising of time/speed in and around organisations. Over recent years, scholars have called for a deeper engagement with Bourdieu's conceptual framework in MOS (e.g. Emirbayer and Johnson, 2008; Kerr and Robinson, 2012; Harvey et al., 2020). However, although Bourdieu's theoretical tools are being applied to a growing number of fields—e.g. Scottish banking (Kerr and Robinson, 2012), UK equality and diversity (Özbilgin and Tatli, 2011), and Indian fashion (Khaire and Richardson-Hall, 2016), to name just a few—to date, his concepts have not been systematically applied to the field of artificial intelligence. Furthermore, although practice-based theories of time in MOS are influenced by Bourdieu (e.g. Orlikowski and Yates, 2002; Kaplan and Orlikowski, 2013), it would be an understatement to suggest his concepts have seen limited application to the study of time/speed in organisation studies.

By conceptualising and empirically exploring the British AI field using Bourdieu, this thesis sheds light on the socially and politically contested nature of AI. It unveils the extent to which industrial and military actors have increasingly imposed themselves on this social arena as they battle to control the definition of legitimate norms and practice in the field. Thus, the thesis addresses criticisms from organisational scholars that mainstream analyses of AI are overly deterministic (e.g. Bloomfield, 2018; Fleming, 2019), that is, they tend to view AI as the outcome of an inevitable logic of technological development to which organisations and society can only react (e.g. McAfee and Brynjolfsson, 2017; McKinsey Global Institute, 2017). By contrast, this thesis demonstrates how AI is changed and shaped by various socio-organisational power relations with a specific focus is on the temporal dimensions of AI research and development and the temporal characteristics of AI systems.

In addition to extending Bourdieu's conceptual resources to a new and important field, this thesis also demonstrates Bourdieu's potential for enriching the analysis of time and speed in and around organisations. Specifically, it highlights the value of Bourdieu's relational perspective and his attention to power, history, and reproductive mechanisms; all of which advance scholarly understanding of speed and the politics of time.

A fourth contribution of this thesis is toward *informing policy and practice in the British AI field*. Effective, robust, and democratic policy in this social arena requires a commitment to investigating the contested terrain of British AI, including the power relations underpinning the field. Previous research has raised concerns with the extent to which high-level AI policy and ethics advisory councils are dominated by actors from industry (e.g. Greene et al., 2019; Hagendorff, 2020). This thesis provides a more empirically and theoretically-grounded understanding of the British AI field, bringing to the fore both dominant and dominated voices. More specifically, it brings forward knowledge and understanding of the socio-temporal dimensions of AI, a hitherto largely neglected area of study. Throughout the thesis, I demonstrate the significance of these socio-temporal dimensions—their social, political, and ethical consequences.

Overall, this research contributes to the theory on time and speed in organisation studies as well as to more general debates regarding the sociology of speed. It builds and extends the use of Bourdieu's conceptual framework in MOS by examining an under-researched field and bringing his concepts to the study of time/speed in organisations. Finally, it is of value to the formation of policy and practice in the British AI field that is both empirically- and theoretically-grounded.

1.4. THESIS STRUCTURE

The current thesis proceeds through seven chapters. Following the introduction, chapter 2 presents my 'problematising review' of the literature pertaining to speed. The chapter begins by justifying the value of problematising as an approach to reviewing literature, and in particular, the MOS speed literature. It describes the specific method I applied to select and problematise the 65 key texts relating to speed in MOS. Next, the chapter looks at how to define speed and features of its definition. It then presents in detail five problematic assumptions and agendas regarding speed and organisations. To address these, it proposes five counterpoints or alternatives. The chapter concludes by outlining in more detail my two research questions which aim to move the alternative speed assumptions and agendas forward.

Following the problematising review, chapter 3 introduces the empirical site, that is, the British AI field, where I problematise speed further. I explain and justify my use of Bourdieu's relational sociology for the purposes of conceptualising and empirically exploring the British AI field, and I provide rationale for investigating this social space. Because for Bourdieu constructing the field is always a matter of empirical investigation, the chapter outlines in brief the key lines of division within the AI field across the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time. The chapter also maps out the position of key institutional actors across these dimensions. In the second half of chapter three, I detail and account for the methodology used in the research. The research design is presented, as well as the processes of data collection and data analysis.

In chapter 4, I present the first of two main findings chapters. The chapter investigates the question of how differently positioned actors in the British AI field experience time/speed. It elaborates and explains the different temporal position-takings in the British AI field across the axes of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time. Specifically, it pays close attention to how differences in the value and meaning of speed manifest in actors' accounts and strategies. The chapter theorises a set of 'speed advantages' and 'speed pathologies' which relate to the four temporal parameters. Overall, the chapter unveils how there is no single, consolidated view of speed or its importance in the British AI field, but competing perspectives in line with the multiplicity of vested interests of various stakeholder groups.

Chapter 5 builds on the previous chapter to examine the power relations and socio-material mechanisms through which speed is reproduced/resisted within the

British AI field. A Bourdieusian concept of the field requires the researcher to consider not only the differences between actors in terms of their position-takings—in this thesis, their different relationships to time and speed—but the relative means (i.e. capital) have at their disposal to influence this struggle. Actors with more socially valued capital have greater powers to produce and impose legitimate meaning. Accordingly, this chapter makes explicit the power resources available to actors who advocate for the different temporal positions. It examines historical changes to the logic and species of capital which can be used to produce effects there. Doing so allows the investigator to 'objectify' the structural relations which shape the temporal commons in the British AI field (Hilgers and Mangez, 2014). Following this, the chapter draws on Bourdieu's notion of 'habitus' to examine the reproduction of speed in the British AI field. The chapter ends by outlining possibilities for change whereby the dominant temporal regimes of techno-scientific and machine-instantaneous time are subverted.

Chapter 6 provides an initial discussion and contextualisation of the findings and contributions of the thesis within the literature. The chapter is composed of two main parts. In part one, it discusses the findings of the thesis in light of the problematising review and the empirical study. In part two, it explores the implications of the findings for policy and practice in the British AI field.

Finally, in chapter 7, I conclude by providing a summary of the main research findings. I distil the key findings and contributions of the research into the four main contributions briefly outlined above: (1) Problematising the MOS speed literature, (2) Comprehending speed pathologies in the British AI field, (3) Building and extending the use of Bourdieu's conceptual framework in MOS, and (4) Informing policy and practice in the British AI field. The thesis ends with a discussion of some of the limitations inherent in my research design before outlining several possibilities for future research.

CHAPTER 2.
SPEED AND ORGANISATION STUDIES: A PROBLEMATISING REVIEW

'The question of speed is central.'
(Virilio, 1994, p.14)

2.1. INTRODUCTION

The current chapter presents a problematising review of research relevant to speed in MOS, reflecting on some of its limitations and suggesting alternative lines of inquiry. The aim of my problematising review, and thus of this chapter, is to identify and challenge assumptions underlying existing speed research, and based on that, to formulate more informed and novel research questions on the topic.

The problematising review method as utilised here was initially posed by Alvesson and Sandberg (2020) as a critical rejoinder to Elsbach and Van Knippenberg's (2020) argument for 'integrative reviews.' The *integrative review* adopts a more conventional approach to conducting literature reviews, regarding them as a way to 'generate representative description[s] of a field' (Elsbach and Van Knippenberg, 2020, p.1277), and then to use this as a way to identify gaps and build on past research. In Elsbach and Van Knippenberg's (2020) argument, knowledge production is viewed as accumulative, and the review domain is treated as more or less given. By contrast, the *problematising review* regards reviews as an 'opening up exercise,' the aim being to try 'to re-evaluate existing understandings of phenomena, with a particular view of challenging and reimagining our current ways of thinking about them' (Alvesson and Sandberg, 2020, p.1297). It rethinks the process of reviewing through four principles: (1) the ideal of reflexivity, (2) reading more broadly but selectively, (3) not accumulating but problematising, and (4) the principle that 'less is more' (Alvesson and Sandberg, 2020).

In this chapter, I explain these four core principles, justifying the problematising review as appropriate and valuable to an examination of speed in MOS. The MOS speed literature is particularly well-suited to a problematising review for two main reasons. First, existing research on speed in MOS has become highly fragmented, spread out across various disciplines and sub-domains using specific labels such as 'innovation speed' (e.g. Kessler and Chakrabati 1996), 'internationalization speed' (e.g. Chetty et al. 2014), 'integration speed' (e.g. Bauer 2015), and 'strategic decision making speed' (e.g. Bakker and Shepherd 2017). While these specific sub-fields have yielded valuable insights, scholars working within their respective sub-domains risk breeding parochialism and remaining tightly bound to certain paradigmatic assumptions and research traditions. Second, to my knowledge, there are currently no 'critical-' or 'problematising reviews' of the MOS speed literature. Previous reviews on speed in MOS have favoured either the integrative review style (e.g. Casillas and Acedo, 2013), or systematic review types (e.g. Ellwood et al., 2017). However, these kinds of reviews tend to reproduce institutionalised lines of reasoning and overlook or ignore alternative views of knowledge which see knowledge arising through productive dissensus.

Following an explanation of the problematising review, the chapter outlines the specific method I used to operationalise Alvesson and Sandberg's (2020) four principles and select texts to review/problematise. In total, 65 texts were selected for this review: 35 texts from ten 'top tier' MOS journals using the keywords 'speed,' 'pace,' or 'accelerat*'; 15 from the broader knowledge domain of temporality in MOS; and 15 from classic social science perspectives on speed and leading contemporary speed theorists outside the MOS domain. For each of these the following questions were explored: (1) What conversation does the text contribute to? (2) What is being probed? (3) What are the key findings or claims? (4) What (if any) data and methods are used? (5) What measures or conceptualisations of speed are used (or how does this text relate to speed)? (6) What assumptions underpin this work? (see appendix 1).

Before laying out my critical analysis of the 65 texts, the chapter considers how to define speed and features of its definition. Following this, it identifies and problematises five key assumptions of the MOS speed literature: (1) believing that speed is predominantly a good thing; (2) assuming speed should be evaluated in relation to economic value; (3) amplifying top executives' perceptions of speed; (4) privileging the antecedents to speed; and (5) treating speed as a general ontological premise from which to theorise. Based on this critique, I propose several counter-assumptions and alternative lines of inquiry which have the potential to become the start of novel theoretical contributions: (1) taking full stock of potential speed pathologies; (2) adopting a stakeholder view to consider how speed effects a broad range of actors and interests; (3) broadening the sample by considering the speed experiences of marginalised voices; (4) studying how speed is resisted, and (5) questioning the perceived omnipresence of speed.

The chapter concludes with a summary of the five problematisations and five alternatives. I discuss how I used this review as a means of proposing and analytically informing the research questions which the thesis proceeds to address.

2.2. THE PROBLEMATISING REVIEW

The systematic evaluation of existing studies within a specific field is a crucial part of almost any research. A thoughtful literature review can help to increase the relevance, originality, and impact of a research undertaking. Literature reviews can also prove instrumental in assisting other researchers to get their bearings within a specific domain and facilitate learning. It is not surprising then that there are numerous guides on how to conduct literature reviews. These often differ in style and purpose, from the 'integrative review' (e.g. Elsbach and Van Knippenberg, 2020), to the 'meta-analysis review' (e.g. Combs et al., 2019), through the 'critical review' (e.g. Todnem By, 2005), and so on.

Although literature reviews can be valuable, they are not unproblematic (Gond et al., 2020). Different kinds of literature reviews contain varying assumptions regarding knowledge production and how research is done. For example, in Elsbach and van Knippenberg's (2020) argument for integrative reviews, the authors see reviews as being a way to generate 'representative description[s] of a field' and then to 'build on previous work' (p.1277). A key imperative is to 'systematically trace much (or maybe even all) of the literature on a selected topic' (p.1278) and then to provide 'representative summaries of the state of the science' (p.1287). Similarly, Combs et al., (2019) in their discussion of meta-analytic research, note the main aim of such reviews is to 'aggregate evidence' (p.1) and 'summarise information' regarding various 'theoretical relationships' (p.2).

While upon first glance these may seem sound objectives, reviewing literature in this way presents a number of issues. In a provocative article by Alvesson and Sandberg (2020), the authors raise a total of seven concerns with how literature reviews are widely conducted. Although their discussion is specifically aimed at Elsbach and van Knippenberg's (2020) proposal for integrative reviews, their comments are broadly relevant to prospective review authors and useful for the purposes of justifying why I undertook a problematising review. I distil them here into three main categories.

(1) **Problems with labelling.** A first set of issues often side-stepped by review authors revolves around what defines the domain of a review. Despite the fact that much of what we study has no obvious or absolute boundaries, many review authors ignore this by adopting a highly focused approach, normally by conducting a search using a specific keyword such as 'decision making speed' or 'time-based competition.' The problem with this is that review authors often rely too heavily on labels that may be ambiguous and unreliable indicators of a targeted domain. Moreover, literatures that might be highly relevant for understanding issues are excluded from the article catch.

These problems are highly pertinent to the literature on speed in MOS. To date, past reviews in this area have concentrated on tightly specified labels such as 'innovation speed' (e.g. Kessler and Chakrabati, 1996), 'integration speed' (e.g. Bauer, 2015), and 'internationalisation speed' (e.g. Chetty et al., 2014). While these reviews have covered much within their narrow domains, they have traded depth for breadth and consequently ignored wider knowledge domains and more critical ways of thinking about speed which are the focus of this current review (e.g. Agger, 1989, 2004; Rosa, 2010; Virilio, 1986).

(2) **The contested terrain of knowledge development.** A second set of problems relate to review authors' assumptions regarding how knowledge develops. A strongly held assumption in many review articles is that knowledge production is cumulative, and that if the review author successfully traces all (or most) of the literature then this will 'point the way' toward missing pieces which can be built upon. However, in practice this view downplays the notion that most, if not all, research is constrained by paradigmatic assumptions, and because research is often reliant on its paradigm, accumulation is difficult if not impossible (Jackson and Carter, 1991). Instead, knowledge might be better thought of as proceeding through productive dissensus and divergence. As I argue in more detail shortly, review articles on the various sub-domains of speed in MOS have been constrained by a number of paradigmatic assumptions, such as the shareholder view of the firm.

(3) **A view from somewhere.** A final set of issues concerns the biases often hidden in literature reviews, including the view that reviews are a 'good thing.' It is often the case that review pieces privilege certain research groups and texts to the exclusion of others (for example, North American journals), yet claim to be providing 'representative summaries' (Elsbach and van Knippenberg, 2020, p.1287) thus

implying author neutrality. In practice, however, authors may in fact be cementing certain worldviews and reinforcing conservatism at the expense of opening a domain up for problematisation.

Given these problems prevalent in many review articles, Alvesson and Sandberg (2020) argue that alternative approaches to thinking about reviews are necessary. Accordingly, they propose the problematising review, which is based on four core principles.

(1) **The ideal of reflexivity.** This involves the active and systematic attempt to avoid taking conventions or assumptions for granted and inadvertently reinforcing or reproducing them. Crucial is that review authors question assumptions, perspectives, and vocabularies, including their own, in order to imagine, test, and suggest alternative ways of thinking about a research domain.

(2) **Reading more broadly but selectively.** The second principle aims to overcome the problem of researchers 'going native' by reading too much in a limited field and becoming strong on conventionality, but weak on creativity. The important thing here is to try to reduce the risk of 'box thinking' and counteract the problems of the arbitrariness of the domain by looking at a more limited yet careful set of readings. This may involve focusing first on some core and representative readings within the targeted research domain, and then shifting focus toward those texts with a broader bearing on the topic.

(3) **Not accumulating but problematising.** This principle stands in contrast to the aforementioned accumulation norm. Rather than look for missing pieces in a domain, usually by conducting a surface reading of many texts, what is important is

to undertake a deep reading of foundational texts, and then to identify and articulate more problematic or limiting elements in these texts. The review author might then develop alternative assumption grounds and consider these in relation to their audience. Reflexivity is important here, as the reviewer must evaluate their own proposed assumption ground and not just what is problematic about conventional ways of thinking about the domain.

(4) **The concept of 'less is more.'** Finally, the principle of 'less is more' emphasises fewer readings, but a deeper concentration on coming up with novel and unexpected insights.

In summary, the problematising review takes as its main aim the identification and problematisation of key assumptions within a research domain, and the articulation and critical evaluation of alternative assumption groups which have the potential to become the start of novel theoretical contributions. Having discussed the principles guiding a problematising review, I now explain my process of applying them.

2.3. METHOD OF REVIEW

Given the principles of the problematising review, this review chapter could not rely on a keyword search alone. Furthermore, it became important to carefully identify relevant, yet arguably more peripheral texts which might shed light on the domain of interest, that is, *speed*. To complete this task, I read the literature via a three-level approach.

At the first level, I began my search by focusing on 40-years (1980-2020) of publication in ten 'leading' MOS journals: *Academy of Management Journal, Academy of Management Review, Administrative Science Quarterly, Human Relations, Journal of Management, Journal of Management Studies, Journal of World Business, Organization Science, Organization Studies*, and *Strategic Management Journal*. Cognisant of the highly contentious nature of journal selection, I selected this mix of North American and European journals in part because they have a strong reputation for selecting papers on the basis that they make significant theoretical contributions to MOS, but perhaps more importantly, on the anticipation that the texts within them would be a good place to begin evaluating prominent (though not necessarily critical) understandings and conceptualisations of speed as they appear in MOS. My key aim at this first level was to acquire a set of foundational texts on the topic of speed in MOS.

Within these ten journals, a Web of Science search was conducted using the keywords: *speed*, *pace*, and *accelerat** in the 'topic' function. The 'topic' function searches 'title, abstract, author keywords, and keywords plus.' I chose to have the keywords 'pace' and 'accelerat*' in addition to 'speed' because pace and speed are often used interchangeably in the literature (e.g. Amis et al., 2004; Kunisch et al., 2017), and acceleration explicitly concerns a 'speeding up.' Based on these criteria, my search returned 252 papers. After a careful evaluation of the abstract of all 252 papers, 163 were discarded, leaving a total of 89 texts. From this, 20 papers were purposefully chosen due to their high citation score and direct relevance to the subject of interest. From the remaining 69 papers, a further 15 were selected at random giving a sample of 35 texts. While it may be the case that some thoughtful studies are excluded from this initial article catch, my goal was not to achieve a full inventory but to have a revealing sample to scrutinise.

At the second level, I looked to shift my focus toward considering some wider texts relevant to the topic of speed. The literature on temporality in organisations is highly relevant for understanding issues concerning speed, helping to counteract the arbitrariness of the speed, pace or accelerat* labels. As Sorokin and Merton (1937, p.615) argue: ‘No concept of motion is possible without the category of time.’ Accordingly, for the second level of my review, I identified a further 15 significant texts from this domain. I started this process by identifying prominent reviews on temporality in organisations (a total of 7 articles). Next, I contacted a small number of scholars from this research field and asked whether they could recommend any additional texts outside my sample which they considered pertinent to the category of speed. Some of their recommendations included book chapters and, in two cases, whole books (see Appendix 1, level 2 for a full list). These readings were useful to avoid over-reliance on the right ‘labels’ during my first level.

Finally, for the third level, I sought to read more broadly by considering a mix of classic social science perspectives with a bearing on speed, as well as some contemporary speed theorists from outside the MOS domain. This led me first to (re)read the classic works of Marx (1857/1973, especially p.140-143), Weber (1922/1978, p.956-1005), Simmel (1900/2004, p.433-519; 1903/1950 p.409-424), and Taylor (1911/2005), all of whom had a significant amount to say about speed. I further read Bauman (1999) and Harvey (1989) for their reflections and continuations on these classical perspectives. In addition to considering these quintessential texts, I read and analysed the works of Paul Virilio (1986, 2005) and Hartmut Rosa (2010, 2015)—two of the foremost theorists of speed. As a sign of the paradigm-bound and specialised nature of speed studies in MOS, of the 35 articles identified during level one of my literature search, none included references to either of these theorists. This is in spite of the fact that Connolly (2009) claims: 'It would be difficult to overstate the importance of Paul Virilio to comprehension of the effects of speed on the late modern condition' (p.261). Likewise, Hartmut Rosa has been described as 'the best-known contemporary social theorist of acceleration' (Wajcman and Dodd, 2016, p.5). The final text considered was a recent handbook entitled '*The sociology of speed: Digital, organizational, and social temporalities*' which brought together a broad range of theoretical perspectives on the subject (Wajcman and Dodd, 2016). The aim of this third level was to inspire elevated reflexivity and critical reflection on the domain of speed in MOS.

By the end of my three-level search, a total of 65 texts were considered. For all of these texts, the following six questions were explored: (1) What conversation does the text contribute to? (2) What is being probed? (3) What are the key findings or claims? (4) What (if any) data and methods are used? (5) What measures or conceptualisations of speed are used (or how does this text relate to speed)? (6) What assumptions underpin this work? Appendix 1 provides a comprehensive overview of all included texts as well as abridged answers to these questions.

2.4. WHAT IS SPEED?

Before proceeding to lay out my critical analysis of these texts, it is important to be clear on what exactly is meant by speed, and more importantly, what I mean by speed in this thesis. One of the notable features of the literature concerning speed is just how rarely the concept is ever specified or defined in detail. This feature becomes more problematic in light of the fact the concept has at least two dominant meanings, denoting first, a calculable rate at which something or someone moves or operates, and second, a relative concept associated with (perceived) rapidity of movement or incident. Perhaps adding to the confusion, many authors appear to use these two meanings simultaneously. For example, Kessler and Chakrabarti (1996) define 'innovation speed' as 'the time elapsed between (a) initial development...and (b) ultimate commercialisation (p.1144); i.e. speed as a measurable *rate of incident*, whilst also using the term to refer to fast and accelerating innovation, i.e. speed as *rapidity*.

Although these meanings differ, one explanation for their frequent conflation is that for social and organisational scholars, speed as a measurable rate of incidence or physical movement is of little interest in and of itself. Rather, what seems to be of interest is how speed which is considered remarkable in some way—i.e. rapid speed or high-speed—affects various socio-organisational actors, processes, and outcomes. So, while organisational scholars may look to calculate specific rates, such as the speed of innovation, competitive response, internationalisation, strategic decision making, production, organisational change, or even the general pace of organisational life, it is typically with a focus toward those rates which are, relatively speaking, considered or perceived to be occurring at a fast pace. This is not to say that things which happen slowly are devoid of interest. On the contrary, it seems difficult if not impossible to understand social movements such as 'slow food' (van Bommel and Spicer, 2012) or 'slow science' (Stengers, 2018) without reference to the broader definition of speed as fast and vice versa.

This raises the question however, of how speed may be measured or analysed. A few clarifications are necessary here. First, as the reader may have noticed, we can distinguish between two different categories of speed: (1) speed associated with physical movement, and (2) more sedentary forms of speed associated with rapid rates of delivery of experience or change. The first category provides perhaps the most common, intuitive understanding of speed and its mathematical definition: speed equals distance over time. This is the kind of speed associated with fast cars, rollercoasters, airplanes, and so on, that is, physical movement through space and time. By sedentary speed, what I am referring to is the fact that many of us can experience haste, hurry, and a sense of rapidly occurring change or incident without ever leaving the office desk (see: Tomlinson, 2007). This is the kind of speed associated with time pressure and intense temporal regimes. Although distinct, these two forms of speed frequently interweave. For example, in order not to miss a tight deadline at work, a person might choose to drive to work quickly.

The second point to note is that whether as rate of incidence or physical movement, speed is often 'measured' through reference to 'clock time.' Clock time refers to an objectified subjective indicator that sees time as linear, standardised, quantifiable, and divisible (Adam, 1994, Holt and Johnsen, 2019). Indeed, this close relationship between speed and clock time is widely noted by contemporary scholars of speed and temporality (e.g. Ancona et al., 2001; Bluedorn and Denhardt, 1988; Kunisch et al., 2017). However, given that an hour, a day, or some other metric of time can be experienced differently by different people, speed is also profoundly ‘subjective.’ Not everyone experiences speed the same way. This is as true for those hurtling through space on a rollercoaster as it is for those striving to stay in the “rat race.” Some may find speed thrilling while others find it alarming or oppressive. As such, the analysis of speed yields to both an ‘objective’ and a ‘subjective,’ phenomenological approach, with a combination of the two likely being the most promising route (Rosa, 2010). For example, scholars might seek to calculate how much time is spent on definable episodes or units of action, such as strategic decision making or democratic deliberation, whilst also exploring how individuals involved in these processes perceive or grapple with their temporal conditions.

A third point to make is that speed is deeply social in the sense that the norms and cultural beliefs we hold regarding speed are subject to socio-organisational power relations (Wajcman and Dodd, 2016). MacKenzie (2016) makes the point that in addition to being social, speed is also material. Temporality today is shaped and experienced via multiple media modalities. Thus, given the socio-material underpinnings of speed, an analysis of speed ought to be inclusive of the institutional context, infrastructure, and power relations. For example, within some organisations, people may feel the need to respond to emails quickly. However, this is arguably not due to the pace of data transmission, but a result of collective norms that have sedimented around appropriate response times (Wajcman, 2009). Furthermore, an individual's ability to resist these speed imperatives and socio-temporal norms depends very much on their power in the organisation or field in question (Wajcman and Dodd, 2016).

A final point to note is that whilst speed may be investigated as a phenomenon in and of itself, some scholars contend that speed is better conceived as 'a relation between phenomena' (e.g. Virilio, 1997, 2005; see also James, 2009). In this view, speed is an important variable that mediates between events, processes, locations, activities, things, and so on. Central to this conceptualisation is an understanding that the speed (or perceived speed) at which something happens or moves has the capacity to change its fundamental character, or as Virilio (2005, p.105) claims, 'speed metamorphoses appearances.' One way of illustrating what is at stake here is to think of how the speed at which we move from position A to position B alters our relation with the world. For example, if we travel at a speed of 100 kilometres per hour, those things which appear in our field of vision—e.g. trees, fields, animals—can appear distorted or blurred. However, if we make the same journey by foot, our relation to the environment, our ability to see, to perceive, and thus to comprehend it is altered. Similarly, if we think about contemporary workplaces, the rate at which components 'whizz' along conveyor belts or people enter and leave our working lives affects our capacity to experience, perceive, and comprehend these things and people. Under this conceptualisation, investigators view speed as an important variable which mediates our relationships with one another, with space, with objects, with organisational performance, and more. This leads to the famous idea first promulgated by Marx and later developed by others (e.g. Harvey, 1989; Hassard, 2002; Virilio, 2005), that as speed increases, space and time are literally compressed.

Summarising this section, we can say that conceptually, speed has two dominant meanings. It is both a measurable rate of movement or incident and a relative concept denoting rapidity. Subtle differences exist between the corporeal experiences of speed associated with physical movement and the sedentary speed experiences related to (involuntary) time-pressure (Vostal, 2016). In either case, speed yields to both empirical calculation and subjective interpretation. However, given the normative aspects of speed, it is both an outcome of, and a target for, actors' construction. Finally, speed may be viewed as a structuring principle which affects how we experience the world (Virilio, 2005).

For the current chapter and remainder of this thesis, it is the notion of speed as denoting rapidity, and the related concern with 'doing things quickly, speeding things up' (Grey, 2009, p.27) which is central to the analysis. However, such a focus does not preclude analysis of speed as a measurable rate of movement or incident. Rather, the two seem complementary. Similarly, my emphasis is less on speed as it relates to physical movement and more on speed as it relates to time pressure. Echoing Virilio's (1986, 2005) claim that speed affects our being in the world, I am particularly interested in a critical phenomenology of speed. Having articulated what speed is and what I mean by it, this chapter now turns to identify and problematise some prominent assumptions in the MOS literature concerning speed.

2.5. CRITICAL REFLECTIONS ON THE SPEED LITERATURE

2.5.1. Believing that speed is predominantly a good thing

A first assumption pervading much of the MOS literature on speed is to regard speed as predominantly a good thing. This view applies across the range of MOS sub-domains which explicitly deal with speed. Existing studies on strategic decision making speed (e.g. Eisenhardt, 1989; Kownatzki et al., 2013), innovation speed (e.g. Kiss and Barr, 2017), the speed of internationalisation (e.g. Chetty et al., 2014), the speed of organisational change (e.g. Romanelli and Tushman, 1994), M&A integration speed (e.g. Homburg and Bucerius, 2006), competitive dynamics (e.g. Nadkarni et al., 2015), and strategic management more broadly (e.g. D'Aveni et al., 2010; Dykes et al., 2018) all contain strong claims in favour of speed. As Kessler and Chakrabati (1996) note: 'There seems to be an underlying bias toward speed, meaning faster is always better' (p.1154). This view is echoed in the discourses of many contemporary organisations, from Facebook's (2012) 'The quick shall inherit the Earth,' to McKinsey and Company's (2020) 'The need for speed.'

Arguably, an emphasis on speed offers several benefits for organisations. First, existing studies have documented how organisations who can execute certain processes faster than their rivals may accrue various 'first-,' or 'fast-mover advantages' (e.g. Hawk et al., 2013; Suarez and Lanzolla, 2007). Bakker and Shepherd (2017) argue that 'opportunities are inherently fleeting, hence, speed is crucial to their capture' (p.130-131). By being first (or a 'fast follower') to market, organisations can gain market share, acquire key resources, and gather additional profits before their competitors catch up (e.g. Lieberman and Montgomery, 1988; Langerak and Hultink, 2005). Moreover, alongside factors such as price and quality, speed is frequently regarded as a key determinant of competitive advantage (Scherer, 1967).

Second, speed may be valorised under conditions where time is viewed as a commodity (Adam, 1994). The principle of 'commodified time'—where time is treated as something which can be bought, sold, calculated, and controlled—is a dominant feature of Western organisation (Marx, 1978; Thompson, 1967). It is neatly expressed in Benjamin Franklin's (1748) famous equation: 'Time is Money.' To the extent that this conceptualisation of time permeates organisational labour relations, where workers are remunerated for their time and not for the goods and services they produce, it is clear that time saved is equivalent to money made (Marx, 1978). For this reason, managers typically regard time as a scarce resource which must be analysed and optimised (e.g. Taylor, 1911/2005). Indeed, when time is money, doing more per unit of time is equivalent to (relative) profit (Rosa, 2010). These principles are central to theories of 'time-based competition' (e.g. Stalk, 1990) and 'high-speed management' (e.g. Jones, 1993), where the emphasis is on doing things in the least amount of time in order to maximise profitability.

Finally, as I discussed earlier, speed may be experienced as a certain kind of thrill, both as a corporeal experience associated with physical movement (e.g. Duffy, 2009), but also the sense of excitement that can result from time-pressure (Vostal, 2016), the feeling of being in a (competitive) race (Czarniawska, 2013), and of efficiently accomplishing one's tasks (Aeon and Aguinas, 2017). Taken together, these three factors produce powerful incentives for organisations, managers, and those who research them to venerate speed.

However, speed is not always a positive-enabling force for organisations or their many stakeholders, but can instead be problematic, making speed a mixed blessing. At a basic level, intense temporal regimes and the 'need for speed' can result in a plethora of negative-oppressive consequences, ranging from psycho-social burnout (e.g. Adam, 1994; Rosa, 2010), to temporally-caused alienation (Rosa, 2010), to the obliteration of time and space required for democratic participation and critique (Virilio, 1986; 2005).

While I do not have space here to elaborate on the many negative modalities of speed (see section 2.5.1. for a more detailed discussion), the few mentioned are for the purpose of disputing the bias toward seeing speed as something largely positive. In the MOS speed literature there is a growing recognition that speed is not an unequivocal good. For example, in their ethnographic study of an internet start-up, Perlow et al. (2002) found that an emphasis on speed resulted in workers prioritising fast decisions over careful reflection and contemplation, which eventually diminished the organisation's performance. Likewise, other scholars note a curvilinear relationship between speed and performance, claiming a moderate speed may be better than a high one (e.g. Forbes, 2005, Jiang et al., 2014; Vermeulen and Barkema, 2002). However, as much as these more critical perspectives are welcome, their analysis is constrained by what they assume the value of speed should be measured against, which takes us to my next critique.

2.5.2. Assuming speed should be evaluated in relation to economic value

Closely related to the assumption that speed is predominantly a good thing is the assumption of what 'good' means. A key issue here is the tendency of MOS speed scholars to assume the value of speed should be judged by how it impacts organisational performance, with 'performance' almost invariably meaning some derivative of shareholder value—for example, sales growth and profitability (e.g. Judge and Miller, 1991), Tobin's Q (e.g. Pacheco-de-Almeida et al., 2015), or return on sales/assets (e.g. Derfus et al., 2008). In more specific cases, performance is sometimes judged by the perceived success of goal-oriented processes, such as how an emphasis on speed affects an M&A integration process (e.g. Bauer and Matzler, 2014) or an internationalisation process (e.g. Chetty et al., 2014). Of the 31 *empirical* papers examined during level one of this review, [4] more than two-thirds asked some variant of the question: How does the speed of X (e.g. decision making, competitive response) affect performance?

While scholars following this convention have built up an increasingly sophisticated and contingency-based theory of the specific conditions under which speed is more or less likely to improve economic performance (e.g. Siggelkow and Rivkin, 2005; Kiss and Barr, 2017), these studies are of limited value to scholars and practitioners interested in non-economistic concerns. This is an important limitation because a) the core tasks of many organisations and institutions often have little or nothing to do with profit-making (e.g. government administrations, civil society pressure groups, professional bodies, etc.), and b) profit-seeking organisations tend

[4] The remaining 4 of 35 texts were conceptual/review papers.

to be institutionally complex (Ramus et al., 2017), that is, they face competing prescriptions from various institutional logics (Greenwood et al., 2011). Other scholars emphasise that organisations are composed of many different 'stakeholders' each with frequently divergent interests (Freeman, 1984). Thus, while it may be the case that speed frequently enhances and, in some instances, diminishes shareholder value, the more political question of: 'For whom is speed good, and for whom is speed bad'? is eluded.

However, it is this question which is arguably most crucial to a thorough understanding of the significance of speed for organisations and institutions, accounting for both its social and political implications, as well as its economic implications. For example, in the strategic decision-making literature, while organisations privileging fast decisions may experience improved economic performance (e.g. Eisenhardt, 1989; Baum and Wally, 2003), this likely comes at the expense of democratic participation, which is an inherently time-consuming yet important ethical principle (e.g. Rosa, 2010; Scheuerman, 2004). Similarly, although accelerating new product development may help organisations to seize certain 'temporal advantages' (D'Aveni et al., 2010), such increased demands on workers' time may result in devastating person pains—as Tracy Kidder's (1981) Pulitzer Prize winning book, the 'Soul of the New Machine' so vividly details. As a final example, while there may be enormous financial and even socio-political incentives for drugs' companies to accelerate the speed of trials, doing so may have disastrous effects on later users as adequate checks and balances are omitted.[5]

[5] The relevance of this in light of the COVID-19 pandemic is briefly discussed in chapter 7, section 7.4.3.

In these examples, what is evident is that the legitimacy of speed cannot be established through an analysis of its effects on economic performance alone, yet this is precisely what is taken as primary in the MOS speed literature. Hence, an alternative is to point to the distinct and oftentimes divergent priorities of an organisations' or social fields' many stakeholders, where the effects of speed are not evenly distributed and depend on the power relations inherent to the site of interest.

2.5.3. Amplifying top executives' perceptions of speed

A third assumption worth articulating concerns who or what the appropriate sample should be when examining perceptions of speed and its implications. To date, the norm has been to distribute surveys and interview members of an organisation's top management team (TMT) (e.g. Forbes, 2005; Judge and Miller, 1991; Kiss and Barr, 2017), often explicitly under the auspices of the 'upper echelons' perspective (Hambrick and Mason, 1984). In this view, executives' characteristics and experiences are regarded as being of central explanatory importance to organisational outcomes (Neely Jr. et al., 2020). For example, in Bauer and Matzler's (2014) study of the antecedents and performance implications of speedy M&A integrations, the authors reason it is 'managers' who should be surveyed because they have 'enormous knowledge about the transaction and integration phase' (p.277).

However, related to the issue of how the value of speed should be judged, is the issue of whose point of view should be considered, and with what weighting. Gurvitch (1964), for instance, revealed the radically contrasting attitudes to time and speed are held by management and workers. For managers, particularly top-managers, the notion that 'time-is-money' is highly prevalent. Thus, while management is likely to sanitise speed, making intense temporal regimes sound attractive, workers at the sharp end may have a wildly different perspective. This ideological aspect to speed is perhaps best illustrated in the labour process literature which details the historic contests between workers and managers over the speed of the production line (e.g. Delbridge, 1998; Rubin, 2007). While executives and disciples of Frederick "Speedy" Taylor strove for ever greater production efficiency and hence an increase in the pace at which workers executed their tasks, on the other side, a leader of the American labour movement made the counterpoint:

> "The people of the United States have a right to say we want to work only so fast. We don't want to work as fast as we are able to. We want to work as fast as we think it's comfortable for us to work. We haven't come into existence for the purpose of seeing how great a task we can perform through a lifetime. We are trying to regulate our work so as to make it an auxiliary to our lives and be benefited thereby" (Commons, 1921, p.148).

One reason for the amplification of managerial sensibilities on speed may be due to the dominance of the strategic management field over the speed construct; that is, discourses of speed pervade this management sub-domain more than others (Bansel et al., 2019). In part, this underlines the importance of scholars reading more broadly so as to minimise the biases which build up around certain labels and within specific areas of research, but it also suggests there is an opportunity for other disciplines to reclaim the speed construct and open it up to more critical and diverse interpretations.

2.5.4. Privileging the antecedents to speed

Given that speed in various organisational processes is broadly linked with economic performance, many MOS speed researchers reason that it is important to theorise the mechanisms through which speed can be both attained and mobilised. For example, Forbes (2005) simply argues that: 'Past research has indicated that the speed with which strategic decisions are made can affect various organisational outcomes, including performance. Therefore, it is important for researchers to understand the determinants of decision speed' (p.355). Similarly, Schoonhoven et al. (1990) argue that 'Speeding products to market is acknowledged as one of the major bases for survival' (p.178). Hence, organisation theory must 'identify dimensions…likely to have implications for speeding first products to market' (p.179). Recent work on 'accelerators'—a growing feature of the entrepreneurial landscape—has argued for the need to understand how such programs 'speed up' a venture's development (e.g. Hallen et al., 2020).

One consequence of this rationale is that there has been a one-sided focus on uncovering the antecedents to speed but a relative dearth of work studying how speed may be resisted or contested. For example, in the strategic decision-making literature, executives who rely on their intuition, have high risk tolerance (Wally and Baum, 1994), are more confident (Forbes, 2005), quickly resolve conflicts, immerse themselves in real-time information, and integrate strategic decisions (Eisenhardt, 1989) all drive faster decision making. At the organisational level, centralisation (Weber, 1973), firm-level incentives (Siggelkow and Rivkin, 2005), and standard operating procedures (Bakker and Shepherd, 2017) reportedly lead to faster decisions.

In research on competitive dynamics, Chen and Hambrick (1995) contend that small organisations are faster implementors of competitive responses than large ones. Scholars interested in M&A integration speed argue that a high cultural fit and high degree of strategic complementarity are key to fast integrations (Bauer and Matzeler, 2014). Similarly, the literature on innovation speed points to factors such as goal clarity, speed emphasis, project support (Kessler and Chakrabarti, 1996), entrepreneurial experience, competition, VC ownership (Schoonhoven et al., 1990), and TMT information processing capacity (Kiss and Barr, 2017), among others, as mobilisers of speed. At a more general level, past research has argued that logics of commercialism, militarism, and competition are key determinants of speed (e.g. Rosa 2010, Virilio, 1986). Finally, faster speeds are often linked with new socio-material arrangements, such as AI and automated systems, which can generate rapid new digital temporalities (e.g. Urry, 2009; Virilio, 1986).

However, while the list of speed determinants continues to grow, it is not clear that unravelling these is a particularly productive exercise. Rather, it may be the case that what scholars are finding are ever increasing ways for managers and innovators to oppress themselves as well as workers (Thrift, 2000). This may be due to what is sometimes called the 'Red Queen effect' (Derfus et al., 2008), or the 'slippery-slope phenomenon' (Rosa, 2013), the idea being that as one group or organisation finds new ways to accelerate their processes, others must follow suit, negating the initial gains and leading to a frenetic or 'hyper-accelerated standstill' (Rosa, 2010). Citing Barlow (1999, p.85) 'The faster I go, the faster I need to go,' Thrift (2000, p.688) contends: 'Could there be a better description of capitalism?'

2.5.5. Treating speed as a general ontological premise

A final assumption inherent in the MOS speed literature and held by many organisational practitioners is that speed is a more or less inescapable, unavoidable, and omnipresent condition of modern organisation. Perhaps nowhere is this premise more essential than to the sub-fields of 'hyper-competition' (e.g. D'Aveni, 1994; D'Aveni et al., 2010), or 'dynamic capabilities' (Teece et al., 1997). For example, D'Aveni et al., (2010) argue that new organisational theory is needed to keep up with the 'current disruptive and fast-speed environments of today' (p.1376). Wiggins and Ruefli (2005) claim 'that a substantial portion of the US economy is characterized increasingly by hyper-competitive behaviour' (p.906), where 'intense and rapid moves' (p.888) proliferate. Teece et al., (1997) contend that today's 'winners' are those who can 'demonstrate timely responsiveness and rapid and flexible product innovation (p.515).' Hence, in these perspectives, speed is treated as a general and indisputable ontological premise from which to theorise (du Gay, 2017). Given the widespread impact of these perspectives—Teece and colleagues' (1997) paper has nearly 38000 citations at the time of writing—it seems that a 'need for speed' has pervaded our common-sense understanding of contemporary organisation.

However, there are two main issues with this view. The first issue is that we run the risk of naturalising speed as something 'out there'—an objective fact without history or culture to which organisations must simply adapt. Not only is this assumption erroneous, but the more temporal norms and structures are socially interpreted as factually given, the easier it is to regulate and coordinate individuals and organisations around potentially pathological yet arbitrary temporal regimes.

Thus, rather than departing from the premise that speed is a general and crucial feature of the business of organising, it seems equally, if not more important, to render such logic visible and subject it to critique. An obvious starting point is to examine how speed and speed imperatives get (re)produced in socio-organisational contexts. Another option might be to avoid highly general assumptions about speed, organisations, and their relation to one another altogether, and to instead stay attuned to more local, detailed specifications of organisational arrangements (du Gay, 2017).

The second issue is that constant references to the omnipresence of speed can serve to mask all kinds of inertia, slowdown, and conservatism which often lurk beneath a hyper-dynamic surface. For example, a pioneering figure turned critic of the artificial intelligence field, Joseph Weizenbaum (1976), argues that while computers and AI systems are often framed as instruments creating a step-change in the pace of socio-organisational change, these same systems are also fundamentally conservative forces. He contends how in the banking sector, if it had not been for the computer, banks would likely have needed to decentralise and regionalise, but the computer made such changes unnecessary. Similarly, while Rindova and Kotha (2001) in their influential paper on 'continuous morphing,' argue that Yahoo! and Excite competed through rapid and continuous transformation of their organisational form and function, one might call into question to what extent these firms really 'morphed' at all, but rather hardened and solidified extant social structures and power relations.

2.5.6. Summing up the problematisations

Reading a broad but foundational set of texts on the topic of speed in MOS, I have identified and problematised a number of key assumptions in the literature. In particular, I suggest some basic issues with the proclivity to valorise speed, to measure its value largely through reference to economic performance, to amplify elite actors' perceptions of speed, to privilege the study of speed's mobilisation, and finally, to regard speed as a general ontological premise from which to theorise. Inherent in these five critiques are ideas for rethinking the existing MOS speed literature and opening up new lines of inquiry. I now turn to discuss these more fully.

2.6. REIMAGINING AND RECONCEPTUALISING SPEED IN MOS

2.6.1. Taking full stock of potential speed pathologies

In a departure from most past research in MOS which has a tendency to either 'fetishize speed' (Carr, 2006), or at the very least, to overlook, ignore, or suppress its 'dark side' (Linstead et al., 2014), there is both space and need for research that takes full stock of potential speed pathologies. The idea of a 'speed pathology' was first identified by Perlow et al. (2002), who noted that organisations could become trapped in a pathological context where speed trumps other concerns, leading to decreased economic performance. However, as I argued earlier, speed may be implicated in the production of many socio-political pathologies, which greatly extend beyond the narrow confines of economic value.

Ideally, then, MOS scholars interested in thinking critically about speed and its implications should, at least in some ways, look for how speed and speed imperatives may be oppressive or pathological. Here, the work of critical social theorists such as Paul Virilio (1986) and Hartmut Rosa (2010) can provide valuable food for thought. While these authors have received a fair amount of attention within critical sociology (e.g. Armitage, 1999, Gane, 2006, Vostal, 2016, Wajcman, 2015), their work has tended to be neglected by MOS researchers who appear transfixed by the positive modalities of speed.

Virilio's efforts to probe the multiple effects of speed belong to a broader body of knowledge which he calls 'dromology,' i.e. the study of speed, its logic, and political-ethical effects (Virilio, 1986). The concept is a neologism coined by Virilio himself, derived from the Greek word, dromos, meaning 'race' or 'racecourse.' In Virilio's dromological perspective, he is principally concerned with the way in which speed shapes the appearance of phenomena and our being in the world. That is, Virilio (1986, 2005) wants to draw our attention to how speed can diminish our ability to perceive, comprehend, and thus critique things.

One speed pathology for Virilio is the way in which speed compresses the time and space necessary for politics and critique. The faster the speed, the greater the compression (see also: Marx, 1973; Harvey, 1989). As Virilio (2010) argues, effective governance and laws require an 'incompressible period of time for reflection' (p.2). However, intense temporal regimes can make responsible research and innovation, as well as practices of deliberation, a "waste of time" (Wajcman, 2015). Many of Virilio's critical reflections on speed go hand-in-hand with his critique of modern technologies. While for some scholars, automated decision-making technologies (i.e. AI) are valuable precisely because of their speed, for Virilio, this is why we should fear them most. The automation (read: extreme acceleration) of warfare, financial trading, and other human domains via AI and related technologies renders politics and critique obsolete—they are quite literally overtaken because the speed of cognition cannot keep up with the lightning pace of digital information (Virilio, 1986).

For Rosa (2010, 2015), speed pathologies can manifest from crises of 'temporal desynchronisation.' This concept is based on the insight that not all institutions, processes, systems, practices, and so on, can be sped-up equally. Whenever two systems or processes are interlinked, the acceleration of one can put the other under pressure, such that, 'unless it speeds up too, it is perceived as an annoying break or hindrance' (Rosa, 2010, p.69). For example, the high speeds demanded by many contemporary organisations may overburden the temporalities of the human body. Certainly, there seems to be substantial evidence that increases in burnout and depression are in part a reaction to temporal overload (e.g. Adam, 1994). Individuals put under sustained time pressure frequently experience maladies such as hypertension, ulcers, and anxiety, among others. Rosa (2015) also describes tensions between other systems such as the fast temporalities of techno-capitalism and the temporal prerequisites of democracy, or the global economic system and the ecological one (see also: Bansal and DesJardine, 2014).

Another speed pathology developed by Rosa (2010) is the potential for speed and speed imperatives to result in temporally caused 'alienation'. As individuals pursue greater speeds, their ability to connect with the social world, the self, the objects they work and live with, and so on, becomes increasingly jeopardised. The appropriation of various experiences and subsequent familiarisation with them requires time. However, as Rosa contends, this time is no longer readily available to individuals in high-speed environments. Under intense temporality, people's relationship with the world, the things they produce or consume, is changed such that they are increasingly detached or disengaged from them. One important disclaimer for Rosa's speed-alienation critique is that it seeks to go beyond essentialist disputes about human nature (Vostal, 2014, 2016). These disputes have plagued Marx's original concept of alienation (Schacht, 1971), since it implies some ideal subjectivity to which we are alienated from. However, for Rosa (2010, p.98), 'what we are alienated from through the dictates of speed...is not our unchangeable or unalienable inner being, but our capacity for the appropriation of the world'—that is, our ability to be intimate and acquainted with it (see also, Rosa, 2019).

Drawing attention to these more negative modalities of speed is not to say that MOS assessments of speed should be inverted from a 'speed is good,' to a 'speed is pathological' normative framing. Rather, it seems important to read speed dialectically, i.e. as containing simultaneously enabling and pathological elements. Certainly, there is a need to subject calls for 'slow organisation,' 'slow management' (Karreman et al., 2021), or other 'slow movements' (Honoré, 2004) to critical scrutiny. Slow does not necessarily equate with care, resonance, or sustained reflection, but rather, may entail regressive qualities such as dogmatism or parochialism (Connolly, 2009, Vostal, 2014). Moreover, slow movements may prioritise an experience of time premised on withdrawal, privatisation, and depoliticisation (Sharma, 2014). Nevertheless, the speed pathologies mentioned above suggest a critical disposition toward speed is worth emphasising with the hope of enabling new, more affirmative time developments to occur (James, 2008; Virilio, 1986).

2.6.2. Adopting a stakeholder approach to evaluate performance

A second opportunity for MOS scholars interested in speed is to investigate not only how speed and speed imperatives impact the economic performance of organisations, but how such factors may impact the interests and performance criteria of a wide range of stakeholders—many of whom have little interest in economic performance. Accounting for the pathologies of speed partially depends on where the scholarly gaze is directed. If it is aimed predominantly at shareholders or managers, scholars may conclude that speed is a good thing, because these actors arguably have more to gain and less to lose from an emphasis on speed. However, if we expand our gaze to all those who have a stake in an organisation or institution, the story is likely to become increasingly muddled. Speed may produce value for some actors but be costly to others.

Thus, central to new and arguably better conversations about speed in MOS must be questions such as: Beneficial for whom? Harmful to whom? Beneficial and harmful for what, and under what circumstances? (Bluedorn and Waller, 2006) As I argued earlier, to date, the value of speed has largely been derived by investigating its implications for shareholder value. While this is widely regarded as the dominant measure of performance for owners and managers, other groups such as workers,

workers' families, regulators, customers, environmental groups, and so on, may have profoundly different understandings of organisational performance or effectiveness, particularly as they relate to speed.

In a rare example of how such a stakeholder approach to evaluating speed might look, Czarniawska (2013) explores how speed is evaluated by different stakeholders at three news agencies. Within these news agencies, speed logics are highly salient, as first coverage of a story can yield more readers and hence, profit. While this carries obvious benefits for shareholders, the journalists responsible for producing the stories report feeling under significant psycho-social strain and often complained that they had a lack of time for reflection. Moreover, while speed was interpreted by some readers as a key determinant of their choice of news source, others pointed to the importance of accuracy, credibility, and impartiality, all of which appeared to be sacrificed for speed. Such a stakeholder-driven approach to evaluating speed is likely to produce much more nuanced, locally grounded, and contingency-based understandings of speed than is currently the case.

2.6.3. Broadening the sample by considering the speed experiences of marginalised voices

Building on the previous suggestion, a related opportunity for MOS scholars interested in speed is to explore the temporal experiences and speed orientations of marginalised voices. To date, most research on speed has tended to sample members of an organisation's top management team to evaluate the success of various speed strategies and accelerated processes. However, this approach privileges the perspectives of elite actors and leads to an interpretation that is too narrow.

An alternative approach is to seek out and nurture hidden or marginalised voices, exemplified by, but not limited to, junior workers, women, small civil society groups, people with disabilities, and others. For example, if speed comes to be seen as a virtue or a necessity in some organisational contexts, what does this mean for people with disabilities who may find it difficult, if not impossible, to keep 'up to speed' with their more able-bodied colleagues (Adam, 2003)? Similarly, in feminist literature, many scholars have argued that women experience a 'double burden' of balancing paid employment with continued responsibility for household work (e.g. Glucksmann, 1998; Sullivan, 1997), so we might expect them to suffer disproportionally with demands for increased speed at work. As a final example, junior colleagues sometimes find themselves carrying a greater burden to work at high-speed in order to progress to more time-liberated positions, such as the pressure of gaining tenure in some academic fields (Vostal, 2016).

Considering the perspectives of such actors is perhaps made more important by the fact that these groups tend to have the least power to determine the 'appropriate' orientations toward time and speed. However, this suggestion should be understood with the caveat that, like other social structures, peoples' temporal norms and meaning making processes are themselves a target for control and manipulation (Granqvist and Gustafsson, 2016). In other words, there are often invisible, or 'hidden temporal structures' (Zerubavel, 1985) which exist 'behind the backs of actors' (Rosa, 2010, p.315), shaping and regulating their norms around speed. Thus, while it is important to pay attention to actors' local meanings and perceptions of speed, researchers must remain reflexive to the possibility that broader systems of temporal domination may play a role in their generation (Bourdieu, 1992).

2.6.4. Studying how speed is contested and resisted

Another alternative to mainstream MOS perspectives on speed is to focus less on elucidating the pathways toward new accelerative forms of organisation and fast subjectivities, and to examine more, or at least in close measure, how speed may be contested and resisted in socio-organisational contexts (Brose, 2004). Such studies may range from micro-level acts of resistance, such as daydreaming, digital detoxes, or individual attempts to build 'resonance' in organisations (e.g. Rosa, 2019), to larger, more macro-level examinations of slowness movements (e.g. van Bommell and Spicer, 2012), post-growth initiatives (e.g. Banerjee et al., 2020; Rosa et al., 2017), and efforts to secure a new time budget for workers and citizens (e.g. Blyton, 1989; NEF, 2020). Rosa (2010) advises that we might make a further distinction between limited and more radical forms of deceleration and speed resistance. Limited forms tend to have the purpose of allowing individuals, groups and organisations to go faster after a short period of slow down. For example, a team might go on a short yoga retreat in order to have more energy and creativity to thrive in acceleratory environments afterwards. Radical forms, such as anti-modernist movements like 'deep ecology' fundamentally reject the 'unnatural' temporal rhythms of 24/7 capitalism (Crary, 2013) and focus on slowing down more broadly (e.g. Sessions, 1987).

One way to think about possibilities for speed resistance whilst remaining cognisant of domination is to examine changes or crystallisations to what Bluedorn and Waller (2006) call the 'temporal commons.' They argue that different societies, social fields, organisations, and groups have a temporal commons: "The shared conceptualisation of time and the set of resultant values, beliefs, and behaviours regarding time, as created and applied by members of a culture-carrying collective" (p.357). One attribute of a temporal commons is the degree to which it accentuates speed and values it positively. As a way of emphasising agency, Bluedorn and Waller (2006) argue that we need to engage in 'stewardship' over the temporal commons—to carefully and responsibly manage it.

Looking back, it is possible to see radical, even revolutionary changes to the temporal commons at different historical junctures and at various levels of analysis. For example, at the societal level, Thompson's (1967) famous study of the institutionalisation of a new 'time discipline' in Britain during the 17th to early 20th century argued that through new time-keeping technologies (e.g. the clock), heightened supervision, a changing division of labour, and the provision of monetary rewards, workers became socialised to a new temporal commons that prioritised punctuality and speed. Preceding this period, work was far less synchronised and idleness more acceptable. For the purposes here, Thompson's (1967) study helps illustrate two points. First, it provides glimpses of a time where speed was perhaps more vulgar, and less valorised at the societal level, at least in pre-Industrial Britain. However, second, Thompson notes that despite significant efforts by many actors to actively contest the new time-discipline, these stewardships generally failed. This highlights the importance of analysing the power relations which make possibilities for resistance more/less likely.

While Thompson's (1967) study is perhaps more illustrative of hegemonic power rather than agentic power regarding the temporal commons, when we look to slowness movements (e.g. Honore, 2004; Parkins and Craig, 2006), we may observe more efficacious forms of resistance to a temporal commons with hypertrophied concerns for speed. Despite their potentially problematic relationship with bourgeois values, the growing popularity of slow movements in many social fields, from slow food, to slow science, to slow fashion, suggest that real changes to the temporal commons are possible, at least for the privileged (van Bommell and Spicer, 2012). Again, this is not to downplay the very real possibility for hegemonic power and domination. Temporal norms often do go unchallenged and, as I pointed out earlier, may exist 'behind the backs of actors.' In Bourdieusian terms, they are deeply rooted in our habitus, taking on the form of a 'second nature' (Bourdieu, 1990b, p.56). Moreover, even if actors actively recognise and desire to renegotiate certain temporal norms and structures, they are not equally equipped to do so. Although we must remain cognisant of these limits and restrictions, it is important not to lose sight of the fact that some actors, even against the odds, are capable of purposively disrupting and changing their temporal conditions and fashioning an alternative politics of time (e.g. Granqvist and Gustafsson, 2016; Kaplan and Orlikowski, 2013). Thus, the study of how deceleration and the maintenance of slower temporal regimes emerge presents a key opportunity for MOS researchers in contrast to those focused solely on acceleration.

2.6.5. Questioning the perceived omnipresence of speed

A final possibility suggested here is to question, rather than uncritically accept, the premise that contemporary organisation and/or society more broadly is defined by an ever-greater need for speed and acceleration (du Gay, 2017). Although the concept of speed has considerable rhetorical appeal, it is important not to overemphasise the degree to which speed saturates various environments. Ironically, this tendency to exaggerate the presence of speed is not unique to management or organisational scholars but is shared among speed's most virulent critics. Wiggins and Ruefli's (2005) claim that most of the US economy is characterised by intense temporalities is no less epochal than Virilio's contention that Western nations have moved from 'the age of brakes' to 'the age of acceleration' (Virilio, 1998, p.140-145).

Thus, arguably a better, less absolutist alternative is to emphasise the need for more local, grounded, and empirical work on the subject of speed. More contextual studies are likely to reveal that rarely is there a blanket imposition of speed logics, but that individuals, groups, organisations, and social fields are differently affected. Indeed, for some organisations, injunctions to develop dynamic capabilities or other speed strategies may at best be gratuitous, and at worst highly destructive (du Gay, 2017). Moreover, while speed clearly lends itself to empirical measurement (e.g. instructions per second, or the pace of decision making over time), speed is equally born of the perception of those observing it. Thus, it is important to stay attuned to the complexity of peoples' lived time and the unique ways in which they grapple with speed (Sharma, 2014).

In addition to offering a more complex account of how speed is differentially experienced, a further advantage to scepticism regarding general assertions about the omnipresence of speed is that researchers can stay more receptive to possibilities of inertia, slowdown, and conservatism. As I argued earlier, although we may observe and experience rapid changes and dizzying speeds, beneath this liquification and perceived continuous morphing may lie increasingly solid forms of freeze and relative stasis (Morgan and Spicer, 2009). Thus, it is important for researchers to reveal these often-hidden facets of socio-organisational life, a task made difficult, if not impossible, when operating under general theoretical axioms of high-velocity environments, hyper-competition, and related speed concepts.

2.7. CHAPTER SUMMARY, AND THE OPENING UP OF RESEARCH QUESTIONS

In this chapter, I systematically and critically interrogated the MOS literature pertaining to speed. Sharing the concerns of Alvesson and Sandberg (2020), I reviewed the literature by following four principles: the ideal of reflexivity, reading more broadly but selectively, not accumulating but problematising, and the concept that 'less is more.' Following these principles, and through a detailed reading of 65 texts, I identified five problematic assumptions in the mainstream MOS speed literature and suggested five alternatives. A summary of these five problematisations and five alternatives can be found in the table below.

Table 2.1 Problematising the MOS speed literature

Key assumptions in the MOS speed literature	Alternative assumption grounds and agendas
Believing that speed is predominantly a good thing	Taking full stock of speed pathologies
Assuming speed should be evaluated in relation to economic value	Adopting a stakeholder approach to evaluate performance
Amplifying dominant perceptions of speed	Broadening the sample by considering marginalised voices
Privileging the antecedents to speed	Exploring how speed is contested and resisted
Treating speed as a general ontological premise	Questioning the perceived omnipresence of speed

As outlined in the previous chapter, a key aim of the current thesis is to move forward these five alternative agendas and assumptions. To do so, I propose two main research questions which go some way toward addressing the problematisations.

(1) *How do differently positioned actors with different agendas and power resources experience time and speed within a socio-organisational context?*

The problematising review suggested there has been an existing research bias in MOS toward the positive modalities of speed. This seems to be due to investigators either limiting their analysis to how speed impacts economistic issues or focusing on the speed perceptions of dominant social groups whose views, goals, and incentives may differ radically from those working in other contexts or with less power to set the temporal parameters of socio-organisational life. Thus, a more critically oriented investigation of speed must seek to address the potentially negative-oppressive aspects of speed which I have termed 'speed pathologies.' Additionally, it must explore the issue of 'for whom is speed good, and for whom is it bad' among diverse actors and stakeholders.

(2) *How is speed reproduced/resisted within this same socio-organisational context?*

In addition to highlighting the potential dark side of speed, the problematising review identified the issue of how speed may be resisted as an important alternative to the current analytical focus on how speed is mobilised. This seems particularly important if speed and speed logics are capable of producing significant harms as Virilio, Rosa, and the other researchers introduced here warn. Accordingly, my second research question seeks to understand the socio-material mechanisms through which speed is both actively reproduced and resisted. Such an investigation must look at the ways in which agents, both individual and collective, struggle to shape what Bluedorn and Waller (2006) call the temporal commons—'the shared conceptualisation of time and temporal values created by a culture-carrying collectivity' (p.355). Also keeping with the analysis of this chapter, it is important to remain sceptical of the degree to which speed saturates certain environments, including that of the field to be investigated.

In the next chapter, I introduce the specific empirical site, i.e. the British AI field, where I investigate and elucidate answers to these research questions. To conceptualise and empirically explore the field of British AI, I draw on the conceptual tools of Pierre Bourdieu, specifically, his theoretical triad of field, capital, and habitus. I explain my reasons for selecting this empirical site, for drawing on Bourdieusian sociology, and my various methodological choices.

CHAPTER 3.
THE BRITISH ARTIFICIAL INTELLIGENCE FIELD AND RESEARCH METHODOLOGY

'The battle over minutes and seconds, over the pace and intensity of work...has been, and continues to be, right royally fought.'

(Harvey, 1989, p.231)

3.1. INTRODUCTION

In the previous chapter, I noted that speed is both a positive-enabling force and a negative-oppressive one. Different actors experience and make sense of speed differently. Moreover, while some actors attempt to mobilise speed, others may actively resist it. The effects of speed and actors' ability to contest it are not evenly distributed—they depend on power relations. In addition, I argued that MOS has so far tended to neglect the pathological aspects of speed, evaluated speed mostly in relation to economic value, privileged dominant actors' perceptions of speed, overlooked the ways in which speed may be resisted, and taken for granted the omnipresence of speed.

To address these issues requires the investigation of a multi-actor research field where various stakeholders with different and often conflicting interests and power resources make sense of pacing and struggle over their field's 'appropriate' temporal orientations. In this chapter, I argue the British AI field offers an excellent 'extreme case' (Eisenhardt, 1989; Yin, 2009) in which to critically explore and elaborate on these issues. To conceptualise and empirically explore the British AI field, I draw on the conceptual resources of Pierre Bourdieu, specifically, his concepts of field, capital, and habitus. Over recent years, Bourdieu's concepts have become increasingly popular among management and organisational scholars (e.g. Emirbayer and Johnson, 2008; Golsorkhi et al., 2009; Özbilgin and Tatli, 2005). In particular, they have been commended for their use in making power relations explicit (Jones et al., 2016), understanding the reproduction of problematic patterns of thought and action (Vaara and Faÿ, 2012), and overcoming the dichotomist paradigms of structure-agency, past-present, technology-society, and subjectivism-objectivism (Emirbayer and Johnson, 2008). These make Bourdieu a fitting guide for my theoretical and empirical ambitions regarding time, speed, and the British AI 'field.'

For Bourdieu (1977, 1988), a field denotes a structured social space, a relatively autonomous domain of activity with its own rules/logic where various actors with different power resources (i.e. 'capitals') struggle and compete for the transformation or preservation of the field. For Bourdieu, fields are both relational and dynamic. Relational in the sense that actors 'exist and subsist through difference; that is, they occupy relative positions' (Bourdieu, 1998, p.31), and this is what defines a field. Dynamic in the sense that these actors are not indifferent bystanders, but strategic actors who endeavour to shape agendas and redistribute power in ways that are to their advantage (Bourdieu and Wacquant, 1992).

Similarly, in this chapter, I conceptualise the British AI field as a dynamic space of relations between various actors, i.e. large supranational technology firms, defence institutions, venture capital (VC) firms, private sector organisations, universities, the British government, consultancies, civil society pressure groups, and professional bodies. These actors are positioned in the field in terms of their relative power and position-taking. For the purposes of this thesis, I highlight two frontiers of differentiation and struggle between British AI actors in regard to speed and temporality, i.e. those oriented toward the intense temporalities of what I call 'techno-scientific time' versus the slower-going temporalities of 'deliberative-democratic time,' and those positioned toward increasingly fast, 'machine-instantaneous time' versus slower, more open-ended 'human-reflective time.'

Techno-scientific time is predicated upon the idea that the British AI sector is in a competitive race where accelerated innovation and limited (self-)regulation are the appropriate organising principles. Conversely, *deliberative-democratic time* is underpinned by the notion that the frames and broad directions of British AI should be set by inherently slow deliberative and democratic processes. *Machine-instantaneous time* is predicated upon the idea that more and more decisions should be turned over to algorithmic systems which can calculate, predict, and execute decisions 24/7, and in near real-time. *Human-reflective time*, by contrast, is underpinned by a belief that decision time should not be organised at speeds beyond the feasible realm of human consciousness, reflection, and intervention.

These principles of division are drawn on the basis of significant empirical evidence gathered for this thesis which includes 33 in-depth interviews with key actors in the field, non-participant observation at 20 British AI events, historical-archival research, and, finally, a large pool of secondary data collected as part of the 'House of

Lords' 2017 Special Committee on Artificial Intelligence' where over 200 British AI field actors commented on the 'pace' of AI research and development (R&D). Moreover, these lines of division are supported by existing literature—literature both specific to the AI field (e.g. Cave and ÓhÉigeartaigh, 2018) and to social fields more broadly (e.g. Rosa, 2010; Scheuerman, 2004). The methods of collecting and analysing the data are described in detail in this chapter.

Overall, the aim of the current chapter is twofold. First, to introduce the reader to a multi-actor research site (i.e. the British AI field) where competition over what Bluedorn and Waller (2006) call the 'temporal commons' is highly visible. Bourdieusian sociology is employed as an analytical tool to unpack this struggle and the socio-organisational power relations constituting it. For Bourdieu, constructing the field is always a matter of empirical investigation, so, inevitably, this chapter begins to map out the positions of key actors in this field. However, the analysis is kept brief at this stage; expanding first in chapter 4, exploring how differently positioned actors in the British AI field experience and make sense of time/speed (RQ1), then in chapter 5, investigating the mechanisms and power relations through which speed is reproduced/resisted within this social space (RQ2). Second, to outline the methodological aspects of the study and to render visible the various decisions made during this research so that the reader can better assess the merit and credibility of the research findings.

Toward these ends, the chapter is structured as follows. First, Bourdieu's notion of the field and his interrelated concepts of capital and habitus are introduced, and the British AI field is conceptualised. Next, a short background to the British AI field is provided and the main frontiers of struggle between actors over the field's temporal commons are identified and critically discussed. Finally, the methodological choices are outlined.

3.2. CONCEPTUALISING THE BRITISH AI FIELD WITH BOURDIEUSIAN SOCIOLOGY

In this thesis, I use Bourdieu's notion of 'field' in order to conceptualise and empirically explore the British AI field. Recently, many MOS scholars have pointed to the potential for Bourdieusian sociology to advance organisational theorising (e.g. Emirbayer and Johnnson, 2008; Golsorki et al., 2009; Kerr and Robinson, 2016). Others have contended that Bourdieu's appeal is not exclusively theoretical but 'fundamentally includes methodological repertoires' (e.g. Ignatow and Robinson, 2017; Savage and Silva, 2013, p.114). Bourdieu himself developed his concepts (or 'thinking tools,' Leander, 2008, p.1) in order to understand and critique power in the empirical world (Kerr and Robinson, 2012). Given the centrality of power to the distribution of speed effects and actors' ability to reproduce/resist speed, Bourdieu seems a fitting companion to investigate these theoretical issues in an empirical, locally grounded context.

For Bourdieu, a field denotes a structured social space, a (semi-)autonomous domain of activity with its own rules/logic where different actors with different power resources (i.e. capitals) struggle for the transformation or preservation of the field. Unpacking this short description reveals three main principles underlying a Bourdieusian field.

First, a field is a *relational, structured social space*. Although fields can be composed of many different organisations, institutions, groups, and individuals, for Bourdieu, it is not the supposed substantial characteristics of these units which defines the field, but the broader relations between them. For Bourdieu, at the heart of a field lies competition and struggle. Struggle emerges as a consequence of the diverse roles, resources, and oftentimes divergent objectives of various actors involved in the field's functioning. These actors compete to transform or conserve the field in ways most favourable to their interests and the various forms of 'capital' they possess. The concept of *capital* is crucial to Bourdieu's understanding of the field. For Bourdieu, capital is a social relation, a generalised resource denoting a 'power over the field' (Bourdieu, 1985, p.724). Each field has its own capital—economic, social, cultural, or symbolic—that represents what is valued, and which enables actors in a field to gain influence. Structure within a field emerges as an interplay of the different positions and the relative capital position-takers hold. Because capital is not equally distributed within fields, Bourdieu contends that all fields are composed of dominant and dominated actors. For Bourdieu, this pattern of dominant/dominated positions constitutes the 'objective structure' of the field. Thus, using a Bourdieusian conception of the field enables an understanding of the British AI field as a structure of power relations among differently positioned actors who compete to impose the legitimate orientations and symbolic orderings of the field.

Second, a field is *dynamic*. As previously mentioned, actors in a field are not indifferent bystanders, but engaged political actors who seek to produce and impose legitimate meaning in the field—for example, what the 'appropriate' temporal norms and structures should be. While Bourdieu (1976) sees domination as pervasive within fields, he recognises that domination is never complete. As a result, fields are continuously reproduced and sometimes transformed through power struggles. However, Bourdieu points out that transformation within fields is not straightforward. This is because, over time, actors socialised into fields tend to develop a sense of the possible/impossible, or the likely/unlikely. Their outlooks and possible position-takings are conditioned by past struggles and their relative power in the field. Bourdieu develops the concept of habitus to explain this. For Bourdieu, habitus is a mediating concept between the poles of field (i.e. groups of interrelated actors) and capital (i.e. power resources). It is a kind of 'embodied history' (Bourdieu, 1982, p.37-38); actors 'feel' for the uncodified 'rules of the game' by which a field is reproduced and which in turn reproduce actors in the field (Kerr and Robinson, 2012). It is Bourdieu's recognition that actors act and interact within structural limits. They develop a 'practical sense' of what it is that one ought to do in particular contexts. This bounds without strictly determining actors' strategies and behaviours. However, it makes subverting the dominant modes of perception more difficult. Thus, a Bourdieusian conceptualisation of the British AI field enables an understanding of the field as dynamically generated through ongoing power struggles within structural limits.

Third, a field is a *relatively autonomous domain of activity* that adheres to institutions and rules of operation that are specific to it. As Bourdieu and Wacquant (1992, p.17) claim, '...each field represents its particular values and possesses its own regularities.' Thus, for Bourdieu, the agreed-upon value that actors compete for is what maintains a field as a relatively autonomous social arena. However, some fields are more self-determining. They function in accordance with their own interests, while others may be significantly affected by other fields. Indeed, Bourdieu sees the social world as composed of a plurality of semi-autonomous fields which overlap with one another—the military field may influence the AI field and vice versa (Siisiainen, 2003). In much the same way as actors within fields are hierarchically located in accordance with the values specific to the field, Bourdieu contends that fields are nested in hierarchical relations, with some, particularly the economic field, being more dominant than others (Jones et al., 2016). Thinking of fields this way helps to overcome the organisation-environment or field-environment dichotomies that are still pervasive in organisation theory (Oakes et al., 1998). Meanwhile, conceptualising the British AI field this way enables an understanding of the field as one embedded in broader economic, social, and political structures, the effects and potency of which are a matter for empirical investigation (Hilgers and Mangez, 2014).

In sum, a Bourdieusian perspective on the British AI field helps us see the field as relationally constituted by various agents competing for power to transform or preserve the field according to opposing agendas and interests. This conceptualisation of the British AI field clearly sets it apart from common understandings of fields as 'particular branches of study or spheres of activity or interest' (e.g. Oxford Dictionary). It also differentiates it from AI specific 'definitions' which see AI as a 'field of computer science dedicated to the creation of systems performing tasks that usually require human intelligence, branching off into different techniques' (Pesapane et al., 2018, p.2). Furthermore, Bourdieu's emphasis on stratification and domination distinguishes it from other forms of field theory, most notably, the interorganisational relations institutionalism associated with DiMaggio and Powell (1983), or the social-psychological perspective connected with Kurt Lewin (1951).

3.3. THE CASE STUDY: TEMPORAL STRUGGLES IN THE BRITISH AI FIELD

Having explained the particular 'thinking tools' used to investigate the British AI field, next I explore what Bourdieu calls the 'individual and collective struggles aimed at conserving and transforming reality' (Bourdieu, 1990, p.141) in this social space. The specific battle which is of primary focus here is actors' struggles to define the field's 'temporal commons,' that is, the set of values, beliefs, behaviours, and structures regarding time and pacing which are considered 'appropriate' (Bluedorn and Waller, 2006). This includes the extent to which the field emphasises, and strategises for, speed, and values it positively. In Bourdieusian terms, it is a symbolic struggle to produce and impose the legitimate (temporal) orientations, but the implications are far from immaterial. As I explore in detail in chapter 4, the temporal commons shapes the kinds of AI systems produced, as well as the conditions of their production, circulation, and consumption. In chapter 5, I will explore more extensively the specific power (i.e. capital) actors bring to this competition which impacts their likelihood of winning.

As already noted, the field under study here is the field of British AI. This field is a dynamic space of relations between various individual and collective actors, i.e.

government policymakers, large supranational technology firms, private sector organisations, VC firms, defence institutions, universities, consultancies, civil society pressure groups, and professional bodies. Geographically, this constellation of actors is located predominantly in London, specifically, the areas of King's Cross, Whitehall, and East London's 'Silicon Roundabout.' However, other concentrations exist in close proximity to prestigious academic institutions known internationally for their AI research—most notably, the Universities of Cambridge, Oxford, Edinburgh, London, and Imperial College. Given the global outlook of many of these actors, the British AI field is also influenced by the strategies and policies of other nations who struggle to strengthen and solidify their positions on the international stage (e.g. Ford, 2015; Lee, 2018).

Currently, the number of actors in the British AI field is very large. In London alone there are an estimated 758 'AI suppliers' (Allott et al., 2018), the largest and most prestigious currently being DeepMind Technologies, a for-profit subsidiary of Google employing more than a thousand individuals. Sixteen new centres for doctoral training in AI have been opened up at universities across the country, aiming to deliver 1000 PhDs between 2019-2024 (House of Lords Special Committee, 2019). In 2018, the UK government established an 'Office for Artificial Intelligence,' designed to implement a £950m 'AI Sector Deal' between industry and public sector organisations. As a final indication of size, there are currently at least a dozen civil society pressure groups and professional bodies specific to British AI, including the Ada Lovelace Institute, Big Brother Watch, the Alan Turing Institute, the All-Party Parliamentary Group on AI, and the Society for the Study of Artificial Intelligence and

Simulation of Behaviour (AISB), among others. The size of the field is substantially greater than the 'dozen or so full-time [AI] practitioners' and 'another hundred people with significant interest' estimated by Fleck (1987) at the end of the 1970s, and the 'one hundred full-time AI posts' and 'over one thousand people with significant interests' estimated by 1986 (p.152).

Defining the 'game' or activities specific to the British AI field is not unproblematic, as the naming and classifying of operations always plays a partisan role in the unending struggle to impose legitimate definitions of the symbolic order (Hilgers and Mangez, 2014). Indeed, since the field's emergence in the decades immediately following World War II, actors have continuously engaged in tumultuous struggles to define the nature and direction of AI R&D—what AI is, and how it should be researched/developed (e.g. Crevier, 1993; Russell and Norvig, 2009). Two of these struggles are worth briefly recalling, because they are not unrelated to the struggle over the field's temporal commons, and they provide some understanding of the shifting symbolic order of the AI field, and its specific productions; they are 'basic versus applied AI' and 'symbolic versus sub-symbolic/statistical AI.'

3.3.1. Basic versus applied AI

The first struggle can be described as one between 'basic AI' versus 'applied AI' positions-takings (e.g. Bloomfield, 2018; Fleck, 1987). Actors positioned toward *basic AI* claim the activities proper to the AI field are to understand the principles that make intelligent behaviour possible, and to simulate these via machines. In this view, AI is principally a scientific endeavour, and AI research should be undertaken, to some extent, for its own sake (e.g. McCarthy, 1990). Actors positioned toward *applied AI* claim the activities proper are to develop AI techniques and applications to solve 'practical' problems, e.g. language translation, missile deployment, and so on. In this view, AI is principally an engineering endeavour, useful in its capacity to tackle specific problems by having computers behave 'intelligently' (e.g. SRC, 1973).

It is a well-known trend that the British AI field has, like many scientific fields (Etzkowitz, 2008; Popp Berman, 2011), shifted toward being more and more applied. Research priorities in the field are increasingly set by actors whose primary goal is not the acquisition of scientific authority regarding intelligent behaviour, but the use of AI for other purposes (Bloomfield, 2018). The particular moment when this shift was most salient occurred in the 1970s with the publication of the 'Lighthill report' (SRC, 1973). The Lighthill report was a critical review on the state of AI research in Britain commissioned by the Science Research Council (SRC)[6]—then, the primary funder of British AI research—and written by the Cambridge mathematician Sir James Lighthill. Lighthill was largely disparaging of AI research that had no 'field of application,' but praised those aspects engaged with solving industrial and other applied problems (Agar, 2020; SRC, 1973). Following the report, the SRC both cut and reorganised funding, leaving 'undirected' basic AI research largely in the lurch (Fleck, 1987).

The move toward applied AI intensified in the 1980s with the 'Alvey Programme,' a £350million joint funding initiative between industry, the Ministry of Defence, and the Science and Engineering Research Council (SERC) which directly

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[6] Renamed as 'Engineering and Physical Sciences Research Council' (EPSRC) in 1994.

linked academic (AI) research to industrial and military needs (Oakley and Owen, 1989). In the 2010s, this trend has been further reinforced by the 'AI Sector Deal,' a £950m agreement between private industry and the public sector to jointly fund and 'commercialise' AI research (HM Government, 2018). As a sign of just how extensively the economic field has gained influence over the direction of AI R&D, in 2018, the British government established a 21-member 'AI Council' designed to advise and oversee AI policy. Over half of these members are from industry (HM Government, 2020). From a Bourdieusian perspective, the British AI field can therefore be said to have followed a relative decrease in the autonomy of the field as actors from neighbouring fields, primarily, the economic field and the military field, have gained power there.[7] This is a theme I will return to in greater detail in chapter 4, and chapter 5 especially.

3.3.2. Symbolic versus sub-symbolic/statistical AI

The second struggle can be described as one between 'symbolic AI' and 'sub-symbolic/statistical AI' positions-takings (e.g. Guice, 1998; Olazaran, 1996). If the first struggle concerns the purposes of British AI, the second concerns the methods to get there. Players oriented toward *symbolic AI* contend that intelligence results from the manipulation of abstract compositional representations whose elements stand for objects and relations (Garnelo and Shanahan, 2019). Accordingly, they use explicit symbolic programming and rule-based reasoning to represent the world in terms of

[7]Accounts written by insiders claim that in the early years, AI researchers lost some of their respectability to speak for AI on account of overpromising and under-delivering (Crevier, 1993). In Bourdieusian terms, they lost 'symbolic capital.' This opened the door for actors from other fields, most widely in the 1970s, and again in the late 80s. These periods also coincide with what are known within the field as 'AI winters' (see chapter 5).

objects, relations, and logical relationships (Forsythe, 1993). A good example of a symbolic AI system is an 'Intelligent Knowledge Based System' (IKBS), a rule-based computational system which makes simple inferences from a knowledge base of pre-determined 'facts' in areas such as medical diagnoses (Collins, 2018). Players oriented toward *sub-symbolic AI* believe the level of the symbol is too high to lead to effective models of mind. Knowledge is better represented in terms of minute, quantitative features related by low-level, often statistical connections (Chalmers, 1992).[8] A good example of a sub-symbolic AI system is an 'artificial neural network,' an information-processing system composed of multiple interconnected processing units which interact in a parallel fashion to produce an output. These models are not explicitly programmed, but 'trained.' To train a neural network in a given classification task involves choosing a statistically representative sample of input/output pairs, and an algorithm for adjusting the strengths (i.e. 'weights') of the connections between the processing units when the system fails to produce the desired outputs (Olazaran, 1996). These systems have become highly effective at generalising from examples and locating hidden patterns in their input (i.e. 'learning'), particularly when trained on vast quantities of data (Collins, 2018).

Past empirical research has traced the institutionalisation processes and power relations shifting the field in either direction.[9] For example, from the 1960s to early 80s, Olazaran (1996) reveals how the symbolic approach 'came to be seen as the right approach to AI' (p.640), supported in large part by government funding and the

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[8] For an excellent discussion of the ethical and epistemic implications of either approach, see Adam, 2000.

[9] It is worth noting that the lines between the two camps have not always been clear-cut. A growing number of researchers are also seeking to combine the two approaches (e.g. Bader and Hitzler, 2005; Domingos and Lowd, 2019).

discursive efforts of eminent members of the symbolic camp. This had the effect of marginalising actors from the sub-symbolic school and the term 'AI' became all but synonymous with the explicit embedding of human knowledge into computer programs.[10] However, this began to change in the late 1980s, as the authority structure and resource allocation system started shifting toward the sub-symbolic camp. Over time, sub-symbolic players have been aided by increasingly powerful technical infrastructures, the development of new algorithmic techniques and, since the 2010s, an exponential increase in the availability of data on which to train models (Russell and Norvig, 2009). Above all, however, actors from the sub-symbolic school have been elevated by large private sector organisations who have come to view the statistical analysis of 'big data' as vital to their business models (Stiegler, 2019; Zuboff, 2019). Over the past decade, many of the world's most powerful companies, such as Google and Facebook, have hired considerable numbers of AI researchers from British universities (and elsewhere), and launched their own research divisions (Gibney, 2016). These academics are almost exclusively of the data-driven (sub-symbolic) variety. Thus, in contrast to the 1960s and 70s, currently, AI has become increasingly synonymous with terms such as 'big data,' 'machine learning,' and 'deep learning,' all of which are principally the domain of sub-symbolic AI (Katz, 2017).

[10] In Britain in the 1980s, many AI researchers avoided using the term 'AI' altogether and instead preferred 'Intelligent Knowledge Based Systems.' Two reasons may be given for this. First, the unfavorable Lighthill report created stigma around the AI label (see chapter 5). Second, the symbolic paradigm was dominant at that time.

Table 3.1. Symbolic struggles in the British AI field along the parameters of basic vs. applied AI and symbolic versus sub-symbolic AI

Position takings	Basic	Applied	Symbolic AI	Sub-symbolic AI
Logic	Understand principles of intelligent behaviour, simulate these via machines	Develop intelligent machines for the purposes of solving 'practical' problems	Intelligence results from the manipulation of symbols	Knowledge emerges from minute, quantitative features related by low-level connections
Organising principles	- Relatively undirected - Relatively secluded from exogenous interests - Science	- Directed toward specific applied problems - Private-public partnerships - Science/engineering	- Knowledge-driven, logicist - Embedding of human knowledge into computer programs - Emphasises approaches such as: knowledge graphs, IKBSs	- Data-driven - Search for patterns among vast numbers of precedents - Emphasises approaches such as: machine learning, evolutionary algorithms, neural networks
Period(s) of dominance	1960s	1970s>	1960-80s	2000s>
Relation to speed/temporality	Declining autonomy of AI field; inclusion of players with hyper-trophied concerns for speed		Sub-symbolic school reliant on increasingly rapid computer processing speeds for training purposes	
Past empirical studies	Agar, 2020; Bloomfield, 2018; Fleck, 1987		Forsythe, 1993; Guice, 1998; Katz, 2017; Olazaran, 1996	

3.3.3. Struggles over the temporal commons

My purpose in highlighting these historical and ongoing struggles along the parameters of basic/applied and symbolic/sub-symbolic is not to lose focus from my interests in speed and temporality, but to emphasise the unstable, messy nature of the British AI field. What is and is not 'AI' is itself a fundamental symbolic struggle with considerable consequences for those actors involved. Accordingly, no simple definition of 'AI' or the 'AI field' can be provided, since the meaning and activities of both are in constant flux. However, rather than extend or renew past analyses of these symbolic struggles, I draw a novel line of division along temporal lines, that is, a line between competing visions in the British AI field of the 'appropriate' temporal orientations. What I mean by this is that different actors within the field are divided on what they consider to be the legitimate pace at which to research and develop AI, and the appropriate temporalities of AI systems themselves.

As previously mentioned, these struggles are not disconnected from competition to define AI or shape the direction of AI research. On the contrary, the declining autonomy of the British AI field vis-à-vis the economic and military fields is intimately connected with the struggle over the AI field's temporal commons, in large part because these fields exercise a great deal of concern for speed (e.g. du Gay, 2017; Rosa, 2010; Virilio, 1986), and the more influence they accumulate, the more likely AI systems and the field itself will consolidate the values most guaranteed in their terms. Furthermore, the transformation toward sub-symbolic techniques has put increased emphasis on the material aspects of speed, since the time it takes to train these models is a common bottleneck, giving those with access to more computer processing power a significant temporal advantage over rivals.

With this in mind, the frontiers of struggle which are the focus here are between those actors positioned toward the intense temporalities of 'techno-scientific time' versus the slower-going temporalities of 'deliberative-democratic time,' and those positioned toward increasingly computer-mediated 'machine-instantaneous time' versus 'human-reflective time.' Keeping with a Bourdieusian conception of the field as a 'structured social space' (Bourdieu, 1998, p.40), I briefly outline here the contours of these positions and the institutional actors constituting them. In doing so, I am inescapably engaged with my research 'findings.' However, this is consistent with a Bourdieusian approach, since the construction of the research object is always, for Bourdieu, a matter of empirical investigation (Bourdieu and Wacquant, 1992, p.100), and my data supports the notion that a key symbolic struggle within this field takes place in relation to imposing a specific vision of what the legitimate temporal orientations should be.[11]

3.3.4. Techno-scientific time versus deliberative-democratic time (an introduction)

The axis of techno-scientific time versus deliberative-democratic time is the first dimension through which the temporal commons in the British AI field is shaped. Actors positioned toward techno-scientific time contend that the British AI field is in a competitive race where accelerated innovation and limited (self-)regulation are the

[11] This data, its collection and my processes of analysing it, are explained in detail in the next section.

appropriate organising principles. This implies a management style that rewards ethical privatisation and rapid (or “agile”) experimentation, administrative decision making, and techno-scientific production. Actors positioned toward deliberative-democratic time contend that the frames and broad directions of the British AI field should be set by inherently slow democratic and deliberative processes. Critical is the notion that AI R&D should not outrun democratic institution’s ability to debate and effectively steer it.

Like the struggles over basic/applied and symbolic/sub-symbolic orientations, the struggle between techno-scientific time and deliberative-democratic time in the British AI field is historically grounded. Traces of the former can be found as far back as the 1980s. During this period, actors in the British AI field such as the Department of Trade and Industry, the Ministry for Defence, and the Science and Engineering Research Council (SERC) began to view AI as indispensable to national security and economic competitiveness. They argued that without accelerating the pace of British AI R&D the country would fall behind international rivals (see DTI, 1982), in particular Japan, who in 1982 announced their ‘Fifth Generation Computer Project,’ an extensive 10-year state-assisted programme to develop increasingly advanced AI technologies, and the United States, who launched a similar project, the ‘Strategic Computing Initiative’ (Edwards, 1986). Accordingly, throughout the 1980s, a growing number of actors within the British AI field were oriented toward a temporal regime that put a premium on high-speed forms of social action and techno-scientific production. As the Alvey Programme stipulated: ‘urgent action is needed…to compete in world markets' and 'the program which we recommend...we urge that it be implemented speedily' (DTI, 1982, section 1.9).

Although never completely subsiding, these issues have returned to the fore with the launch of the UK government's recent 'Industrial Strategy' (HM Government, 2017). In this strategy, putting Britain at 'the forefront of the artificial intelligence and data revolution' is recognised as one of four ′Grand Challenges' by the British government (p.10). This report has become the basis for a £950million 'AI Sector Deal' (HM Government, 2018), the first major state-assisted and industry backed strategy for funding AI in Britain since the 1980s, and the 'Office for Artificial Intelligence' whose stated priorities are to 'identify accelerators and obstacles' (OAI, 2019a), and 'supercharge the AI sector' (OAI, 2019b). Other institutional actors have aligned themselves similarly. For example, in their report, 'Artificial Intelligence in the UK,' the management consulting firm McKinsey and Company contends that: 'The journey to capturing AI's benefits is a fast-paced competitive race in which those slow to move will lose out' (McKinsey Global Institute, 2018, p.2). Large supranational technology firms such as Google have also used race rhetoric to describe their strategic orientations (Ford, 2015; Lee, 2018). In similar fashion, the Ministry of Defence lists the rapid development of AI as key to securing the country's military advantage (MOD, 2019). In addition to these actors, venture capitalists and other private sector organisations are among those who hail the idea of techno-scientific time which can be defined as an orientation toward time that sees speed as a key source of competitive advantage, where the acceleration of performed tasks and activities, and the reduction of regulatory (i.e. time) burdens in the field are equated with survival, prosperity, and progress.

The orientation toward deliberative-democratic time is less established, but growing, in part due to the intensification of AI systems' use in governing social and economic life. In the 1980s, the level of public concern regarding AI was relatively low, with only a couple of international institutions such as 'Computer Professionals for Social Responsibility' (CPSR) focused on AI safety and governance. However, by the 21st century, public concern has increased considerably, driven in part by prominent political and corporate scandals such as Cambridge Analytica's use of machine learning for the purposes of election rigging (Amershi, 2019), and the application of AI by large technology firms for the purposes of behavioural modification (Zuboff, 2019). Moreover, reports of potentially extensive job losses (e.g. Fleming, 2019), algorithmic biases (e.g. Eubanks, 2018; O'Neil, 2016), increasingly powerful autonomous weapons (e.g. Bloomfield and Vurdubakis, 2015), and the popularisation of ideas of uncontrollable 'super-intelligence' (e.g. Bostrom, 2014; Hawking et al., 2017) have further raised concerns. As a consequence, new AI-related civil society pressure groups have proliferated. For example, in Britain, the Ada Lovelace Institute, Big Brother Watch, and a House of Lords Member's Bill have recently called for a moratorium on facial recognition technologies, a particular offshoot of AI. Specifically, the Ada Lovelace Institute argues '...we should press pause on the further rollout of the technology [to gain the] space and time needed for genuine public discussion of what type of society we want to build' (Kind, 2019). Many professional bodies and AI researchers have also called for AI decision-making algorithms to undergo large-scale pharmaceutical-style testing to decelerate deployment until appropriate safety testing and deliberation can take place (e.g. Sharkey, 2019). These actors are oriented toward a temporal regime that is increasingly synchronic with the slower-going temporalities of multi-stakeholder, democratic deliberation, and rigorous testing.

Table 3.2. Position taking characteristics across the axis of techno-scientific time versus deliberative-democratic time

Temporal regime	**Techno-scientific time**	**Deliberative-democratic time**
Temporal logic	Acceleration, dromologics	Open-ended, inherently slow-going
Organising principles	- Limited (self-) regulation - Time-based competition, both local and global - Instilling a sense of urgency	- Designed to slow down during periods of disagreement, uncertainty - Time-consuming negotiations, argument, mediation, and dialogue among multiple stakeholders
Temporal norms	High concern for speed, valorisation of speed and efficiency	Greater concern for temporal autonomy, control over pacing
Main actors	Large supranational technology firms, private sector organisations, VC firms, defence institutions, British government, consultancies	Civil society pressure groups, professional bodies, universities

3.3.5. Machine-instantaneous time versus human-reflective time (an introduction)

The axis of machine-instantaneous time versus human-reflective time is the second dimension through which the temporal commons in the British AI field is shaped. Actors positioned toward machine-instantaneous time contend that the value of AI systems lie principally in their capacity to transcend human temporalities, enhancing productivity and efficiency by classifying, predicting, recognising objects, and making decisions, 24/7, at speeds far exceeding human capabilities. In this view, AI is an enabler. Human thought is considered too slow and inefficient (e.g. Athey and Scott, 2002; McAfee and Brynjolfsson, 2017). Actors aligned toward 'human-reflective time' are generally sceptical of the greater speeds of computer-mediated algorithmic thought which miniaturises the time-lag between action and event, and risks undermining meaningful human control and reflection.

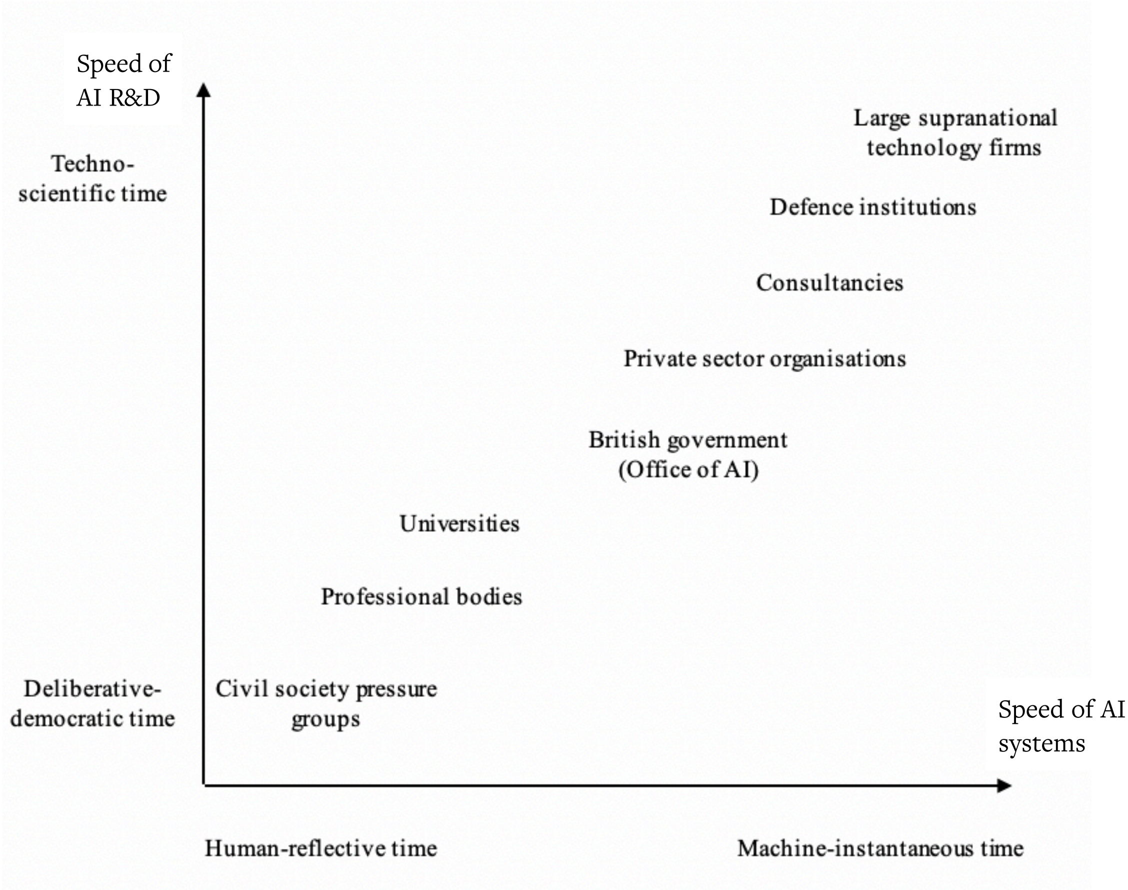
Once again, we can find traces of these respective positions in the field's history. For example, Mirowski (2003) argues that the history of AI is intimately bound with the origins of operations research and specific applied concerns arising out of World War II. Donald Michie, who played a key role in the British AI field's early gestation, is the right kind of example. Before establishing the internationally reputed 'Machine Intelligence Workshops' and the 'Department of Machine Intelligence and Perception' at Edinburgh University in the 1960s, Michie had worked with Alan Turing at Bletchley Park. There, Turing, Michie, and others learned first-hand the power of machines to help tackle the problems of war (and commerce) by acting as "force multipliers" (Bibel, 2014; Edwards, 1986). Several decades later, the case for IKBSs as part of the Alvey Programme was couched largely in their ability to enhance efficiency and increase British productivity by radically speeding up various goal-directed processes (Oakley and Owen, 1989). Today, the rapidity with which AI systems are able to calculate and execute certain decisions (when compared with humans) continues to be a key component of the case for AI's continued development and deployment. As the public-private AI Sector Deal puts it, 'Using advanced algorithmic techniques such as 'deep learning,' AI has the potential to solve complex problems fast, and in so doing, free up time and raise productivity' (HM Government, 2018, p.3). The main institutional actors oriented toward machine-instantaneous time include large supranational technology firms, private sector organisations, defence institutions, and the British government.

The orientation toward human-reflective time also has historical precedence. In the 1980s, groups such as the CPSR began to emphasise the dangers of using AI systems in consequential decision-making contexts on grounds of temporal desynchronisation. In other words, AI-enabled systems, such as those found in weapons, could complete detection, evaluation, and response processes within seconds (or less), rendering it extremely difficult, if not impossible, for human operators to exercise meaningful supervisory control once they are activated—they simply are not quick enough. This temporal mismatch between the high speeds of AI-enabled algorithmic thought and meaningful human supervision is being highlighted in a growing number of domains, from high-frequency trading, to driverless cars, to unmanned aerial vehicles (e.g. Johnson et al., 2013). As a group of leading AI professors at Edinburgh University put it: '...the ability to compute at high speed and large-scale means that significant disasters can arise from automated reasoning errors or inadequate understanding of the fragility of complex interconnected systems before humans can intervene' (HoL AIC0029). The institutional actors supportive of temporalities more in rhythm with the temporal finitude of human thought include civil society pressure groups.

Table 3.3. Position taking characteristics across the axis of machine-instantaneous time versus human-reflective time

Temporal regime	**Machine-instantaneous time**	**Human-reflective time**
Temporal logic	Acceleration, dromologics	Bounded, psychic limits
Organising principles	- 24/7 temporalities - Increasingly pre-programmed algorithmic thought, technocratic	- Human temporalities - Reflective, ethical judgments
Temporal norms	Post-humanist, machine speed	Humanist speeds, temporal finitude of mind-body
Main actors	Large supranational technology firms, private sector organisations, defence institutions, British government	Civil society pressure groups

Figure 3.1. Mapping the position-taking characteristics of key institutional actors in the British AI field along temporal dimensions



It is worth noting that this framework of ideal types across the axes of techno-scientific time versus deliberative-democratic time, and machine-instantaneous time versus human-reflective time should be used with some caution. Empirical cases are often positioned across the continuum rather than at the extremities. For example, the time budget necessary for greater human-reflective time may in part be secured by having machines perform a greater degree of near real-time calculations. As some researchers admonish, there is no temporal logic inherent in artifacts like AI that determines time practices (e.g. Wajcman, 2008; MacKenzie and Wajcman, 1999). However, when factoring in the power relations (the subject of chapter 5), it appears the actors pushing for machine-instantaneous time have little intent on transferring the time 'saved' toward either reflective or leisurely activities, but rather, accelerating yet another sphere of human activity (Hassan, 2010). Similarly, some stakeholders oriented toward techno-scientific time have established public-private partnerships which engage in various forms of multi-stakeholder deliberation. One example is the 'Partnership on AI,' a consortium of major tech firms whose explicit mission is to bring disparate others into discussion on AI governance (PAI, 2020). However, the extent to which such bodies are democratic has been strongly questioned, since they are composed almost entirely of technical experts. As Greene et al. (2019, p.5) note: 'They draw a narrow circle of who can or should adjudicate ethical concerns around AI.' Consequently, rather than engage in prolonged multi-stakeholder deliberation, they appear to be aimed at pre-empting political discussion and privatising ethical concerns to remove barriers to accelerated innovation and dissemination.

3.3.6. An 'extreme case'

Constructed as a relational space where differently positioned actors struggle to shape the temporal commons, I argue the British AI field offers an excellent 'extreme case' (Eisenhardt, 1989; Yin, 2009) from which to build theory about, inter alia, speed and temporality. Pratt (2000, p.458) contends that 'extreme cases facilitate theory building because the dynamics being examined tend to be more visible than they might be in other contexts.' The historically situated and ongoing struggles along the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time provide excellent empirical and theoretical grounds for exploring in rich detail how differently positioned actors experience and make sense of speed within a specific context (RQ1).

Similarly, by exploring the various forms of capital (i.e. power resources) different actors bring to this struggle, it is possible to elucidate the dynamics and forces through which speed is reproduced/resisted within a specific social space (RQ2).

3.4. RESEARCH METHODOLOGY

In this section, I outline the methodological aspects of my study; specifically, my processes of data collection and analysis. It is important to detail and disclose the specific steps, decisions, and judgment calls made during this research so that the merit and credibility of the research findings can be properly comprehended (Aguinis et al., 2018; Watson, 2000). This thesis follows a Bourdieusian approach to methodology in presenting a theoretically framed and historically situated case in which Bourdieu's concepts, together with concepts derived from my critical reading of the speed literature, are used to engage with the empirical world (Bourdieu, 1998; Kerr and Robinson, 2016).

3.4.1. Data collection

Leander (2008) outlines some of the implications of employing a Bourdieusian methodological approach for researchers. First, she notes that 'the context defines what is relevant,' and that 'the exact evidence that needs to be mustered will vary' (p.22). This means that 'depending on their exact research focus, studies include things as diverse as statistical data, biographical CV information, photographical evidence, works of art or literature, analysis of classical texts, archival research, public speeches, newspaper clippings, or interviews' (Leander, 2008, p.22).

To explore how differently positioned actors experience time and speed in the British AI field and the reproduction/resistance of speed in this social arena, I draw on various empirical materials—interviews with key institutional actors from the field, historical-archival reports, non-participant observation at British AI events and conferences, and lastly, the written and verbal accounts of key British AI actors collected as part of the 2017 'House of Lord's Special Committee on AI'. Taken together, this material was also crucial to my initial construction of the British AI field as a site of struggle along the dimensions of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time. I will explain how I made this 'qualitative leap' (Bourdieu and Wacquant 1992, p.104) and my broader processes of analysis in section 3.4.2 to follow.

Semi-structured interviews. I conducted 33 interviews with key institutional actors across the British AI field. These interviews aimed to unpack and, in turn, to map the temporal perspectives of differently positioned actors across the field. The interviews were conducted with a wide range of representatives from organisations that are influential actors in the British AI field (see table 3.4 below). The criterion for selecting informants was to ensure that key actors' perspectives in the British AI field were represented. As a result, data were generated on the views of AI policymakers, industry professionals, consultants, AI researchers, civil society pressure groups, and professional bodies. Complimenting this purposive sampling technique (Patton, 1990), I utilised a snowballing technique (Lincoln and Guba, 1985) where my respondents proposed other members of the field who could provide further informative views. These suggestions were not randomly made but followed the broad context of the research.

The interviews were conducted face to face when possible, and via phone or videoconferencing in other instances. Initially, my interview schedule consisted of relatively broad questions seeking to explore institutional and organisational views on British AI. I asked informants how they came to be involved in AI, how they understood the history of AI in Britain, concerns and struggles they had, who they perceived to have the most influence within AI, and things they liked and disliked about their field. However, as the research developed, I began to probe more specifically into issues to do with time and speed, which I started to pinpoint as a key symbolic struggle within the British AI field (section 3.4.2 for details on how I arrived at this interpretation). In this way, my interviews were not solitary events (Cassell, 2009). I brought pre-understanding and carried insights, both empirical and theoretical, from one interview to the next.

Interviews were very active (Holstein and Gubrium, 1995). Both researcher and respondent played an active role in mediating the flow and direction of the conversation. Certainly, my interviews were not neutral exchanges of 'asking questions and getting answers' (Fontana and Frey, 2005, p.696). Rather, researcher and researched co-constructed the interview process. When I sensed that my participants had a story to tell, I probed deeper, utilising prompts, silences, and other interviewing techniques. Prior to interviewing, I had acquainted myself with various techniques by reading Spradley's (1979) seminal text, The Ethnographic Interview.

To help reduce 'political distractions' that might lead respondents to refrain from sharing certain stories (Alvesson, 2003, p.27-30), all interviewees were assured of confidentiality; specifically, that comments reported would not be traceable to them personally. Following Lincoln and Guba's (1985, p.314) advice, I also offered my respondents the option of 'checking' their verbatim transcripts which I made available within two weeks of the interview to help minimise any loss of meaning. Some expanded or clarified their initial points during this stage, and I was pleased to engage in further discussion. In total, my 33 interviews lasted an average of 61 minutes and respondents had a mean of 11 years' experience in the British AI field.

Table 3.4. Details and attributes of participating informants from the British AI field

Interview	Sector	Role	Gender/Age
1	Private sector	Senior data scientist	M/30-40
2	Civil society pressure group	Director	M/30-40
3	Consultancy	Consultant	F/20-30
4	University	Senior AI research fellow	M/40-50
5	Private sector	Founder, CEO	M/20-30
6	Professional body	President	F/20-30
7	Private sector	Co-founder, director	M/40-50
8	Private sector	Analyst	M/20-30
9	Private sector	ML engineer	M/20-30
10	Civil society pressure group	President	M/20-30
11	University	PhD AI/ML researcher	M/20-30
12	Private/public partnership	Director	M/40-50
13	Supranational technology firm	AI and analytics lead	M/30-40

14	Supranational technology firm	Head of product	M/30-40
15	Consultancy	Consultant	M/20-30
16	VC firm	Investor	M/50-60
17	Private sector	Director	M/50-60
18	Private sector	Data scientist	F/30-40
19	Private sector	Founder, CEO	M/30-40
20	Private sector	Senior data scientist	M/30-40
21	Supranational technology firm	Senior data scientist	M/40-50
22	Policymaking (Gov)	Chair	M/60-70
23	Civil society pressure group	Advisor	F/30-40
24	University	Professor of AI	M/40-50
25	Private sector/university	Senior AI research fellow	M/40-50
26	University/professional body	Professor of AI	M/60-70
27	University	Professor of AI	F/40-50
28	Policymaking (NGO)	Co-chair	M/50-60
29	University	Senior AI research fellow	M/30-40
30	Policymaking (Gov)	Chair	F/30-40
31	Private sector	ML engineer	F/30-40
32	Private sector	ML engineer	M/20-30
33	Private sector	ML engineer	M/20-30

Historical-archival reports. At the same time as conducting interviews, I collected a wealth of historical-archival data relating to the British AI field, including seven books, seven reports, and numerous research papers and company/organisational reports (see table 3.5 for a summary). Historical-archival data provided accounts of key events, key actors, and their respective positions and position-takings throughout the field's history. Of particular relevance were the following: (1) the Lighthill report (SRC, 1973); (2) the Alvey Programme (DTI, 1982);

(3) Fleck's (1987) research paper on the establishment of AI in Britain, (4) the AI Sector Deal (HM Government, 2018), and (5) the House of Lord's report on AI in the UK (HoL, 2018).

When selecting the books and reports, I sought to gather those which were most regarded for their rigour, but also to ensure I was familiar with critical accounts (e.g. Dreyfus, 1979; SRC, 1973). As Katz (2017) notes, many of the accounts of the AI field's past have been written by insiders and practitioners, creating a kind of 'whig history.' My aim was thus to acquire a more balanced set of accounts, including those which 'tend to defend orthodoxy' and those inclined toward 'subversion strategies' (Bourdieu, 1984, p.73).

To help unpack the objective indicators of positions such as the size/resources of organisations, I drew on numerous company/organisational reports (e.g. DeepMind Technologies' 2019 annual report) which included valuable details of the respective power (i.e. capital) different actors brought to the struggle over the field's temporal commons. This was particularly important for exploring how speed is reproduced within the field, as explored in chapter 5.

Table 3.5. List of main historical books and reports consulted

Author	Year	Title	Publisher
Bloomfield, B.	1987 (2018)	The question of artificial intelligence	Routledge
Boden, M.	2017	Artificial intelligence: Its nature and future	OUP
Crevier, D.	1993	The tumultuous history of the search for AI	Basic Books

Dreyfus, H.	1979	What computers can't do: The limits of AI	Harper
Nilsson, N.J.	2009	The quest for artificial intelligence	CUP
McCorduck, P.	1979 (2004)	Machines who think	AK Peters
Russell, S., and Norvig, P.	2009	Artificial intelligence: A modern approach	Prentice Hall
Reports			
Lighthill, J.	1973	Artificial intelligence: A general survey	SRC
DTI	1982	The Alvey Programme	UK Gov
Hall, W., and Pesenti, J.	2017	Growing the AI industry in the UK	UK Gov
HM Government	2017	UK Industrial Strategy	HM Gov
HM Government	2018	AI Sector Deal	HM Gov
House of Lords (HOL)	2018	AI in the UK: ready, willing, and able?	HoL
HM Government	2019	AI Sector Deal: One year on	HM Gosv

Non-Participant Observation. In addition to conducting interviews and gathering relevant documents, data were developed from observation at a total of twenty British AI conferences and events in five cities (see Table 3.6). These events ranged from full-day conferences (e.g. 'Artificial Intelligence in Business and Entrepreneurship') to evening functions (e.g. 'Re.Work Women in AI dinner'), and were attended by a wide variety of actors, including AI policymakers, venture capitalists, AI researchers, industry professionals, consultants, and so on. While at these events, I took detailed notes of discussions. Additionally, I collected various event programs, and had countless informal conversations. This gave the study a 'micro-ethnographic' element (Wolcott, 2005).

Observation at these events proved a valuable source of insight into the orientations and strategies of different actors in the field—i.e. their ‘feel for the game.’ As representatives of their organisations, participants often organised talks and panels making sense of life in their field, its history, possible trajectories, and the particular strategies their organisations were pursuing. I also attended many a post-event drinks reception where more intimate and frank discussions took place. At these, I regularly inquired about participants’ perspectives on the temporal conditions of the field, particularly the pace of AI R&D and the speed of AI systems themselves.

Table 3.6. List of attended AI conferences and events

Event Title	Type	Location	Date	Description
AI in 2018	Event	London	Dec, 2017	Event on AI applications
Art of Possible: Rise of the Robots	Conference	Glasgow	Jan, 2018	Full day, AI and robotics demos and discussions
Artificial Intelligence in Business/Entrepreneurshi	Conference	London	Feb, 2018	Full day, AI conference
ReWork: Women in AI Dinner	Dinner	London	Feb, 2018	Dinner and discussions on AI, woman speakers
London Futurists	Meetup	London	Feb, 2018	Talk Anders Sandberg, Oxford’s Future of Humanity Institute
Glasgow AI	Meetup	Glasgow	Mar, 2018	Meetup group presenting, discussing/doing AI projects
Innovate Now: AI	Event	Newcastle	Mar, 2018	Invite only AI panel, discussions and networking
AlphaGo Screening	Event	London	Mar, 2018	Screening of AI documentary
Become an AI Entrepreneur	Event	Edinburgh	Oct, 2018	Event with EntrepreneurFirst promoting AI entrepreneurship
London AI and Deep Learning	Meetup	London	Oct, 2018	Meetup group discussing trending topics in AI
Mini Neural Information Processing Systems	Conference	Edinburgh	Nov, 2018	Event mirroring the Neur-Ips conference

Artificial Intelligence in Business and Ethics	Conference	London	Feb, 2019	Full day, AI conference
DataFest19	Conference	Edinburgh	Mar, 2019	Two-week festival, including two-day DataSummit conference
AI Expo Global 2018	Conference	London	Apr, 2019	Two-day, AI conference and exhibition
AI Tech North	Conference	Leeds	Jul, 2019	Full day, AI conference
Turing Fest	Conference	Edinburgh	Aug, 2019	Two-day, tech conference
Ethical Intelligence Launch Party	Event	Edinburgh	Aug, 2019	Launch party for new Edinburgh based AI ethics company
This House Believes We Should Fear the Rise of AI	Debate	Edinburgh	Sep, 2019	Oxford-style Debate, with AI professors, lecturers, etc.
Lord Clement Jones– Artificial Intelligence	Event	Edinburgh	Oct, 2019	Event with Chair of House of Lords 'Special Committee'
Wayra AI Accelerator Demo Day	Demo day	Edinburgh	Dec, 2019	AI start-up pitch and demo day
Beneficial AI Society	Meetup	Edinburgh	Various	Meetup group discussing 'Beneficial AI'
AI Ethics and Society	Meetup	Edinburgh	Various	Meetup group discussing AI ethics, reading based

Secondary data. The final element completing my data set was a large pool of publicly available data gathered by the UK House of Lord's Special Committee on Artificial Intelligence. In 2017, this committee issued an explicit call to members of the British AI community to comment on the 'pace' of AI R&D (among other things).[12] This call generated a total of 240 responses, amounting to 1647 pages of 'written evidence.' A further 420 pages were collected from 'oral evidence,' where prominent members of the British AI field answered questions live to members of the Special Committee and the public more broadly. This rich data set helped to ensure that key institutional views in the British AI field were represented and greatly extended the

[12] Details concerning the call for evidence can be found on page 153 of the report: 'AI in the UK: Ready, Willing and Able?' (HoL, 2018).

quantity and diversity of perspectives over what I, as a sole investigator, could achieve through primary research alone. The table below (table 3.7) provides a summary of all the data collected as part of this research.

Table 3.7. Description of data

Data Types	Amount	Use in Analysis
Primary Data		
Interviews		
Semi-structured interviews	33 interviews, 644 pages of text (verbatim transcriptions from audiotape)	Identifying symbolic struggles in the field; mapping the field across the temporal parameters; assessing the field's degree of autonomy from neighbouring fields
Observation		
AI conferences and events	20+ events, aggregating 15 days spent observing (29 pages of field notes)	Getting a 'feel' for the (uncodified) rules of the game; identifying key actors; identifying dominant and dominated positions
Secondary Data		
Written evidence (House of Lords, 2017)	217 documents (1552 pages of responses)	Expanding insight into the position-takings of various actors in the field
Oral evidence (House of Lords, 2017)	22 sessions (420 pages of responses)	Same as above
Historical books, documents and organisational reports	7 books, 7 reports, various research papers and organisational reports	Identifying key actors, key events; reconstituting the structure of positions; evaluating the means different actors have when fighting to define the temporal commons

3.4.2 Data analysis

Bourdieu repeatedly argued that the most important part of social research is the initial carving out of one's object, i.e. the choice of theoretical stakes; the choice of which things to approach in depth and which to sketch; and the choice of what the most pertinent principles of division are within a field (e.g. Bourdieu et al., 1991, p.33–55; Bourdieu and Wacquant, 1992, p.220–224). Despite the challenging nature of these choices, Bourdieu himself notes that 'the division of a field…entails a genuine qualitative leap′ (Bourdieu and Wacquant 1992, p.104). This is not accomplished in one bold, broad stroke, but rather, is a 'protracted and exacting task accomplished little by little' (Bourdieu and Wacquant, 1992, p.228).

The process through which I arrived at, and subsequently divided the British AI field along the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time was similarly gradual, occurring over the period of Sep 2017—Mar 2020. When I first entered the field, I was guided by the much broader question of how to map the British AI field as a 'structured social space, a field of forces' (Bourdieu, 1998, p.40-41) between differently positioned actors. In other words, the two research questions finally presented for this thesis—(1) how do differently positioned actors experience and make sense of speed in the British AI field, and (2) how is speed reproduced/resisted within this social arena—were developed through the processes of data collection, literature reading, and researcher introspection (Patton, 1990).

Hilgers and Mangez (2014, p.18-21) note that to implement Bourdieu's theory of fields, researchers should engage in three main operations. First, to evaluate the degree of autonomy of the field, i.e. identify to what extent actors from other fields have influence there. Second, to describe the symbolic order, i.e. identify the connections and oppositions between different schools, movements, polemics, and battles. And third, to reconstitute the structure of positions, i.e. examine the relative means actors have at their disposal in these struggles. These three stages are to be superimposed onto one another to produce the analysis.

Processes of analysis. In line with Hilgers and Mangez, I began my analysis by (1) identifying the main institutional actors within the British AI field. To do so, I consulted various books and documents to examine the different players throughout the field's history. Additionally, I examined the 217 responses to the 2017 Special Committee's 'call for evidence' which offered a good indication of which actors currently had a 'stake' in the British AI field (Bourdieu, 1990, p.187). I also made lists of different attendees at British AI conferences and events I observed. Finally, I used the outlined materials to help identify key actors to interview and asked these respondents about their views on who held the most influence in the field. Taken together, this data highlighted the extent to which the British AI field was composed of an increasingly diverse group of interrelated actors and was a starting point for analysis.

Next, I (2) elucidated the main struggles between different actors within the field. I created tables and timelines, examining key issues and key events such as the Lighthill report (1973), the Alvey Programme (1983-), and the AI Sector Deal (2019). I also engaged with historians and sociologists studying the (British) AI field and read their books and articles, such as Crevier's (1993) 'The Tumultuous Search for Artificial

Intelligence' and Fleck's (1987) 'Development and Establishment in Artificial Intelligence' which drew on insider accounts and ethnographical observations. These revealed a number of tensions such as those between the aforementioned themes of 'basic' versus 'applied AI' and 'symbolic' versus 'sub-symbolic AI.' Indeed, these themes featured relatively prominently in my own informants' accounts. "Just now the statistical, sub-symbolic approach is in the ascendancy" (Interview #26, Professor of AI, university). "Certainly at the moment, when people think of AI, they are predominantly thinking of machine learning" (Interview #7, director, private sector). "A lot of AI these days is focused on application development…I think it's just the way that the Western university system has gone in the last 20 years or so" (Interview #25, senior AI research fellow, private sector/university). On top of these oppositions, I noted frictions between 'neats' versus 'scruffies' position-takings (e.g. Forsythe, 1993, Russell and Norvig, 2009),[13] and 'general/strong AI' versus 'narrow/weak AI' (e.g. Nilsson, 2009; Searle, 1980).[14] However, while these struggles may have been more or less prominent in the past, they no longer appeared as particularly pertinent principles of division.

A set of divisions that did appear prominent were those along temporal lines. In my early interviews, actors' accounts were opposed on what they considered to be the legitimate pace at which to research and develop AI, and the temporalities of AI

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[13] Russell and Norvig (2009, p.21) describe the two positions as follows: 'The *neats* — those who think that AI theories should be grounded in mathematical rigor —versus the *scruffies*— those who would rather try out lots of ideas, write some programs, and then assess what seems to be working.'

[14] *General AI* is a variety of AI that attempts to develop systems (and techniques) that can be applied to a wide range of tasks (Nilsson, 2009). *Narrow AI* is concerned with the creation of specific systems designed to solve one particular task. *Strong AI* postulates that machines have minds, or eventually they will (Searle, 1987). *Weak AI* indicates that machines simulate (i.e. not duplicate) human intelligence.

systems themselves. I noticed that while some actors saw British AI "developing too fast to actually take the time…to analyse its social impact" (Interview #2, director, civil society pressure group), "outrunning public understanding" (Interview #10, president, civil society pressure group), and "rolling out…before the right questions are asked" (Interview #12, director, private/public partnership), others saw a "need for accelerated development" (Interview #1, senior data scientist, private sector), "to innovate faster than regulators" (Interview #14, head of product, supranational technology firm), and to ensure "the UK…must not be left behind in this race for innovation" (Interview #5, CEO, private sector). Similarly, while some actors saw a need to "address the issue of computer speeds, wherein actions happen at a time scale far faster than humans can respond" (HoL, AIC0029) others believed digital speeds resulted in "massive gains in efficiency and performance" and were vital to "competitive advantages" (Interview #7, director, private sector). Furthermore, I began to see these themes emerge across the different data sources indicating robustness (Voss et al., 2002).

These struck me as potentially fruitful themes to investigate and encouraged me to (3) begin an intensive reading and problematisation of the literature pertaining to time and speed. As chapter 2 revealed, much of the literature on speed in MOS has suppressed its 'dark side,' evaluated speed mostly in economic terms, privileged dominant actors' perceptions of speed, overlooked the ways in which speed may be resisted, and taken for granted speed's omnipresence. However, the accounts being articulated by my respondents demonstrated potential to address these theoretical shortcomings and open up alternative assumption grounds. To be clear, these ideas and the research questions which followed occurred part way through my data collection. My research followed what Czarniawska (2014, p.24) calls a 'logic of discovery,' moving from the field to the desk and back, iteratively.

My approach to data analysis corresponds to a point between middle range and grounded approaches. These two approaches can be defined as follows:

> 'On the one hand, the middle range approach emphasises the importance of formulating theoretical hypotheses in advance of the research in order to guide the research and to give shape to any subsequent theorising after the data has been gathered. On the other hand, grounded theory emphasises the importance of starting the research with as little pre-formulated theory as possible in order that it may be generated during the research itself' (Layder, 1998, p.15).

This approach is not purist in nature. Rather, what would become my 'orienting concepts' (Özbiglin and Tatli, 2011, p.101)—i.e. the key codes and lines of division along the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time—are the outcome of my critical reading of the (MOS) speed literature, which allowed me to identify gaps and alternative assumption grounds, and a reflection of key tensions which I observed in the accounts of my informants. Moreover, from the start of my investigation, I was theoretically sensitised to Bourdieusian sociology which emphasises the importance of relationships, positions, forces, and intensities over variables, categories, and social groups (Savage and Silva, 2013).

To analyse my data, I (4) utilised thematic and open coding (Braun and Clarke, 2006). Thematic coding was carried out by disaggregating the complete data set across the four dimensions. Within each parameter I used open coding to examine the emergent issues in my participants' accounts, giving space to their voice and examining their priorities. Next, I collated the coded data into further themes and sub-themes pertaining to the specific research questions. For example, when considering RQ1, the theme of 'speed pathologies' and the sub-themes of 'temporal desynchronisation,' 'temporally-induced skimping,' and 'precarity' were produced by collapsing related codes. Similarly, 'speed advantages' and the sub-themes of 'competitive advantage,' 'thrill,' 'net-positive,' and 'efficiency gains' were derived. During this time, I continued to iterate between literature supporting the coding, and the data itself.

Importantly, the exact material needed to answer each research question was both distinct and overlapping. To answer the question of how differently positioned actors experience time/speed in the British AI field (RQ1), I analysed not only the individual meanings and agendas of my informants, but their relative power in the field in question—i.e. their capital/resources. Bourdieu (1993, p.10) encourages researchers to move beyond phenomenology. While the subjective understandings developed by actors clearly matter, to account for just these would tend to reinforce domination since the normative aspects of speed make it a target for dominant actors' construction (Golsorkhi et al., 2009). Moreover, temporal norms and structures often go unchallenged because they are socially interpreted as factually given—i.e. they become deeply rooted in actors' habitus (Rosa, 2010). As Wacquant (2004, p.408) notes, there can be no 'absolute epistemological privilege to the native.' Accordingly, I remained sceptical of, without rejecting, the transcripts of my respondents and other data sources by staying attuned to the broader structures in which they were embedded and in which meanings can arise (e.g. Alvesson, 2003 p.28-29; Bourdieu, 1992; Fay, 1975).

It is on this point that the analysis regarding RQ1 overlapped with RQ2. To appropriately answer the question of how speed is reproduced/resisted within the British AI field (RQ2) required an understanding of the relative power different actors brought to the struggle over the field's temporal commons, i.e. the forces shifting the field toward different temporal position-takings. Here, I relied increasingly on material that helped unveil the particular means—i.e. the financial, cultural and social capital—actors had at their disposal, for example, the size of the organisation/institution, its financial resources, legislative authority, etc. This final element of my analysis corresponds to Hilgers and Mangez's (2014) suggestion that researchers must reconstitute the structure of positions within a given field. In this way, the question of how differently positioned actors experience speed and how speed is reproduced within the field were complimentary.

Reflexivity. Throughout my analysis I adopted reflexivity as an 'epistemic strategy' (Wacquant, 2002, p.4). Consistency with Bourdieu requires the investigator to be reflexive vis-à-vis their research object (Bourdieu and Wacquant, 1992). Bourdieu (2004) viewed reflexivity as a key aspect of his project to transcend the 'forced choice' between the dualities of objectivism and subjectivism. For Bourdieu, the role of the social scientist is to unmask social reality and its various inflections which are hidden behind a veil of presumptions and commonsense understandings (Bourdieu, 1992; Özbilgin and Tatli, 2005). In order to transcend the subjective-objective duality, Bourdieu (1992) advanced the notion of 'epistemological break.'[15] This reflexive process of breaking presuppositions as a means of understanding the social world involves two levels of rupture: first, from the primary experience of the research participants, and second, from the presuppositions of the investigator.

In the first epistemological break, I have explained my efforts to transcend phenomenological knowledge by attempting to balance an interest in the level of individual meaning (subjective) with an awareness that various ideological and structural forces (objective) can exist behind the backs of the actors being studied. In addition to objectifying the power relations shaping social life in the British AI field, a further strategy I adopted here was to attend to the history of the field, aiming to undo the mechanisms of dehistoricisation and naturalisation which build up over time (Emirbayer and Johnson, 2008). Another useful strategy was to share chapter drafts with interested research participants from the AI field; as skilful actors in the British AI field, this double hermeneutic approach produced thoughtful insights and comments to which I responded reflexively and critically. These strategies created various checks and balances in my attempt to navigate the middle ground between subjectivity and objectivity which is crucial to a Bourdieusian methodological approach.

[15] Gaston Bachelard's (1968/1940) work was of profound importance in the development of Bourdieu's methodological thinking.

In the second epistemological rupture, I engaged in practices aimed at questioning or "bending back on" my own presuppositions and those of my research field (i.e. MOS). This was a key aspect of my problematising review where, following 'the ideal of reflexivity' (chapter 2), I sought to examine taken-for-granted assumptions regarding speed in MOS, but also to subject my own alternative assumptions to critical scrutiny. However, it was also important when investigating the British AI field. For Bourdieu, the researcher is not a passive mirror-holder reflecting reality back onto the individuals or social fields under investigation. Rather, they are positioned and active; or, as Bourdieu put it: "I know that I am caught up and comprehended in the world that I take as my object" (Bourdieu, 2004, p. 115). Thus, I sought to examine my own biases and relationship to the field under study. While my epistemic position is *largely* outside the field in question (a 'view from outside'), I am affected by the British AI field in that it raises questions that implicate me as a citizen and academic. For example, I found myself relating to those respondents who discussed the imperatives to publish and produce (AI) research and to avoid falling behind one's peers—now reified in so-called 'audit culture'—within universities (Shore and Wright, 1999, 2015). Like some of my respondents, I live in fear or 'micro-terror' of these same socio-temporal structures which affect scholars in MOS, albeit very differently (Ratle et al., 2020). I am perhaps more sensitive to (and critical of) these instruments which diminish temporal agency and, in many cases, produce considerable anxiety and precarity, in part because I am at the start of my academic career and have limited power to resist these structures, but perhaps even more so, because I have experienced suicide bereavement in my nuclear family. Resultantly, I am wary of socio-temporal norms and structures that put considerable pressure on individuals. Having said that, if I allowed the negative emotions I sometimes feel toward such temporal structures to run amok, the resultant research could descend into a ranting polemic. Conversely, if I allowed positive emotions toward the AI field and more specifically, toward aspects of the temporal commons, I would be in danger of failing to dig beneath the surface or place sufficient critical distance between myself and the research in question (Jaggar, 1989). Thus, by engaging in these reflexive practices I sought to improve the research in some way. Once again, in the Bourdieusian tradition, I was searching for a middle way between subjectivism and objectivism.

3.5. CHAPTER SUMMARY

In the first half of this chapter (sections 3.2-3.3) I adopted the French sociologist Bourdieu's theoretical tools to help conceptualise the British AI field. I presented the field as a theoretically framed and historically situated case for the purposes of building and extending theory on time and speed in socio-organisational contexts. I argued that the field provides an excellent 'extreme case' (Pratt, 2000) because the struggles over the temporal commons along the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time are more visible than in other contexts. Accordingly, I use these four parameters in my analysis as orienting concepts in order to map the relative positioning of various actors in the British AI field and explore their perspectives. These concepts provide a platform from which to explore the specific research questions of (1) *how differently positioned actors experience time and speed within a socio-organisational context*, and (2) *how speed is reproduced/resisted within this context*.

In the second half (section 3.4), I presented the methodological aspects of my study. Primary data collection was by semi-structured interviews and through non-participant observation. Secondary data was via historical-archival documents and material from the 2017 House of Lords' Special Committee on AI. Analysis of the data broadly followed a Bourdieusian field analysis approach (e.g. Hilgers and Mangez, 2014; Leander, 2008; Özbilgin and Tatli, 2011). My processes of analysis correspond to a point between middle range and grounded approaches, being both theoretically sensitised and generative of theory during the research process itself. All data was analysed using thematic- and open-coding. Following Bourdieu, I discussed my efforts to practice reflexivity, 'not [as an] end in itself, but as a means to improve research in some way' (Alvesson et al., 2008, p. 495).

I now turn to explore the first of two findings' chapters, where I look at how differently positioned actors in the British AI field experience speed, i.e. research question one. This chapter seeks to address the lack of detailed empirical work examining how various stakeholders with different agendas and power resources grapple with and make sense of speed.

CHAPTER 4.
SPEED ADVANTAGES AND SPEED PATHOLOGIES IN THE BRITISH AI FIELD

4.1. INTRODUCTION

This chapter presents the findings of the empirical study carried out pertaining to the experiences and perceptions of time and speed held by diverse actors in the British AI field. It focuses on addressing research question 1: *how do differently positioned actors in the British AI field experience time and speed?* As I elaborated previously, this field is a contested social space characterised by occupants' struggle for domination. The data I collected highlighted a complex, ongoing struggle over the field's temporal commons, that is, actors' competition to define the field's 'appropriate' temporal orientations (Bluedorn and Waller, 2006).

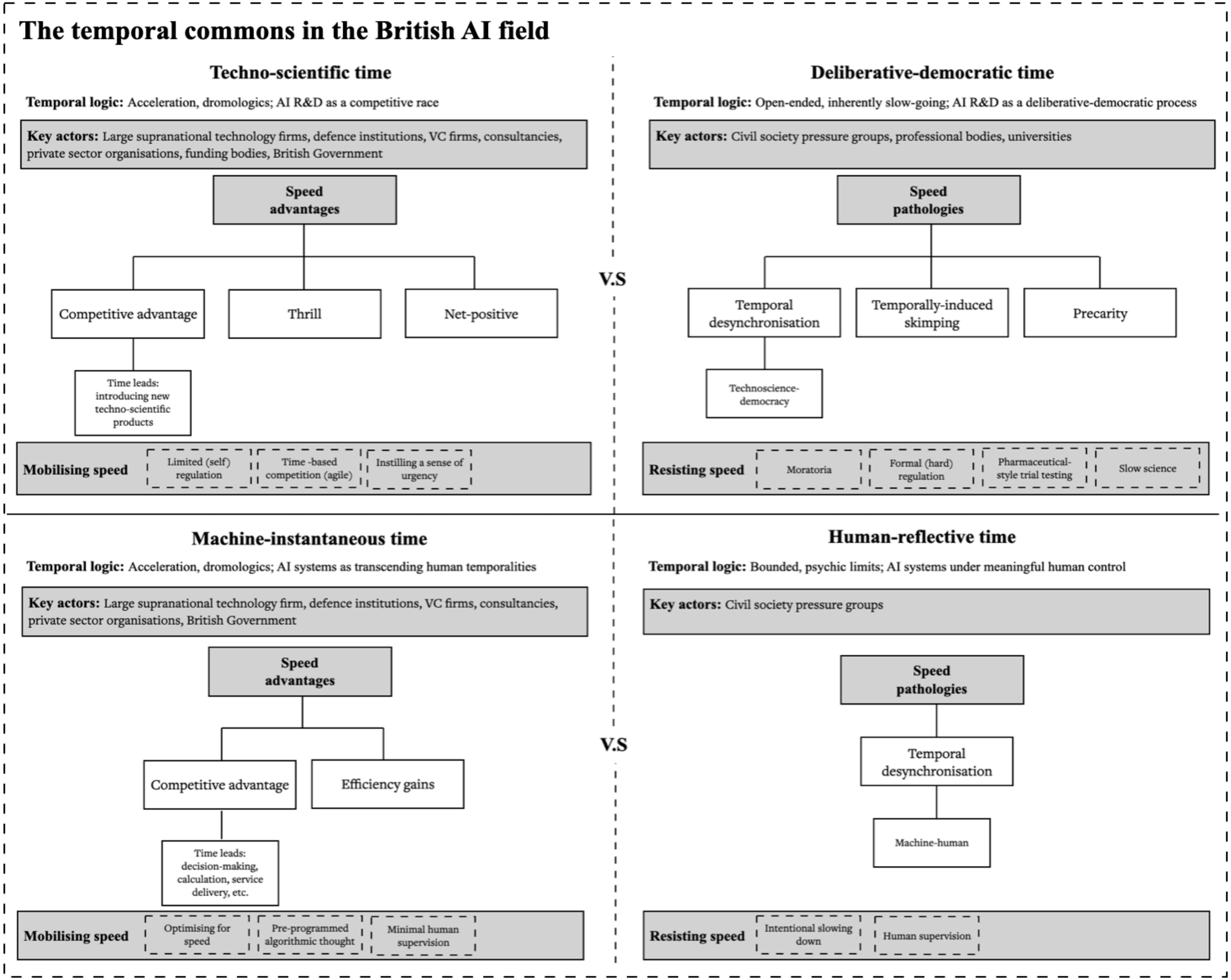
Throughout the data collection and analysis process, it became clear that actors in the British AI field were divided over what they considered the appropriate pace at which to research and develop AI and the computer-mediated temporalities of AI systems. Drawing on my data corpus, together with critical literature on time/speed, the major lines of division in the field are theorised along the axes of *techno-scientific time* versus *deliberative-democratic time*, and *machine-instantaneous time* versus *human-reflective time*. In this chapter, I elaborate and explain these different temporal position-takings, paying close attention to how differences in the value and meaning of speed manifest in actors' accounts and strategies.

For actors oriented toward techno-scientific time—i.e. large supranational technology firms, defence institutions, private sector organisations, VC firms, consultancies, and the British government—speed as it relates to AI R&D was largely perceived as a positive-enabling force. I present their accounts under the theme of *speed advantages* and identify three sub-themes: (1) competitive advantage, (2) thrill, and (3) net-positive. Actors positioned toward techno-scientific time exercise what I call a 'will-to-speed:' seeking to bypass time-consuming democratic and legislative procedures they promote policies of limited (self-) regulation; mandate strategies of rapid experimentation and time-based competition; and instil a sense of urgency. By contrast, for actors oriented toward deliberative-democratic time—i.e. civil society pressure groups and, to a lesser extent, professional bodies and universities—speed was broadly perceived as a negative-oppressive force. I explore their accounts under the theme of *speed pathologies* and identify three sub-themes: (1) temporal desynchronisation/domination, (2) temporally-induced skimping, and (3) precarity. Actors pertaining to deliberative-democratic time are generally opposed to speed imperatives in the realm of AI R&D. They advocate for a temporal regime more synchronic with the inherently slow temporalities of multi-stakeholder, democratic deliberation and rigorous safety testing. Moratoria, formal regulation, pharmaceutical-style trial testing, and an ethic of 'slow science' were favoured as forms of resistance to the logic of continuous acceleration à la techno-scientific time.

For actors positioned toward machine-instantaneous time—i.e. large supranational technology firms, private sector organisations, defence institutions, consultancies, and the British government—the continued acceleration of various human domains via AI systems was perceived as predominantly a good thing. Here, I return to the theme of *speed advantages*, expanding the sub-theme of (1) competitive advantage, and adding a further sub-theme, (4) efficiency gains. Actors here pressed for the optimisation of AI systems for speed, increased pre-programmed algorithmic thought, and minimal human supervision of AI systems. For actors positioned toward human-reflective time—i.e. civil society pressure groups—the sub-second, 24/7 temporalities of AI systems were considered a potentially deleterious force. I return to the theme of *speed pathologies*, broadening the sub-theme of (1) temporal desynchronisation/domination. These actors advocated for the intentional deceleration of AI systems and more meaningful human supervision.

By presenting the themes of speed advantages and speed pathologies under the four temporal parameters, this chapter reveals the contested nature of time and speed in the British AI field. The chapter unveils how there is no single, consolidated view of speed or its importance in the British AI field, but competing perspectives in line with the multiplicity of vested interests of various stakeholder groups. In doing so, the chapter seeks to move forward the alternative assumptions and agendas identified in chapter 2; specifically, (1) taking full stock of speed pathologies; (2) adopting a stakeholder approach to evaluate speed, and (3) studying how speed is actively resisted/contested. This contextualist account of time/speed in the British AI field is further extended in chapter 5, where the different power resources actors bring to having their temporal perspectives recognised as legitimate are examined. Chapter 5 also deals more explicitly with the alternative agendas of (1) considering the speed experiences of marginalised voices and (2) questioning the omnipresence of speed.

Figure 4.1. Overview of struggles over the temporal commons in the British AI field and key themes in the chapter



4.2. A CONTESTED TEMPORAL COMMONS: THE PACE OF AI RESEARCH AND DEVELOPMENT

4.2.1. Techno-scientific time versus deliberative-democratic time

This section covers the major lines of opposition pertaining to actors' perceptions of time and speed as it relates to AI R&D. The dominant temporal logic in various social arenas has been described as largely invisible, de-politicised, and undiscussed (e.g. Adam, 1995; Rosa, 2010). In the British AI field, I did not find this to be the case. The appropriate pace at which to research and develop AI is highly politicised. In part this seems to be explainable by the extent to which AI has become a matter of significant public interest—a phenomenon I investigate in more detail in chapter 5. Whether this interest can be sustained in the face of the COVID-19 pandemic remains to be seen. Some scholars suggest AI has already passed 'peak hype' (e.g. Schwartz, 2018; Sicular and Vashisth, 2020). However, the fact remains that there exist now many organisations who track, monitor, lobby, and contest issues of pacing regarding AI R&D, e.g. the Ada Lovelace Institute, the Alan Turing Institute, and so on. I now turn to outline the axis of techno-scientific time versus deliberative-democratic time; this is the first major dimension through which the temporal commons in the British AI field is shaped and contested.

4.2.2. Techno-scientific time

My research participants from large supranational technology companies, private sector organisations, VC firms, defence institutions, consultancies, and the British government supported a temporal regime based on what I term techno-scientific time. These actors exercised a high degree of concern for speed in the research and development of AI. As one respondent from a private sector organisation put it: "…because it's a digital industry, it's always about moving fast" (Interview #9, ML engineer, private sector). Many others referred to AI R&D in terms of a "fast-paced competitive race" (Interview #5, CEO, private sector) where time is everything and AI is viewed as a key capability that both organisations and nations must attempt to capture and/or develop before their rivals.

In the accounts of actors positioned toward techno-scientific time, I identified three main cases *for* speed in AI R&D. I deploy the theme of *speed advantages* in order to understand and theorise these accounts. Given the large and complex nature of this theme, I present my respondents' accounts as three distinct sub-themes: (1) competitive advantage, (2) thrill, and (3) net-positive. Table 4.1. provides a summary of the main actors pertaining to techno-scientific time, the main arguments for speed, and the policies and strategic orientations advocated by these players.

Table 4.1. Techno-scientific time: Main actors, speed advantages, and strategies[16]

<table>
<tr><th>Main actors</th><th>Theme</th><th>Description</th><th>Example(s)</th><th>Strategies</th></tr>
<tr><td rowspan="5">Large supra-national technology firms

Private sector organisations

Defence institutions

VC firms

British government

Funding agencies</td><td>Speed advantages</td><td>Perceived socio-economic goods emerging from speed and speed logics</td><td>See below</td><td rowspan="5">Limited (self-) regulation

Time-based competition (agile)

Instilling a sense of urgency</td></tr>
<tr><td>Sub-themes</td><td></td><td></td></tr>
<tr><td>1. Competitive advantage</td><td>Speed grants time leads in the introduction of new technologies and products; this allows for extra profits before competitors catch up</td><td>“There is a very strong first mover advantage in...AI now. Whoever gets going first has an advantage” (HoL, AIC0005, VC)

“Whoever gets there first, through either hook or crook ends up ruling the world” (Interview #5, CEO, private sector)</td></tr>
<tr><td>2. Thrill</td><td>Speed produces a sense of excitement, thrill and personal enjoyment</td><td>“I don’t begrudge the fact there’s a lot of pressure to do things quickly and a lot of excitement to develop new stuff” (Interview #25, founder, private sector/university)</td></tr>
<tr><td>3. Net-positive</td><td>Speed is a survival strategy rather than an unequivocal good</td><td>“We recognise that AI is a developing field that has the potential to further transform how defence operates. The Ministry of Defence (MOD) is committed to...retain our technological advantage” (HoL, AIC0229, HM government)

“...the problem is that even if developed nations in general could agree a set of guidelines [to slow down], there’s nothing to prevent a rogue state from developing AI systems without following those guidelines.” (Interview #25, founder, private sector/university)</td></tr>
</table>

[16] In keeping with the Bourdieusian approach, strategies are understood here as ‘the product of a practical sense, of a particular social game. This sense is acquired...through participation in social activities’ (Bourdieu in, Lamaison, 1986: 112).

Speed advantage 1: Competitive advantage. The emphasis on competitive advantage was striking as a justification for speed across multiple levels of analysis. My research participants from large supranational technology companies, private sector organisations, VC firms, defence institutions, and the British government claimed that it was vital to develop AI as rapidly as possible in order to secure temporary strategic advantages over rivals.

At the geopolitical level, a number of respondents stressed the importance of accelerating AI R&D in Britain in order to maintain national economic competitiveness. As an AI developer from a private sector organisation claimed:

> "With AI, entire nations are fighting for it, and that's the kind of level you are competing in. There's always this huge incentive for AI. The monetary incentive itself is enough to actually have a lot of people involved." (Interview #4, senior AI research fellow, university)

It is true that over the past few years, there has been considerable competition at the international level to develop AI. The Future of Life Institute (2020) lists 36 nations who have launched national AI strategic initiatives since 2015. The OECD registers around 60 countries with AI policy initiatives.[17] In some cases, these initiatives explicitly frame future trajectories relating to AI R&D in terms of a "race" for techno-scientific superiority (Cave and ÓhÉigeartaigh, 2018). For example, in their 2017 policy document, 'A Next Generation Artificial Intelligence Development Plan,' China State Council's stated goal is: 'To seize the major strategic opportunity for the

[17] https://oecd.ai/

development of AI, to build China's *first-mover advantage* in the development of AI' (p.2, my emphasis). Similarly, in the report that would become the basis of Britain's £950m 'AI Sector Deal,' Hall and Pesenti (2017) claim that if Britain moved 'swiftly…[it] could gain major and lasting advantages from taking a lead in building and using AI' (p.13).

It is important to clarify that players oriented toward techno-scientific time have a particular understanding of what AI is that is not shared by all agents in the field. As I stressed in chapter 3, there is a longstanding struggle between a) those who view AI as a scientific quest to understand/formalise the principles that make intelligent behaviour possible and b) those who view AI instrumentally as a tool for prediction, classification, automation, and control. As far as the actors oriented toward techno-scientific time are concerned, the need for speed is fundamentally to do with b). Of course, the proponents of a) are always at hand to remind the disciples of b) that none of it would be possible without their efforts. However, when my respondents from industry, the military, and the British government spoke fervently of a 'race,' it was in the sense of securing time leads in the adoption of AI for economic, military, and political ends.

At the organisational level, the case for speed was also couched in terms of competition and capital accumulation. One respondent, a senior AI lead from a large technology company claimed: "Currently, the scene looks like a gold rush. I will say that from 2017-onwards, it became a gold rush" (Interview #13). In their report, 'AI in the UK,' the management consulting house McKinsey Global Institute (2019) makes a similar claim:

> 'For companies, we are seeing fast movers win big and those that move slowly lose out: —Front-runners, defined as companies that fully absorb AI tools into their organisations over the next five to seven years, could increase economic value…by about 120 percent by 2030…Laggards, who adopt AI late or not at all, could lose about 20 percent of cash flow compared with today based on our simulation' (p.3).

Thus, not unlike a lot of strategic management theory, many of my respondents in the British AI field strongly equated time-leads in AI R&D with economic performance (e.g. Bakker and Shepherd, 2017; Hawk et al., 2013). Although some researchers have expressed scepticism regarding the extent to which first-mover advantages generate economic advantages (e.g. Hawk et al., 2013; Pacheco-de-Almedia, 2010), actors oriented toward techno-scientific time in the British AI field lived largely by the assumption that this was true.

Finally, in some extreme instances, some of my respondents argued for rapidity on grounds that AI R&D represented a fairly unique 'winner-takes-all' scenario. These claims are not new; in the 1980s, Robert Kahn, the founder of the Strategic Computing Initiative (the US equivalent of Britain's Alvey programme) argued: 'The nation that dominates this information processing field will possess the keys to world leadership in the twenty-first century' (quoted in, Roland and Shiman, 2002, p.13). Four decades later, in a highly publicised remark, Russian president Vladimir Putin claimed on Russia Today (2017): 'Whoever becomes the leader in this sphere will become the ruler of the world.' Mirroring these views, one of my respondents argued:

> "As I said, the economic incentive is just so high for AI. Whoever gets there first, through either hook or crook, ends up ruling the world." (Interview #5, founder, CEO, private sector)

This notion of AI granting its possessor absolute power is tightly bound with speculative reasoning on the possibility of developing 'Artificial General Intelligence' (AGI) (Goertzel and Pennachin, 2007), which Bostrom (2014) likens to a catalyst for 'superintelligence.' To date, the technical achievements of AI have thus far all been in limited, narrow domains, i.e. AI systems are effective at solving one particular task in some constrained domain, e.g. assessing candidates for a job, winning a game of chess, or otherwise. By contrast, the subfield of AGI seeks to find a universal algorithm for learning and acting in any environment. Some hypothesise that if such an algorithm were developed, AI would exceed human intelligence (a point known as 'the Singularity'), whereupon machines would likely be capable of making themselves rapidly smarter and at some point, far exceed any human intelligence, arriving at 'superintelligence' (e.g. Bostrom, 2014; Chalmers, 2010). The theory goes that were such a 'master algorithm' invented, and could it be controlled, then its ultimate proprietor would have an extremely powerful tool at their disposal to concentrate wealth and power (Bostrom, 2014; Domingos, 2015). The reader may be surprised to learn the degree to which, even among learned folks, ideas of AGI and the Singularity are taken seriously within the field (Bringsjord and Govindarajulu, 2018). It is beyond the scope of this thesis to discuss the contentions surrounding AGI and the Singularity (see Floridi, 2018 for a highly sceptical view). What matters here is that to the extent that AGI is taken seriously and thought to materialise a winner-takes-all scenario, it is seen as an impetus and accelerant for AI R&D.

Speed advantage 2: Thrill. A second argument used by actors in favour of the intense temporalities of techno-scientific time is that rapidity in AI R&D is conducive to thrill, excitement, and fulfilment. Thus, for some actors, acceleration is justified not only for the purposes of international or organisational competitiveness, but for personal enjoyment. Respondents frequently referred to the fast pace of AI R&D as being "highly exciting," "inspiring," "thrilling", and resulting in "adrenaline kicks." As a PhD AI researcher with aspirations to join one of the leading corporate AI research groups put it:

> "What's making me stay in is the speed, the high prospects... If everything's slow, you can see that it's going to be steady progress. But in this, what it really feels like is that there's no glass ceiling, no limit, right? That's exciting." (Interview #12, university)

Here, the rapid pace of AI R&D presented potentially lucrative and invigorating opportunities unavailable to those actors in fields where growth or social action is slow. Another senior AI researcher and founder of an AI company noted that he doesn't "...begrudge the fact there's a lot of pressure to do things quickly and a lot of excitement to develop new stuff" (Interview #25). Other respondents simply stated that they "enjoy the fast pace" and were excited at the prospect of making progress in research they care about (Interview #24). Echoing the cultural theorist Mark Kingwell, there is a 'want to be velocitized' (Kingwell, 1999, p.165).

My interviews with respondents from large supranational technology companies in particular had parallels with discourses of speed and frenetic work-cultures which are epitomised by Silicon Valley (English-Lueck, 2017; Wajcman, 2019). For example, in their book, 'How Google Works,' former Google executives Schmidt and Rosenberg (2014) argue that work-life balance policies are insulting to dedicated, passionate workers who ought to be 'overworked in a good way.' In a similar way, many of my respondents appeared to find suggestions of deceleration in AI R&D dull and unappealing. One respondent I spoke with was an 'AI lead' at a large supranational technology company. In his 'spare time'—weekends and late-evenings—he was organising one of Britain's largest AI conferences. He embraced a fast, intense pace of work, constantly stimulated by an overabundance of interesting projects to do. Thus, in this way, some actors had a positive appreciation of intense temporal regimes in the British AI context. This seemed to be supported by two aspects: First, there was a fairly widely held, yet problematic, equation of AI development with social progress (Bloomfield, 2018). By this I mean that actors' enthusiasm for doing things quickly was in part a result of their unwavering belief that the work they were doing was a boon for society. By this logic, the faster they work, the sooner we will all be better off. As one of my respondents, the CEO and founder of an AI start-up claimed, working on AI is "…really one of the most exciting things. I think AI is the final frontier, and it's going to be like that next evolutionary step" (Interview #5). In a response to the House of Lords' Special Committee on AI, the Chief Scientist at Fujitsu, Dr Joseph Reger, argued that:

> "AI technology…is a competitive race, and the faster the United Kingdom progresses in that race the better it is for the country." (HoL, Q108)

Thus, part of the justification for acceleration rested on notions of linear progress as they have developed in the West since the 18th century (Koselleck 2004; Tomlinson, 2007), i.e. the idea that history moves in an ameliorative fashion toward an ever-improved world (Davidson, 2020).

Second, my respondents were generally praiseworthy of notions of hyper-productivity and hyper-agency regardless of ends. As a machine learning engineer put it: "We don't like when people are only ever talking and not really doing anything" (Interview #9, private sector). In this way, it did not matter so much what someone was doing so long as they were doing it quickly and efficiently. As such, speed seems to have become a kind of measure of performance in its own right (Carr, 2006). There are connections here with the insights laid out by Boltanski and Chiapello (2006) in their seminal book: 'The New Spirit of Capitalism.' In the book, the authors contend that, "…to always be doing something, to move, to change—this is what enjoys prestige" (p.155). For actors oriented toward techno-scientific time they shared this same view of high-speed forms of social action being revered and appealing.

Speed advantage 3: Net positive. A final case made by respondents in favour of accelerated innovation and high-speed techno-scientific production was less about highlighting the economic, militaristic or personal gains of speed and more to do with emphasising the costs of inertia or a lack of urgency in the field. The justification put forward by these actors was that deceleration or stagnation of AI R&D in Britain was "not an option" (Interview #32, ML engineer, private sector) because the costs of doing so outweighed the risks of proceeding at high pace. Thus, rather than attempt to frame speed as an unequivocal good, actors saw strategising for speed as representing a 'net positive.' In other words, it is a successful strategy of survival rather than an unequivocal good.

A common argument in favour of techno-scientific time was that if British AI actors adopted an alternative, slower temporal regime, 'rogue' or 'bad actors,' be they other nations, terrorist groups, or non-state actors, might 'overtake' Britain's AI capabilities, threatening national security or economic prosperity. Indeed, some actors referred openly to an "AI arms race." As part of their evidence submitted to the House of Lords, Darktrace, one of Britain's leading AI 'cyber-security' start-ups, noted that:

> "AI is simply the next phase of the cyber security "arms race." … AI offers the opportunities to supercharge both cyber defence effectiveness and, sadly, the speed, scale and automation of cyber-attacks." (HoL, AIC0243, defence institution/private sector)

Thus, in a nod to Virilio's (1986) insight regarding the antecedents of speed logics (what he calls 'dromologics'), actors argued that the rapid, even hasty, development of AI was less worrying than rival actors outstripping British capabilities and using advanced AI systems against it. When discussing the possibilities of slowing down specifically militarised AI technologies, one respondent argued that:

> "…the problem is that even if developed nations in general could agree a set of guidelines, there's nothing to prevent a rogue state from developing AI

> systems without following those guidelines." (Interview #25, AI developer, private sector)

What struck me most in my interviews with actors positioned toward techno-scientific time was the degree to which speed imperatives appear to have taken on the guise of 'TINA' principles; '*There is No Alternative*,' the phrase made famous by the Conservative British prime minister, Margaret Thatcher. This slogan was used by Thatcher to claim free market capitalism was the only economic system that works. Inter-state military and market competition rendered generalised acceleration in the British AI arena the only option, purportedly stripping actors of any temporal autonomy. To genuinely control the pace of AI R&D would require "global scale cooperation" (Interview #30, chair, policymaking). However, my respondents, hardened to the competitive dynamics of the market and state rivalries, dismissed such cooperation and collaboration as extremely unlikely. One respondent from a private sector organisation described calls for global cooperation on AI R&D as "a case of wishful thinking" (Interview #32, ML engineer), while another contended: "I just don't see that happening" (Interview #27, Professor of AI, university). By this logic, there is no choice but to genuflect at the altar of speed.

Mobilising speed: the strategies and practices of techno-scientific time. Taken together, these arguments form the basis for what I have labelled 'techno-scientific time'—a particular socio-temporal orientation held by predominantly industrial-military actors in the British AI field and backed by the current Conservative government. These actors view accelerated innovation and high-speed techno-scientific production as the appropriate—indeed, only—organising principle.

Put differently, they exercise a 'will-to-speed' (Vostal, 2019), that is, a strong desire to research and develop AI quickly, to speed things up. The common characteristic which binds actors oriented toward techno-scientific time together is a competitive mode of relating to AI R&D, i.e. 'staying in the race' to maintain or gain competitive footing. However, the imperatives of speed were not justified through competition alone. Some actors had a positive appreciation of speed and its adrenaline-inducing capacity for generating personal thrill and pleasure.

As far as this view translates into policy and practice, actors promoted policies and strategies that seek to identify accelerants and remove obstacles that encumber faster AI R&D. This included (1) *advocating for limited (self-) regulation* and the formation of general high-level principles over legally enforceable restrictions. One respondent argued that by allowing those who "know the technologies best" to "self-regulate" (Interview #28, co-chair, policymaking), there is less risk of "stifling innovation," thereby foregoing some benefit to the economy or military. This is the approach currently being pursued by the British government. As one of my respondents, a senior British AI policymaker, put it:

> "We're trying to move towards having an industry-led standard on AI. And we're looking to build that approach into our applications, and into our policy." (Interview #30)

From a temporal perspective, the emphasis on self-regulation can be seen as a means of shifting governing processes toward faster arenas. Formal regulation, with its reliance on bureaucracy and due process, is perceived as too cumbersome and inefficient to deal with the growing velocity of AI R&D. Thus, in this way, techno-scientific time is both anti-bureaucratic and, in many respects, anti-democratic (see deliberative-democratic time below). It is part of a neoliberal agenda that seeks to reallocate decision-making power from the government to markets (Harvey, 2005).[18]

On top of efforts to support self-regulation, a further strategy is to (2) *pursue time-based advantages* at the (inter-)organisational level. These strategies are pursued on two fronts. First, by competing to rapidly accumulate capital, principally, data and 'AI experts,' defined as those individuals who have the training, knowledge, and experience to develop and refine algorithms and AI systems. These resources are viewed as crucial to getting ahead of competitors, particularly data, because the properties of data (i.e. as being partially excludable and yielding increased returns to scale) offer possibilities for monopolistic behaviour. Second, via development methodologies broadly referred to as 'agile.' Here, agile is understood as a design methodology emphasising speed and adaptability in the production and dissemination of AI systems (e.g. Carter and Hurst, 2019; Appugliese et al., 2020). In order to compress development times, AI products are often deployed by organisations before considerable testing takes place. One firm which embodies this agile logic is the large supranational technology company Facebook, a major player in the (British) AI field. In the company's 'Little Red Book,' an internal culture initiative which saw all Facebook employees delivered a small red pamphlet it reads:

[18] This theme is discussed further in chapter five.

> 'Fast is better than slow. While slow is adding unnecessary embellishments, fast is out in the world. And that means fast can learn from experience while slow can only theorise. Those who ship quickly can improve quickly. So fast doesn't just win the race. It gets a head start for the next one.' (Facebook, 2012)

A third strategy adopted by actors pertaining to techno-scientific time was to (3) *instil a sense of urgency,* that is, to build a shared sense that opportunities are fleeting in the social space of AI, ergo, the need for speed. Despite a long history of AI R&D in Britain, it is only since the 2010s that interest in the discipline has returned, albeit under the new paradigm of sub-symbolic or data-driven AI. This has created a relatively unfamiliar operating environment. Thus, when I asked my respondents how their organisations knew what the appropriate pace was at which to research, develop, or adopt AI, their answer was that they did not really know. This was precisely why it was so important for them to instil a sense of urgency as it reduced the risk of "being caught napping."

It is important to note that advocacy for techno-scientific time is not uniform. Some actors, particularly large supranational technology companies, private sector organisations, defence institutions, and VC firms have a stronger orientation toward speed logics in AI R&D, identified here as techno-scientific time, while others, such as the British government, try to position themselves toward the centre of the socio-political spectrum. For example, at one conference I observed during my fieldwork, the Chair of the 'AI Council' (part of the British government's 'Office for Artificial Intelligence') noted during a talk on AI governance:

> "We want to run as fast but as carefully as we can. Run fast and break things, as with Facebook, is no longer good enough." (Fieldnotes #5)

Thus, while broadly supportive of escalatory logics in the realm of speed, respondents from public sector organisations and the British government were more cautious of the pursuit of rapid AI R&D without directly objecting to it. For them, speed is recognised as a potentially harmful yet necessary and largely inescapable imperative.

However, the attempts at orienting the field toward a logic of speed and acceleration has not been without resistance. Indeed, despite its dominance, orientation toward the intense temporalities of techno-scientific time is highly contestable. There is a power struggle within the British AI field along the axis of techno-scientific versus deliberative-democratic time. Techno-scientific time is not well-received by actors whose agenda and interests are less economistic or militaristic in nature. Thus, I move to discuss this resistance under the orienting concept of deliberative-democratic time.

4.2.3. Deliberative-democratic time

My interviews and other data sources suggest that civil society pressures groups and, to a lesser extent, professional bodies and universities, support a temporal regime oriented toward what I term 'deliberative-democratic time.' Rather than seek to emphasise the competitive advantages, thrills, and/or net-positives which rapid AI R&D potentially generates, actors here highlighted the tensions and contradictions between calls for rapidity on the one hand, and democratic participation, safety and security on the other. Specifically, respondents representing democratic-deliberative time indicated a number of '*speed pathologies*,' tempo-induced problems and negative-oppressive forces relating to high-speed AI R&D. I develop three sub-themes here to describe and elucidate these perspectives, (1) temporal desynchronisation/ domination; (2) temporally-induced skimping; and (3) precarity.

Table 4.2. Deliberative-democratic time: Main actors, speed pathologies, and strategies

Main actors	Theme	Description	Example(s)	Strategies
Civil society pressure groups Professional bodies Universities	Speed pathologies	Perceived socio-political harms emerging from speed and speed logics	See below	Moratoria Formal (hard) regulation Pharmaceutical-style trial testing Slow science
	Sub-themes			
	1. Temporal desynchronisation/ domination (technoscience/democracy)	Crises resulting from disjuncture between differently paced systems, fields and processes (in this case, between the pace of AI R&D and the *speedability* of democratic processes)	"AI is developing too fast to—and that's a general feeling within the sector—to take the time to analyse its social impact" (Interview #2, director, civil society pressure group) "It's constantly running away from regulators…New laws are likely obsolete before the ink has dried" (Fieldnotes #13)	
	2. Temporally-induced skimping	Speed compresses the time and space required for ethical deliberation; safety precautions curtailed in the pursuit of speed	"…things are happening too fast now. People certainly submit half-baked papers to conferences and these papers are then not reviewed properly because everyone just has too much stuff to review. And now with the [social] impact statements being a requirement, it's just another thing we don't have time for" (Interview #27, Professor of AI, university)	
	3. Precarity	Speed and compulsive speed logics result in an environment of fear and instability	"…it can get overwhelming. You feel…that even if you stop for a minute… 'Oh my god, I'm going to be left behind'" (Interview #10, president, civil society pressure group) "…worries are heightened by predictions that technology will	

			soon dramatically 'disrupt' how we currently live and work. Already, these fears can be seen in the insecurity experienced by precarious workers and the alienation many feel in relation to [AI]." (HoL, AIC0124, civil society pressure group).	

Speed pathology 1: Temporal desynchronisation/domination (techno-science/democracy). Borrowing from Rosa's (2010, 2015) concept of 'temporal desynchronisation,' the first pathology relates to what respondents experienced as a crisis of desynchronisation. Rosa's (2010) fundamental idea is that not all systems, processes, fields, and so on can be sped up equally; they are capable of acceleration to different degrees. Whenever two systems, processes, or fields interlock, i.e. whenever they are synchronised, the acceleration of one puts the other under pressure such that, unless it accelerates too, it is viewed as an annoying break or hindrance. These same phenomena may be understood through the related concepts of 'temporal asymmetry' (e.g. Reinecke and Ansari, 2015; Zerubavel, 1981, p.65) or issues of 'entrainment' (e.g. Ancona and Chong, 1996; Gersick, 1994).

My respondents from civil society pressure groups, professional bodies, and universities highlighted a crisis of desynchronisation, whereby AI R&D is unfolding at a tempo faster than democratic institutions can effectively steer it. In other words, the acceleration of AI R&D and its translation into commodities for private and public use is quicker than democratic institution's ability to safely regulate and make sense of the emergent social dynamics engendered by such processes. As a spokesperson for the Ada Lovelace Institute succinctly put it during a conference I attended: "Public understanding, ethical guidance, and legal frameworks have not kept up with the development of data-driven and AI technologies" (Fieldnote #10).

For some of my respondents, this problem began with a basic disjuncture between the perceived pace at which AI is developing in Britain and public understanding of it. In an interview with a director of a civil society pressure group, he argued:

> "The AI field has been guilty of outrunning public understanding. I mean, it's really one of the most dangerous things. It's like when people were illiterate and the priesthood had the monopoly on being literate. You know, because, people didn't know what was in the Bible, so they could tell them…what they thought was in the Bible, their interpretation, which was a massive power. And you definitely have this kind-of priest-class arrogance among many developers where, like these priests, they are exclusively literate in a new, very consequential language, which is, you know, Python, C++, or whatever it is, which is totally incomprehensible to most people." (Interview #10)

However, although public understanding of AI is an important part of any democratic participation, of greater significance for some of my respondents was a desynchronisation between the fast pace of AI development and the time-demanding practices of democratic deliberation and legislative planning. The growing ubiquity of AI systems in the governing of social life in Britain and elsewhere (e.g. Berns and Rouvroy, 2013; Stiegler, 2019) has led to an increasing number of calls for democratic participation and oversight (Greene et al., 2019). The problem, however, is that it takes a lot of time to 'organise a public, to identify the relevant social groups, to formulate and weigh arguments, and to reach consensus and cast deliberate decisions. And it also takes time to implement those decisions' (Rosa, 2010, p.71). Indeed, in societies which are becoming increasingly pluralistic, such as Britain, the time demanded for the effective organisation of collective interests is increasing (e.g. Connolly, 2002; Scheuerman, 2004). Thus, there appears to be a growing temporal mismatch between imperatives for speed in AI R&D on the one hand, and the possibilities for democratic oversight on the other.

For actors, one area where these issues of desynchronisation are highly pronounced is in the AI sub-field of automated facial recognition. In the past 3-5 years, there has been a near exponential increase in the number of scientific papers and applications emerging from this area (Bradford et al., 2020; Big Brother Watch, 2018). In a notable use-case, the London Metropolitan Police has become the largest police force outside of China to roll out the use of this biometric surveillance tool (Big Brother Watch, 2020). However, as one civil society pressure group puts it:

> "We need to build the evidence base to provide the foundations upon which policy, regulation and technical development in the field of digital recognition technologies should be built. However, this will take time. Indeed, it should take time – technology policy and regulation should not be reactionary or rushed, but rather fit for purpose and sufficiently adaptable to prevent redundancy as a result of technological advancement." (Ada Lovelace Institute)

At a broader level, some respondents believed that if AI R&D progresses at a rapid tempo, then a danger is that after prolonged periods of education and deliberation, decision makers are at risk of making entirely anachronistic decisions—technological progress in AI has already made them obsolete. In an informal conversation with a senior fellow from a professional body at an AI conference, he stated:

> "To be honest, for anyone attempting to keep up AI development today it's just an impossible task. It's constantly running away from regulators and even those closest to the tech can barely keep pace. New laws are likely obsolete before the ink has dried." (Fieldnotes #13)

Perhaps worryingly, at least from the perspective of actors oriented toward deliberative-democratic time, some of my respondents from large supranational technology companies and private sector organisations identified the same issue of temporal desynchronisation. However, they expressed temporal desynchronisation as an explicit goal, not something they struggled with or experienced as a negative-oppressive force. As a senior executive at one large AI-centred technology company put it:

> "We innovate faster than the regulators. The tech sector has gained a lot of our power through speed and stealth, because we've avoided lots of regulation, whereas finance is highly regulated. Even in this company, our product is used by a hundred million individual humans per month...We have no regulation, zero and none." (Interview #14)

This represents an extreme form of what Reid (2013, p.743) calls 'temporal domination,' the exercise of social power through time. The ability to move at a pace beyond which state authorities or democratic institutions can reasonably keep up grants some actors the ability to engage in what Zuboff (2019) calls 'permissionless innovation.' Actors exploit the time lag it takes for others to understand and deliberate their innovations. When discussing these issues, one of my respondents, the CEO of a private sector AI firm, used the term 'patsy' to describe those outside the immediate technical sphere of AI work who are easily exploited by information and temporal asymmetries in the field:

> "...it might sound arrogant but if you read about AI in the newspaper, if you hear about something from some standard body, you are already too late, in the sense that you are in the periphery...you are...the patsy." (Interview #5)

Thus, some actors with whom I spoke appeared blatantly aware of the potential to capitalise on temporal disjunctures. While some of my respondents saw a pacing problem, others saw an opportunity. Here, perhaps more than anywhere, we can observe the ambiguity of speed in AI R&D and the importance of posing the question: 'for whom is speed good, and for whom is it bad?'

Speed pathology 2: Temporally-induced skimping. In opposition to techno-scientific time, my respondents from civil society pressure groups, professional bodies, and universities also expressed concern with what I call 'temporally-induced skimping.' Temporally-induced skimping occurs when ethical deliberation and safety precautions are curtailed in order to meet demands for greater speeds in the British AI context. Skimping amounts to a cut, or destruction of, time-consuming critical reflection and safety precaution in the name of speed and efficiency. This issue is intensified by the perception of a 'winner-takes-all' scenario as outlined above. The more actors believe there are large advantages to being first movers, the greater the risk of skimping on safety and reliability concerns.

One case which elucidates temporally-induced skimping in the British AI arena was mentioned several times during my fieldwork. To understand it requires an awareness that a common strategy for achieving competitive advantage within the AI field is through the acquisition of substantial and often highly sensitive data training sets. This is particularly true given the currently dominant data-driven AI paradigm. Reflecting this, the phrase 'data is the new oil' is a frequent utterance within the AI arena.[19] Accordingly, there is a widespread understanding that accumulating or monopolising data at speeds beyond one's rivals is an effective way of gaining power in the field. However, as my respondents pointed out, this urge to move quickly incentivises the abandonment of ethical consideration and responsible practice. Here is one AI developer reflecting the point:

> "...the danger I think, is that if one organisation holds all the data, well then really you hold more of the keys to AI. We continuously face pressure to acquire more data so we can build better systems, but that pressure to speed up the data acquisition processes, it carries a cost. We saw this with Google DeepMind...despite all their pledges to lead the way in developing ethical AI, they rushed into a contract with the NHS [National Health Service] where they acquired one and a half million health records. Did they ask anyone for consent? No, they didn't. They just wanted to get the data first" (Interview #10)

[19] See chapter 5 for a deeper exploration of this theme.

Elsewhere, this same case was raised by 'medConfidential' during the House of Lords' call for evidence. They claimed that Google DeepMind's 'need to be first' meant they failed to 'check…whether there were any rules they should have followed. So they followed none of them' (HoL, AIC0063). Thus, here, the focus on doing things quickly, in this case, acquiring data before one's competitors, appears to exact a toll on AI workers capacity to deal with the multiple ethical and political realities unfolding around them (Virilio, 1986).

In a related issue, some of my respondents used the analogy of "an arms race" to describe the temporal conditions in the British AI-field, raising concerns that race dynamics were having a 'blinkering' effect, obscuring considerations other than winning.

> *Respondent*: "With the atomic bomb…there's quite a good analogy. At the time there was a race to create the atomic bomb so there was less time to think about what could happen if we get to build it. We did it so quickly we had no time to think about the ethical standards."
>
> *Interviewer*: "That's an interesting analogy. So you think there might be something similar happening in the AI field–organisations, developers, etcetera are racing one another?"
>
> *Respondent:* "Yeah, exactly…and the problem is we're often using blinkers in order to minimise distractions, but we forget about these ethical standards." (Interview #9, ML engineer, private sector)

This insight sits very closely with Wajcman's (2015) note that the omnipresence of speed imperatives makes responsible research and innovation a 'waste of time.' In order to win an 'AI arms race,' real or perceived, respondents felt pressured to change the way they function, minimising activity that is not aimed purely at technical advancements, often starting with ethical and political deliberation (see also: Armstrong et al., 2016; Bostrom, 2014).

Some respondents also objected to the agile approaches being utilised to develop and deploy AI systems. As a professor of AI noted:

> "I think the danger around speed is that as long as we're in this culture, where the new things are deployed, and have a real-world impact...before a lot of testing; that's a bit like using an untested microwave, right?" (Interview #12, private/public partnership)

Indeed, some respondents from universities even appeared to suggest that these agile practices were profuse within scientific research. AI research is fairly unique in that conferences (e.g. IJCAI, ICML, NEURIPS)[20] are widely perceived as more prestigious than academic journals. As another professor of AI puts it:

> "It's a phenomenon that I've experienced throughout my career. There has always been this preference, in the whole field of computing, for publications in conferences over journals. And there was this feeling that the pace of research is very, very fast, and that the journals are too slow, and that the conferences get the publication out there quickly, and so on." (Interview #26, university/professional body)

[20] In order: International Joint Conference on Artificial Intelligence, International Conference on Machine Learning, and Conference on Neural Information Processing Systems.

However, the effect of this is that many ideas are not revised or enriched following acceptance. Another respondent, a senior AI fellow, was highly critical of this:

> "This, I think, encourages certainly a very, very nasty way of doing science. People are not appreciating, not giving each other time to come up with significant research, but just go from one conference deadline to the next which means the time for development is typically something like two months, which is way too little to really come up with an interesting scientific idea." (Interview #29, university)

Speed pathology 3: Precarity. A final argument against the emphasis on speed as it relates to techno-scientific time was the issue of precarity. Respondents from civil society pressure groups in particular pointed out the potential psycho-social burden a rapid succession of developments in AI might cast onto others, including the precarisation of workforces in other social fields. As one interviewee put it:

> "[AI] will require a lot more rapid up-skilling. So in terms of how you consider yourself as a person, it will mean a lot more self-doubt. If you require everybody to have a certain level of training or qualification, you subject everyone to a rollercoaster experience..." (Interview #8)

Of course, these concerns are not new, nor are they unique to the AI field. Marx and Engels (2004), Harvey (1989), Bauman (1999), and Rosa (2010, 2019), among others, have highlighted the incompatibility of techno-capitalist exigencies of continuous innovation with stable and secure social arrangements. For my respondents, it is the potentially 'deep transformations to work' wrought by AI systems (see Furman and Seamans, 2019; Newell and Marabelli, 2015) which is the destabiliser or 'disruptor.'

What they were keen to point out was the relationship between compulsive logics of speed and an environment of fear. As another respondent put it:

> "There's a real sense of fear and emergency...and we are giving people a reason to be scared because we're quickly taking away their jobs. Say you're a worker somewhere, you might ask, 'How will AI help me?' You just see, 'Hey, they're just replacing me with this machine, I'm really angry at AI in general'...That's worrying." (Interview #6, president, professional body)

While the impact AI may have on the labour force is likely not as deterministic as some of my respondents believed, it is generally accepted that if many jobs do not disappear (e.g. Oxford Martin School, 2016; McKinsey Global Institute, 2017), then more precarious forms of labour will likely proliferate (Fleming, 2019). Recently, for example, the ride-sharing platform Uber has been accused of using the threat of AI (in this case, self-driving cars), to suppress attempts by workers to unionise and demand less precarious work conditions (Fleming, 2019). What makes this threat more potent is a generalised sense, whether real or imagined, that AI is developing rapidly (see also HoL, AIC0124). Thus, while my respondents were not rejecting of the potentially positive aspects of continued AI R&D, there was recognition that the faster these processes take place, the greater the threat of irrelevancy and instability for those who may find themselves victims of AI technological progress.

Resisting speed: the strategies and practices of deliberative-democratic time: In contrast to those actors seeking to accelerate AI R&D, actors pertaining to deliberative-democratic time adopt the notion that the pace and broad directions of British AI R&D ought to be set by inherently slow, deliberative and democratic processes. The performance criteria of civil society pressure groups, professional bodies, and to some extent universities, is less preoccupied with bottom line, economistic concerns and more engaged with social and political concerns, such as democratic participation, safety, and privacy. Importantly, deliberative-democratic time is not one of unreserved deceleration, i.e. my respondents were not calling for the cessation of AI R&D, nor were they simply renouncing competition or markets for AI products. Rather, what was vital for them was to find ways to put the escalatory tendencies of AI R&D on a leash. The organising strategies pursued by actors pertaining to deliberative-democratic time were as follows:[21]

First, in a number of instances, respondents argued for *moratoria*. A temporary suspension, or halt, on certain lines of AI R&D were called for by virtue of more time and space being necessary to deliberate and mediate diverse interests concerning the need and/or likely impact of these developments. Specifically, the subfields of facial recognition technology and offensive autonomous weapons systems were marked out. As an example of a call for a moratorium on biometric systems:

> "We are engaging stakeholders in discussions about the establishment – by consensus – of a voluntary moratorium on future public and private sector deployment of facial recognition technology. Occupying the middle ground between inaction and prohibition, a moratorium provides for time and space for informed thinking and the building of public trust. It has been used with effect in the field of bioethics…A moratorium in the context of facial recognition technology and surveillance technology more generally also enjoys support from civil society actors such as think-tank

[21] I expand on these in more detail in chapter 5 under section 5.5. 'Possibilities for change.'

> DotEveryone and the UN Special Rapporteur for freedom of expression." (Civil society pressure group, Ada Lovelace Institute).

Second, in contrast to those who call for limited self- or even de-regulation concerning AI systems, actors here called for *formal (or 'hard') regulation* imposed by the state. A key aspect here was recognition that self-regulation has a lack of enforceability (or as one respondent put it, it lacks "teeth"), hence the need for top-down government regulation which is both enforceable and has coordinating properties. Another recognition was the need for greater democratic participation in deciding the forms and ends of techno-scientific AI production. Where the interests of greater democratic control and speed met concerning AI R&D, some respondents highlighted the potential of "regulatory sandboxes." Here, the idea is that AI systems are rolled out and tested in small, controlled environments where they can be monitored by democratic authorities and only released for wider use should they pass pre-agreed standards (see for example: Fenwick et al., 2017).

On a related note, and in contrast to agile development methodologies, some actors stressed the need for AI systems to go through a '*pharmaceutical-style trial testing.*' Thus, in much the same way as drugs are vigorously examined to help ensure their safety and efficacy, AI decision-making algorithms should be rigorously tested for their fairness, safety, and so on.

Fourth, some representatives from universities embraced call for '*slow science*' within AI R&D. Part of a broader 'slow movement' (see Honore, 2004), 'slow science' or 'slow scholarship' resists imperatives of relentless productivity and speed within the academic lifeworld in favour of thinking, deliberating, and judging that is more contemplative and unhurried (e.g. Chambers and Gearhart, 2018; Stengers, 2018). However, it cannot be said that this represents the dominant temporal position of British universities where new public management 'audit cultures' prevail and those with the most publications/citations win the most recognition.[22] Nevertheless, there is a growing backlash within these institutions and within the AI field in particular where respondents discussed the need for slower publication models within AI/ML with the intent of manifesting greater rigour and reducing stress and precarity, particularly among junior academics. [23]

In sum, these strategies aim at fostering an alternative politics of time in the British AI field. They offer something of a figurative brake pedal where the aim is to align the temporal rhythms of AI R&D with slower democratic and deliberative processes.

4.3. A CONTESTED TEMPORAL COMMONS: THE PACE OF AI SYSTEMS

4.3.1. Machine-instantaneous versus human-reflective time

In addition to observing a divide between actors across the techno-scientific, deliberative-democratic time spectrums, I discerned a further divide between machine-instantaneous and human-reflective time dimensions. Whereas the former concerns the tempo of AI R&D, the latter relates to the computer-mediated

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[22] This is another theme which I discuss more fully in chapter 5.

[23] Ironically, one of the leading proponents of 'slow science' in AI/ML is Yoshua Bengio, a 2018 recipient of the ACM Turing Award (see Bengio 2019). According to his Google Scholar page, in 2020 he (co-)authored 82 papers.

temporalities of AI systems. AI systems are understood here as the result of sociomaterial, not simply technical processes (MacKenzie, 2018; Wajcman, 2015). In other words, AI systems manifest the (temporal) priorities and preferences of their owners/designers/engineers, including the broader institutional environment in which they are embedded. In chapter 5, I will expand upon this point to argue that AI systems can be viewed as crystallisations of socially organised action (i.e. habitus) (Bourdieu, 1992). They embody a form of practical reason whereby a whole set of social relations, practices, and assumptions are embedded into them.

Machine-instantaneous time thus reflects a particular set of values, beliefs, and practices regarding time which contends that AI systems ought to be engineered and employed to transcend human temporalities, thus enhancing productivity and efficiency by predicting, inferring, classifying, ranking, and executing decisions, 24/7, and at tempos far beyond the limits of the body-mind. Large supranational technology firms, private sector organisations, defence institutions, VC firms, and the British government orient themselves toward machine-instantaneous time. By contrast, civil society pressure groups advocated for temporal parameters more in line with the comparatively slow temporalities of human thought. Sceptical or, in some cases, outright critical of the near-instantaneous speed of pre-programmed algorithmic thought, these actors pressed for more extensive human supervision, and, in some cases, the intentional slowing down of AI algorithmic decision-making technologies.

4.3.2. Machine-instantaneous time

Actors oriented toward machine-instantaneous time exercised a high degree of concern for speed and its mobilisation via AI systems. They shared an enthusiastic sense that AI systems could and should be designed to greatly speed up calculative and predictive moments, offering those who optimise them significant competitive advantages and efficiency gains. Machine-instantaneous time is simultaneously a reprimand of the inadequacy and deficiency of human time (Crary, 2013) and an affirmation of a machinic transhumanism (Kurzweil, 2005, p.127). It is part of the ever more rapidly setting-into-motion of goal-directed human action and thought. As one ML engineer put it: “AI enables us to do so much more in less time.” (Interview #31, private sector). Respondents provided numerous examples of how AI could be used to “save time,” from reducing mortgage approval processing times to accelerating medical diagnoses.

Table 4.3. Machine-instantaneous time: Main actors, speed advantages, and strategies

Main actors	Theme	Description	Example(s)	Strategies
Large supra-national technology firms Private sector organisations Defence institutions VC firms British government	Speed advantages	Perceived socio-economic goods emerging from speed and speed logics	See below	Optimising for speed Pre-programmed algorithmic thought Minimal human supervision
	Sub-themes			
	1. Competitive advantage	Speed grants time leads in algorithmic decision-making, calculation, prediction, and service delivery; this grants a competitive edge over slower rivals	"...with the level of cyber-attacks that we are seeing today... we have reached the limit of what humans can achieve in cyber defence. Therefore, we use AI programmes to analyse the data with speed and accuracy." (HoL, AIC0243, defence institution).	
	4. Efficiency gains	Speed results in more economical time-use; more can be done in less time	"...through...AI systems, what we are essentially doing is that we are launching the world forward into a state of like hyper-productivity" (Interview #5, CEO/founder, private sector) "...bots are extremely attractive for businesses because they free up staff to work on the more complex parts of the roles, help increase productivity and/or support cost reduction. They also work rapidly, twenty-four hours a day..." (HoL, AIC0073, consultancy).	

Speed advantage 1: Competitive advantage. The relative speed with which AI systems can execute various tasks, from trading stocks to detecting threats, was perceived by many of my respondents as a key strength and design imperative for their construction. The shared narrative for actors oriented toward machine-instantaneous time was that AI systems offer the potential to greatly transcend the temporal limits of human thought and action. Echoing the optimistic sentiment of Brynjolfsson and Mcafee's (2014) 'The Second Machine Age', one respondent, a Senior Innovator from a private sector firm, claimed that:

> "AI is really the extension of a technological change that started over two centuries ago with the industrial revolution. This industrial revolution is considered by many to be the 'first machine age'– which had the effect of scaling human physical capacity massively. With the popular advent of AI, many are considering today to be the 'second machine age". This...age will scale human mental capacity, to the same degree (if not more) than the industrial revolution scaled human physical capacity." (AIC0081)

However, given that AI systems frequently compete not simply against human beings, but against networks of other competing algorithms, or against other human-machine assemblages (MacKenzie, 2016), respondents oriented toward machine-instantaneous time largely shared the view that AI systems ought to be "optimised for speed" (Interview #28, co-chair, policymaking), such that they perform at the fastest possible rate. The closer AI systems come to performing functions instantaneously, the better since further acceleration is no longer possible after the instant.

One respondent from a large supranational technology company used the example of Google's AI search algorithm to discuss the value of speed as it relates to AI systems and organisational performance. Research at Google shows that a delay in search of as little as half a second results in a 20% reduction in traffic (Hoelzle, 2012). Impatient users click away. Incidentally, this is the amount of delay users would face if Google's search algorithm increased the results on one page from 10 to 30. Similarly, despite the significant biases' integral to Google's 'autocomplete function,' this feature is maintained on the basis that it accelerates users' search times, ultimately driving clicks and profit. Lastly, Google's search algorithm rewards sites with shorter load times on the basis that this spurs engagement and, ultimately, financial performance. So even if a site is likely to have more accurate information pertaining to the user's search, it may be excluded due to its comparatively slow loading. As Urs Hoelzle, the Senior Vice President of Infrastructure at Google explains:

> "Speed isn't just a feature, it's *the* feature…We have one simple rule to support this Gospel of Speed: Don't launch features that slow us down…This simple concept drives legions of Google engineers and product managers." (Hoelzle, 2012, my emphasis)

This example serves to illustrate how organisational imperatives of speed may become embedded in AI algorithms. In the case of Google's search algorithm, the need for speed is viewed as crucial to the firm's profitability and is thus optimised within its algorithm accordingly. At one conference I attended, a participant from another large technology company told me that: "Many organisations and AI experts succumb to the idea that their algorithm must be faster than that of the industry leader" (Fieldnotes #18). Hence, machine-instantaneous time reflects a set of design decisions where imperatives for speed and instantaneity become embedded in AI systems.

Another domain where these principles can be observed in relatively pure form is in the field of high frequency algorithmic trading (HFT) (Lewis, 2014). The

Bank of England estimates that in Europe HFT accounts for approximately 30-40% of all equity and futures trades (BoE, 2010). Although AI algorithms account for just one element of a broader sociomaterial assemblage of fibre-optic cables, towers, computer processing units, programmers, and so on, taken together, the speeds attainable by these aggregations may be the difference between millions in either profit or loss. In his extensive fieldwork of HFT networks, MacKenzie (2018, 2019) notes that algorithmic signals traveling at 2/3rds the speed of light can be perceived as "too slow" due to their comparative sluggishness. Thus, in markets where firms compete on ultra-fast timescales, decision-making algorithms are viewed as an essential part of achieving competitive advantage and are designed with instantaneity in mind. Unsurprisingly, this was also the case for those representatives from defence institutions where AI detection, launch and logistics systems are teleologically charged with speed as a key indicator of performance. As the outgoing First Sea Lord of the Royal Navy puts it:

> "AI is set to play a key role in the future of the service. As modern warfare becomes ever faster, and ever more data-driven, our greatest asset will be the ability to cut through the deluge of information to think and act swiftly and decisively." (MOD, 2017)

Speed advantage 4: Efficiency gains. In addition to securing competitive advantages through infinitesimal temporal leads, my respondents also highlighted the potential of AI systems to greatly increase productivity and efficiency—i.e. doing more in less time, being economical with time. As Hall and Pesenti (2017, p.2) put it in their report, 'Growing the AI Industry in the UK': 'AI offers massive gains in efficiency and performance to most or all industry sectors, from drug discovery to logistics.'

Specifically, two advantages were highlighted. First, respondents saw a key advantage in the potential for AI to cut costs by having fast machines perform more of what was previously conducted by workers. Given that in capitalist economies, labour time figures as an important production factor, accelerating or automating various goal-directed processes via AI systems is equivalent to making (relative) profit (Marx, 1973; Rosa, 2010). Thus, AI is viewed instrumentally as a tool to pursue efficiency, productivity, and profit through ongoing acceleration. This is seen as particularly important by economic and political actors within the British context where productivity has remained relatively stagnant in recent years. From 2010-2015, productivity grew at 0.2% a year, more than 90% below the average of 2.4% from 1970-2007 (McKinsey Global Institute, 2019). Furthermore, the push towards fast AI systems either as augmenting or automating devices resonates with the drive to cut costs in public service delivery in times of austerity. To take just one example, the Ministry of Defence has been under pressure to significantly reduce operational costs (Bloomfield and Vurdubakis, 2015). Hence, the deployment of AI is perceived as rational in so far as it enables the fast, efficient, and cost-effective prosecution of war.

Second, respondents viewed AI as a way to open up time, increasing the time budget of workers and customers/clients who are affected by AI systems. In this way, like other techno-scientific products before it, AI is often presented as a 'solution' to a time-starved world. As one machine learning engineer put it:

> "So the way I see it is a bit like how stuff happened after the Industrial Revolution, right? So when you look at, you know, things will be ploughed manually, and then…people suddenly had access to tractors and you didn't need, you know, 10-20 people or whatever…like you suddenly had much more free time. And that free time ended up being invested back into the economy…so I managed to do what I used to do for six hours, in one hour. I see it [AI] as freeing people up from having to do…mundane…repeatable automatable tasks.." (Interview #33, private sector)

Similarly, returning to the example of HFT, MacKenzie (2016, p.56) notes that: 'One consequence of the often-limited direct role of human beings in HFT is that they can experience less pervasive time pressure than in older forms of trading in which humans were more central.' Thus, if employed properly, AI systems may function to reduce time pressure and the need for speed felt by humans in other domains. In its most utopian form, Bastani (2020) in his book 'Fully Automated Luxury Communism,' has discussed the potential for AI (and other) technologies to be repurposed such that they liberate us from work and provide an opportunity to build a society beyond scarcity and beyond capitalism. Likewise, building on the autonomist Marxist tradition (e.g. Hardt and Negri, 2000), in Britain, a small movement on the political Left known as 'Accelerationism' argues that we should embrace the intensification of capitalist society's accelerating and de-territorialising properties, and repurpose the material infrastructure of capitalism itself, including AI, to universally emancipatory ends (Williams and Srnicek, 2014; for critique of accelerationism, see Bifo, 2011; Gardiner, 2017; Noys, 2014).

These visions of AI (and other) technologies being (re)purposed to increase leisure time or to open up time for greater democratic participation and meaningful work are part of a dominant sociotechnical imaginary that dates back more than a century (Thompson, 1967; Wajcman, 2015).[24] However, what tends to be absent from these imaginaries is an engagement with, or understanding of, the power relations which shape our relationship to time and speed. For example, in the case of the ML engineer working to automate transcription, while it is true that by using this service I might 'save time' which would otherwise have been spent transcribing interviews during my research, it is unlikely that I will reallocate this time to spend it with friends and family. Rather, because of powerful imperatives to publish (or perish) in British universities, it is more probable that I will begin preparing conference papers or articles for journal submission somewhat sooner. In this way, as much as AI systems may enhance productivity by granting their user the power to do more in less time, without changing broader socio-organisational relations of power, it is unclear to what extent AI presents a solution to speed imperatives and time scarcity.

Mobilising speed: the strategies and practices of machine-instantaneous time: In sum, these arguments form the basis for what I have called 'machine-instantaneous time.' They are based on a deep-rooted belief in the inadequacy and deficiency of human temporalities; the computer-mediated temporalities of AI systems are presented as the solution. Consequently, actors seek to mobilise speed through human-AI assemblages or the replacement of humans entirely from certain

[24] Perhaps most famously John Maynard Keynes predicted in 1930 that by the early 21st century labour- and time-saving technologies would result in a 15-hour workweek (see Suzman, 2020).

tasks. In the accounts of my respondents, I encountered three main strategies pertaining to machine-instantaneous time.

First, as I discussed, actors spoke of their efforts to *optimise for speed* in the technocratic sense of tuning and designing AI systems with speed and instantaneity in mind. Whilst these design decisions result in certain trade-offs, for example, between speed and accuracy, what was interesting was the extent to which speed often appeared to take precedence over other considerations as illustrated in the example of Google's search algorithm. Of course, this is far from a universal as in some contexts; for instance, in medical diagnoses, misclassification errors are potentially fatal and therefore the costs of reduced accuracy are more pronounced. In this way, the nature of the task partially affects the extent to which actors are likely to optimise for speed over other factors. However, logics of competition and efficiency appeared to create strong motives towards acceleration in the design of AI systems.

Second, at a basic level, pursuing machine-instantaneous time requires more and more processes to be handed over to algorithmic decision-making technologies. Hence, actors advocated for *increased pre-programmed algorithmic thought* where AI systems can make decisions, 24/7, in immediate response to a pre-determined set of objective circumstances. In one extreme case, a respondent from a large supranational technology company spoke of how in his past workplace AI engineers had suggested their entire betting platform be automated:

> "I used to work with [Bet24/7][25] and we personalised the homepage of Bet24/7...[T]he engineers had an idea that you basically just hooked everything up, made it a closed system where you had models running, training for revenue. And you could just remove all humans from the loop entirely and just have the models efficiently running your business - pointed at your accounting systems, pointed at your website and set it to optimise the website for that number. And that's your business...And it sticks with me because it got traction. People went: "Oh! Well, maybe we won't go all that way, but how much further can we go?" (Interview #13, AI lead)

A third, related strategy is to move toward a state of *minimal human supervision*. This aligns with the debate over whether to *augment* human capabilities or *automate* human tasks using AI (e.g. Brynjolfsson and McAfee, 2014; Davenport and Kirby, 2016). Augmentation involves humans collaborating with AI systems in order to perform a task whereas automation implies that AI systems take over human cognitive tasks. Although these two applications of AI are more interdependent than previously thought (Raisch and Krakowski, 2021), my respondents oriented toward machine-instantaneous time placed considerable emphasis on giving more autonomy to AI systems. Indeed, humans were largely seen as 'a mere disturbance in the system that can and should be designed out' (Cummings, 2014, p.62). This tendency (and the resulting challenge) was neatly expressed by the Leverhulme Centre for the Future of Intelligence in their response to the House of Lords' call for evidence:

> "Much of the attraction of AI systems is that they will automate many tasks. In some cases, they will perform tasks simply because we don't want to,

[25] A betting company; not its real name.

> perhaps because they are tedious (monthly accounts) or dangerous (bomb defusal). But in other cases, it will be because AI is bringing a distinct advantage, such as performing faster, cheaper or better. We won't realise these benefits if a human is monitoring the system every step of the way—we will want AI systems to just get on with it (whatever 'it' is). In other words, part of the attraction of AI is its increasing ability to perform tasks autonomously. It is this increasing autonomy that gives rise to many of the ethical and governance challenges posed by AI." (HoL, AIC0182)

4.3.3. Human-reflective time

In contrast to those players advocating for greater reliance on, and acceleration of, pre-programmed algorithmic thought, actors pertaining to human-reflective time were highly critical of the growing displacement and outpacing of human thought by intensive AI systems. Returning to the theme of speed pathologies specifically, I explore their accounts under the sub-theme of temporal desynchronisation/domination. However, in this case, temporal desynchronisation refers not to a disjuncture between the pace of AI R&D and deliberative-democratic processes, but rather, between AI programs and the thought systems of psychic individuals. Table 4.5. provides a summary of the main actors pertaining to human-reflective time, the main arguments against increasingly fast AI algorithmic thought, and the strategies and policies posed by these players.

Table 4.4. Human-reflective time: Main actors, speed pathologies, and strategies

Main actors	Theme	Description	Example(s)	Strategies
Civil society pressure groups	Speed pathologies	Perceived socio-political harms emerging from speed and speed logics	See below	Intentional slowing down Human supervision
	Sub-theme			
	1. Temporal desynchronisation/domination (human/ machine)	Crises resulting from disjunctures between differently paced systems and processes (in this case, between high-speed computation and human oversight, intervention and will formation)	"…the ability to compute at high speed and large-scale means that significant disasters can arise from automated reasoning errors or inadequate understanding of the fragility of complex interconnected systems before humans can intervene." (HoL, AIC0029, university) "These [autonomous weapons] systems complete their detection, evaluation and response process within a matter of seconds and thus render it extremely difficult for human operators to exercise meaningful supervisory control once they have been activated other than deciding when to switch them off." (HoL, AIC0248).	

Speed pathology 1) Temporal desynchronisation/domination (human/machine). In opposition to machine-instantaneous time, actors oriented toward human-reflective time perceived an additional threat of desynchronisation, this time between human response times and machine response times. For example, in his response to the House of Lords' call for evidence, Professor Noel Sharkey, chair of the International Committee for Robot Arms Control, highlighted the dangers of automising split-second responses via AI systems in the military context:

> "These [autonomous weapons] systems complete their detection, evaluation and response process within a matter of seconds and thus render it extremely difficult for human operators to exercise meaningful supervisory control once they have been activated other than deciding when to switch them off." (HoL, AIC0248).

These fears have long been a concern of Virilio (1986) who sees AI systems as depriving humans of their ability to intervene. Because AI systems are capable of executing stock trades or missile launches on nanosecond timescales, there is a 'miniaturisation of action' which severely reduces the possibilities for interrupting AI processes (Virilio, 1986, p.156). At one point, Virilio (2000) argues that: 'The twin phenomena of immediacy and of instantaneity are presently one of the most pressing problems confronting [us].' The risks of this particular form of temporal desynchronisation are significant, as evidenced by the 2010 'Flash Crash,' when the Dow Jones Industrial Average fell and regained almost 1000 points (just under 9%) within a matter of minutes (Smith, 2018). In order to deal with these issues, further technical systems (known as 'circuit breakers') are engineered in order to caretake other machines. However, as more and more systems are layered atop of one another, the dangers of their 'tight-coupling' are likely to amplify risks rather than reduce them (Perrow, 1984). Thus, contrary to those who contend that AI expands our mental and perceptual capabilities through acceleration, my respondents from civil society pressure groups saw the orientation toward machine-instantaneous time more as a diminution of these capabilities.

Another related concern which one respondent raised was with the capacity of AI systems to essentially overtake, or run ahead of people's desires, expectations, volitions, will, and so on. Discussing the potential of AI systems to be used to manipulate preferences and behaviours, he stated:

> "...then there is the more subtle sort of influencing—whether that is political or commercial—of humans who don't know that they're being influenced. Because what's happening is so under the hood and so quick...that it's not easily discernible to be a manipulative effort, right? ...bots overtake our own processes of understanding ourselves by creating profiles and showing us things that we have never explicitly expressed we wanted or needed" (Interview #28, chair, policymaker).

In this way, those things which for people form the horizon of their future (i.e. their protentions) are outstripped, overtaken, and increasingly replaced by automated versions that are produced by intensive AI and computational systems functioning between 1-4 million times quicker than the nervous systems of psychic individuals (Stiegler, 2019). Thus, AI systems can be used to exploit people by overtaking them via digital doubles and profiles; this itself constitutes a form of temporal domination as the exercise of social power through time.

Resisting speed: the strategies and practices of human-reflective time. Contrary to those actors who view speed and instantaneity as key design imperatives for the construction and deployment of AI systems, actors oriented toward human-reflective time were supportive of temporalities more in rhythm with the embodied finitude of contemplative human thought and consciousness. Resisting the temporal regime of machine-instantaneous time based on inconceivably brief instants that are beyond the biological platform of human life, they suggested a number of policies and practices.

First, actors embraced ideas of *intentionally slowing down* parts of ultrafast AI-enabled networks in order to (1) bring sub-second machine operating times increasingly in line with the approximately 1-second real-time response and intervention of any human (Saariluoma, 1995) and (2), to level out highly asymmetric advantages available to faster participations. Such practices of introducing intentional delays have already been implemented in the context of HFT. Known in emic terms as 'speed bumps,' the idea is to introduce delays in market exchanges such that system-level stability is enhanced (see Johnson, 2017; Stafford, 2019).[26] Additionally, in an effort to deal with the capacity for AI systems to outstrip individual protentions and discreetly influence behaviour, actors discussed an intentional slowdown of AI systems as being a policy of identification and transparency. As one respondent put it:

> "...so the slow down there to get to the point is...the bots need to identify themselves, okay? And so that then creates the mental time and space in the human's mind to say, "Well, wait a minute, there is a smart algorithm here that is observing me, and that is recommending certain things." And

[26] In the US, policymakers introduced delays of 350 microseconds (i.e. 0.35 milliseconds) in some futures markets by sending all orders down 38-miles of coiled fibre (Hu, 2018). In the UK, the London Metal Exchange is set to approve similar measures (Stafford, 2019).

> at least now, I sort of have seen that there are some automatic processes under the hood." (Interview #28, chair, policymaker).

Second, actors oriented toward human-reflective time were more likely to support *meaningful human supervision and participation* in decision-making as opposed to automation. Automated decision-making using AI, whilst extremely fast and potentially efficient, instils a logic of formal rationality (Lindebaum et al., 2020; Weber, 1978). However, humans have a unique capacity for open-ended value-rational reflection and substantive rationality, that is, the capacity to see, in normative terms, 'the world as it might be' (Suddaby, 2014, p.408), involving 'what is,' 'what can,' and 'what ought to be.' Thus, rather than arguing for more and more economic, military, and policy decisions to be turned over to some kind of choice algorithm that might 'save time' in the technocratic sense of consuming less minutes but can only 'choose' within the parameters of its programming, participants from civil society pressure groups advocated for greater human involvement. Increased human participation in decision-making was seen as necessary for maintaining the open-ended nature of thought and the experience of time as an open matrix of possibilities for reflection, deliberation, argument and rational choice between value alternatives (Noonan, 2019). As one respondent put it:

> "When we compare machines to humans there is a clear difference between the logic of a calculating machine and the wisdom of human judgment. Machines perform cost effective and speedy peripheral processing activities based on quantitative analysis, repetitive actions, and sorting data…They are good at automatic reasoning and can outperform humans in such activities. But they lack the deliberative and sentient aspects of human reasoning necessary in human scenarios where artificial intelligence may be used. They do not possess complex cognitive ability to appraise a given situation, exercise judgment, and refrain from taking action or limit harm. Unlike humans who can pull back at the last minute or choose a workable alternative, robots have no instinctive or intuitive ability to do the same." (HoL, AIC0112, reader, university)

4.4. CHAPTER SUMMARY

The current chapter revealed a variety of temporal standpoints in the British AI field. A combination of interview data, historical-archival material, micro-ethnographic observation, and secondary data was used to answer research question 1: *how do differently positioned actors in the British AI field experience time and speed?* I accounted for these differences across the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time (see figure 4.1. for a reminder). For obvious reasons, when engaging with such a complex field composed of many interrelated actors, in order to be explainable, some elements here have been simplified and abstracted to a degree, but I have tried to avoid sweeping generalisations, balancing the voice of my respondents and the institutions they represent with theories of time and speed in and around organisations.

What has come across, I hope, is that there is no single consolidated view of speed or its importance in the British AI field, but competing perspectives in line with the multiplicity of vested interests of various stakeholder groups. Indeed, when diverse actors are considered—e.g. economic, political, military, and civil society actors—speed appears to be a deeply ambiguous phenomenon, experienced as both a positive-enabling force and a negative-oppressive one. This reinforces my argument in chapter 2 of the need to overcome the tendency to evaluate speed in terms of economic value and to adopt a stakeholder view, broadening the performance criteria beyond mere economistic and managerialist concerns.

This chapter has also drawn on actors' accounts from civil society pressure groups, professional bodies, and universities in the British AI field to theorise a set of 'speed pathologies'—temporal desynchronisation/domination, temporally-induced skimping, and precarity. I have defined speed pathologies as socio-political harms emerging from speed and an emphasis on doing things quickly. Findings suggest that accelerated, fast AI R&D renders democratic and deliberative processes increasingly obsolete because they are inherently slow and cannot keep up. Likewise, speed exacts a toll on actors' capacity to deal with the multiple ethical and political realities taking place around them; there is less time and space for time-consuming critical reflection and safety precautions. To boot, speed and compulsive speed logics in AI R&D appear to result at least partially in an environment of fear and instability. Thus far, these pathologies of speed have typically been ignored, downplayed, or overlooked by mainstream MOS but there is no question that fast and intense temporalities in the interorganisational context of British AI pose significant social, political, and ethical problems. I will discuss the implications of these speed pathologies—the "so what"—for both MOS and British AI in more detail in chapters 6 (discussion) and 7 (conclusions).

Finally, this chapter also briefly explored actors' strategies to both mobilise and resist speed as it relates to AI R&D (techno-scientific time versus deliberative-democratic time) and AI systems (machine-instantaneous time versus human-reflective time). Actors oriented toward techno-scientific time strategised for speed by advocating for limited regulation, time-based competition, and instilling a sense of urgency. By contrast, actors oriented toward deliberative-democratic time pointed to a number of strategies for tempering the field's escalatory tendencies in the realm of speed, specifically, moratoria, formal regulation, trial testing, and an ethic of 'slow science.' Separately, actors oriented toward machine-instantaneous time highlighted efforts to optimise AI systems for speed, concede more control to pre-programmed algorithmic thought, and to minimise human supervision of AI systems. Conversely, actors oriented toward human-reflective time advocated for the intentional slowing down of AI systems and more meaningful human supervision.

However, these struggles among actors both over the meaning and value of speed and over the mobilisation and resistance of speed do not take place on an even playing field. On the contrary, some actors have a disproportionate say in shaping the temporal commons in the British AI field and defining the legitimate temporal orientations. Thus, to further explore the question of how speed is reproduced/resisted within the British AI field, the thesis now turns to explore the power relations which actors bring to these struggles. This is broadly in line with a

Bourdieusian field analysis which recognises it is not simply about revealing the major lines of difference and opposition with fields, but about the respective power resources actors bring to this fight.

CHAPTER 5.
THE (RE)PRODUCTION/RESISTANCE OF SPEED IN THE BRITISH AI FIELD

'As gravity bends light, so power bends time.'

(Clark, 2018, p.1)

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5.1. INTRODUCTION

In the previous chapter, I mapped out the position of key institutional actors in the British AI field across the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time. These four temporal dimensions emerged as key lines of differentiation and struggle between actors in their attempts to define the field's legitimate temporal orientations. In line with their competing interests and agendas, actors positioned themselves differently on issues of time and speed.

However, while these findings reveal the main frontiers of differentiation and confrontation, a Bourdieusian conception of the field requires us to consider not only the differences between actors in terms of their position-takings—here, their different relationships to time and speed—but the relative means (i.e. capital) actors have at their disposal to influence this struggle (Hilgers and Mangez, 2014). For Bourdieu, fields are composed of dominant and dominated actors; they are not level playing fields (Bourdieu, 1977). Domination is contingent on possessing the right quantities and combinations of economic, cultural, social, and symbolic capital (Wacquant, 1989). The more socially valued capital an actor possesses, the greater their power to produce and impose legitimate meaning. Because actor's position-taking is in part shaped by their relative power in the field, it is critical to account for and 'objectify' these structural relations (Bourdieu, 1990).

Accordingly, the purpose of this chapter is to extend the analysis found in chapter 4 by making explicit the power relations underlying actor's struggle over the British AI field's temporal commons. Specifically, the aim is to answer research question two: *What are the mechanisms and power relations through which speed is reproduced/resisted within the British AI field?*

To this end, the chapter proceeds as follows: First, I identify a series of historical shifts in the inclusion criteria of the British AI field. These shifts amount to changes in who is recognised as having authority there, and what forms of 'capital' can be used to produce effects. The three shifts identified pertain to distinct periods in the history of the British AI field:

(1) AI researchers' loss of field-specific symbolic capital following the Lighthill review (1973-1982),

(2) The commercialisation and militarisation of AI under the Alvey Programme (1983-1988), and

(3) Data-driven AI and the intensification of a globalised neoliberal regime of AI R&D via the AI Sector Deal (2009-ongoing).

I argue these three shifts opened up the British AI field to influence from actors whose interests are not principally the acquisition of scientific authority regarding intelligent behaviour but the use of AI for economic, military, and political ends (Agar, 2020). New actors gained in their capacity to speak "for" AI and these players brought with them an increasing orientation toward imperatives of speed and acceleration.

Second, I explore the relative means actors currently have at their disposal to shape the temporal commons in the British AI field. At present, the field is composed of a heterogenous group of interrelated actors including: AI researchers, large supranational technology firms, private sector organisations, VC firms, defence institutions, government policymakers, universities, consultancies, civil society pressure groups, and professional bodies. I examine the trajectories and changes in the structure and volume of the capitals of these various actors. While actors oriented toward deliberative-democratic time and human-reflective time have gained some influence in recent years, the power resources available to actors positioned toward techno-scientific time and machine-instantaneous time are significantly greater.

Third, I draw on Bourdieu's notion of 'habitus' to examine the reproduction of speed in the British AI arena. For Bourdieu (1977), habitus stands as a mediating concept between the poles of the field and capital. It is a set of social dispositions, a sort of 'generative principle' of beliefs, values, and practices, which actors acquire during their socialisation (Bourdieu, 1977, 1990). Over time I argue that the commercialisation and militarisation of AI research has helped to crystalise a particular set of dispositions and tendencies in the AI field where speed is perceived as largely positive, necessary, and incontestable. Moreover, I contend that these orientations are then actively embedded within many AI systems. Theorising AI systems as crystallised parts of habitus (Stern, 2003), I argue they embody a form of practical reason whereby a whole set of social relations, practices, and assumptions are embedded into them.

Finally, I explore possibilities for change. Fields are never fixed once and for all, and in the British AI field, the legitimacy of the fast temporalities of techno-scientific and machine-instantaneous time are contested. While some actors have more of a monopoly to define the forms of legitimacy prevailing in a field, change and agency can happen (Hilgers and Mangez, 2014). I outline some latent possibilities which may lead the British AI field to become increasingly oriented toward the slower temporalities of deliberative-democratic time and human-reflective time.

5.2. NEW PLAYERS, NEW CAPITAL: OPENING THE DOOR TO SPEED LOGICS

How did the British AI field, which started out as a small collective of heterogenous researchers working to understand the principles of intelligent behaviour and how these could be formalised computationally, become a social arena dominated by imperatives for speed and acceleration? The first step to answering this question requires a historical analysis of the forms of capital and logic which are specific to it.

Capital, as understood by Bourdieu, amounts to a social relation, a generalised resource denoting a 'power over the field' (Bourdieu, 1985, p.724). For Bourdieu, there are many different species of capital—economic (money and material assets), cultural (scarce symbolic goods, skills, and titles), social (relationships of mutual acquaintance and recognition), and so forth (Bourdieu, 1986). Although capital is often presented as resources, Jones et al. (2016) suggest it may also be understood as energy: capital is the medium through which dominant positions are attained and struggles organised within a field.

However, the efficacy of different types and volumes of capital depend on the extent to which they correspond to the dominant tendencies of the field (Jones et al., 2016). In other words, the volume of capital an actor is endowed with depends on the symbolic value attributed to the resources held. Capital which is recognised as legitimate is what Bourdieu (1998, p.85) calls 'symbolic capital.' Thus, in order to construct the field, researchers must learn the specific symbolic capital operating within it and in order to construct the symbolic capital, the investigator must deduce the specific logic of the field. Emirbayer and Johnson (2008) note there is a sort of hermeneutic circle involved here, a 'to and fro movement in the research process that is quite lengthy and arduous' (Bourdieu and Wacquant, 1992, p.108).

My analysis of the British AI field reveals a series of historical shifts when the specific capital and logics of the British AI field transformed. The shifts are: (1) AI researchers' loss of AI-specific symbolic capital following the Lighthill report (1973-1982); (2) The commercialisation and militarisation of AI during the Alvey Programme (1983-1988); and (3) Data-driven AI and the intensification of a globalised neoliberal regime of AI R&D via the AI Sector Deal (2009-). Taken together, these three shifts represent a growing contraction in the autonomy of the British AI field (Albert and Kleinman, 2011). They are indicative of the British AI field's heteronomy vis-à-vis the wider laws of capitalist economy and national security. These fields are encroaching upon the AI arena and with each invasion, imparting it with a growing orientation toward speed.

5.2.1. The British AI field in the 1960s: A field of restricted production

The genesis of a field is a process of differentiation and autonomisation (Bourdieu, 1996). Several features mark the emergence of a new field, notably: (1) the appearance of a specialised elite, (2) the constitution of a specific knowledge, (3) the creation of authorities providing recognition and consecration, and (4) the establishment of an inclusion criteria for entry into the field (Hilgers and Mangez, 2014). These features do not just appear but are the result of historical struggle. For new fields to form, actors must have won some degree of autonomy from other fields such that these actors—who constitute the initial 'elites' of the field—become more or less responsible for legitimate interpretation of practices and norms in their specific domain (Bourdieu, 1996). This process of autonomisation results in the emergence of a type of capital specific to the field; the more autonomous the field, the more potent its specific capital and the more agency the field's elites have to set the forms of legitimacy prevalent within the field.

The genesis of the British AI field is itself a story of struggle for autonomy. In the decades immediately following World War II, in the US and Britain, there was a flourishing of interest in areas of research including cybernetics, operations research, and information theory. Among these disciplines, discussions of the possibility of machine thought were not uncommon (e.g. Turing, 1950; Wiener, 1948). Cybernetics, for instance, sought to examine similarities between machines and biological processes (Wiener, 1948), and in the 1940s, comparisons were already being drawn between neurophysiological processes and networks of artificial neurons (McCulloch and Pitts, 1943). However, with the arrival of the digital computer in the early 1950s, a different approach was posed which endeavoured to build models of intelligent behaviour at the symbolic level (Shannon and McCarthy, 1956). New high-levelling programming languages were developed to allow scientists to represent concepts and operate upon them directly in the computer. By contrast, cybernetics represented intelligent behaviour at the level of the physiological mechanisms underlying thought.

After several failed attempts to distinguish this novel symbolic approach (the name 'automata studies' was initially posed), a US-based researcher, John McCarthy, decided he must 'nail the flag to the mast' (quoted in Fleck, 1987, p.114) and proposed the name '*artificial* intelligence.'[27] This was first presented at the now renowned workshop, the 1956 'Dartmouth Summer Research Project on Artificial Intelligence' (McCarthy et al., 1955). This eight-week workshop proved largely successful at isolating the symbolic computer-oriented modelling theme. The basic premise of the symbolic theme was that intelligent behaviour could be captured by systems that reason from a set of facts and rules describing a domain.[28]

It was not until the 1960s that the distinctly symbolic AI approach was developed in Britain. Then, 'the prime mover' was Donald Michie, a geneticist at Edinburgh University who had worked with Sir Alan Turing at Bletchley Park (Fleck,

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[27] A key purpose of the term *artificial* intelligence was to differentiate it from the *biological* emphasis of cybernetics.

[28] Within AI, the epistemological limits of this cognitivist approach, despite some early criticisms from phenomenologists (e.g. Dreyfus, 1965, 1972), did not become widely known until the late 1980s (see section 5.2.4. to follow).

1987, p.120). It was at Bletchley where Michie became fascinated with the possibility of building machine thought. However, after the war, there were few opportunities to pursue these interests. In 1962, acting as a hobbyist rather than a geneticist, Michie travelled to the US and became aware of developments in AI there. Impressed by the US's research and computing facilities, he returned to Britain and disillusioned by the lack of facilities in his own country, began lobbying for change. He succeeded in being commissioned to conduct a survey of British scientists' views on computer provision and the potential of AI, and this formed the basis of the Science Research Council's (SRC) proportionately generous funding into the area (Fleck, 1987). In addition to attracting funding, Michie engendered considerable interest among scientists at other academic institutions and by the late 1960s, Britain had proven itself an emerging centre for AI research, most notably, at the Universities of Edinburgh, Cambridge, Essex, and Sussex. Notable early figures included: Christopher Longuet-Higgins, Bernard Meltzer, N.S. Sutherland, Richard Gregory, and of course, Donald Michie.

While the process of differentiation from cybernetics and related fields remains a key aspect of the genesis of the AI field in Britain and the US, for the argument developed here what I want to emphasise is the significant victory the early founders secured in freeing themselves of constraints imposed upon them from external fields, e.g. the economic field, the military field. Indeed, the British AI field throughout the 1960s was distinguishable for one overriding characteristic: the small number of researchers pertaining to it were largely free to establish priorities and define legitimate activity among themselves (Crevier, 1993). In Bourdieusian terms, the field followed a logic of 'restricted production' (Bourdieu, 1996). AI researchers were, for the most part, able to self-determine their own criteria for the evaluation of AI systems and theories, including the conditions of their production. Although British AI R&D was principally financed by the state-backed Science Research Council (SRC), it was, as Fleck (1987) notes, 'difficult to find evidence for any positive direction of research by the funding agencies in the 1960s' (p.111). In AI researchers' received folklore, the 1950s and 60s are widely referred to as the 'golden age' (Interview #10) or 'golden years,' [29] in large part because there were very few strings attached to research and researchers had more agency to do their own thing.

This relative autonomy was important for two reasons. First, AI researchers' high degree of autonomy meant there was no coordinated attempt to synchronise British AI research with rival research groups from other nations or institutions. AI researchers were largely free to set their own tempos and velocities and were subjected to little surveillance or external evaluation. They could follow ideas, arguments and 'futile' questions where they lead with relative patience and impunity (Stengers, 2018).

Second, during this period, the British AI field had a strong *scientific* orientation toward understanding the underlying basis of intelligent behaviour. The dominant view at the time was that scientific inquiry was intrinsically valuable, regardless of any immediate application. This is not to say British AI researchers in the 1960s entirely eschewed industry- or military-oriented research. Mirowski (2003) points out that, from the offset, AI was rather closely connected with operations research (OR), which emerged in Britain during World War II and sought to apply

[29] See for instance: Crevier, 1993, p.51; Roland and Shiman, 2002, p.61

scientific principles and statistics to optimise military, and later, business operations (see also Kobbacy et al., 2007). Thus, right from its genesis, the British AI field had a certain *engineering* orientation where researchers were interested not just in understanding intelligent behaviour, but on building systems that could solve tasks efficiently and 'intelligently.' However, this engineering logic initially proved secondary to the scientific one.

5.2.2. First shift: The 1973 Lighthill Report—A reduction in field-specific symbolic capital

The logic and capital specific to the British AI field experienced a shift in the 1970s with the publication of the Lighthill Report (SRC, 1973). After nearly a decade of high autonomy, the SRC commissioned an inquiry into the field which fundamentally altered its structure. Two main factors formed the basis for the survey: First, there was a general reduction in public spending in the early to mid-1970s which prompted British research councils to engage in an unusually large number of evaluations (Institute for Fiscal Studies, 2009). Second, there were several bitter disputes between the field's initial elites regarding the nature and aims of AI research, so much so, that the SRC resolved to intervene (Howe, 2007). Third, a number of early prognostications made by AI researchers had proved overly optimistic, such as Simon and Newell (1958)'s claim that 'within ten years a digital computer will be the world's chess champion' (p.7). Consequently, the SRC grew doubtful.

To conduct the review, an outsider—Sir James Lighthill—was recruited. Lighthill, charged with making 'a considered appreciation of the subject of artificial intelligence, its achievements, its practitioners, its promise and its needs' (cited in, Agar, 2020, p.294) was largely critical of AI in his report, suggesting that any scientific accomplishments in the field had stemmed from modelling efforts in more traditional disciplines such as biology and mathematics, not from AI per se (SRC, 1973). The report thus resulted in both a loss of confidence in AI by the British academic establishment and considerable funding cuts from the SRC (Crevier, 1993; Fleck, 1987).

However, two things must be understood here about Lighthill's report. First, while the report is often cited as calling for a *halt* of British AI research (e.g. Russell and Norvig, 2009), it is more accurate to view it as providing a particular *steer* (Agar, 2020). Indeed, Lighthill praised certain aspects of AI, especially those areas of research directly linked to industry and 'solving industrial needs' (SRC, 1973, p.3-5). Thus, Lighthill was not so much against AI as he was affirmative of a particular *engineering* orientation which had played an important (yet supplementary) role in the early genesis of the field. The report opposed the dominant view of AI establishment members that AI should be seen as a 'useful *scientific* enterprise in its own right' (Sutherland in SRC, 1973, p.22, my emphasis). Lighthill's report thus served to invite in species of capital from industry—i.e. economic and military capital—which began to alter power relations in the field.

Second, the report set an important precedent in the British AI field, being that British AI R&D, its prospects, practices, and direction, could be judged authoritatively by an outsider. Although Lighthill had significant symbolic capital on account of his position as a Lucasian Professor of Mathematics at Cambridge

University,[30] he was not an AI expert or insider. Thus, while 'outsiders' gained in their capacity to speak "for" AI, many AI researchers lost their power of legitimate worldmaking (Bourdieu, 1985). Symbolic of the reputational damage imposed, in the decades following Lighthill's report many researchers stopped using the term 'AI' to describe their work (Grudin, 2009; Russell and Norvig, 2009). As one of my respondents noted:

> "Even by the 90s, it felt like it wasn't proper science using the word artificial intelligence such was the power of the Lighthill report." (Interview #23, senior AI research fellow)

To summarise this first shift, while the British AI field started off as a relatively autonomous scientific domain, the 1973 Lighthill report undermined the field's autonomy. The report began to lay sediment to a particular view which perceived AI as being tied to industrial needs. Moreover, it shifted the inclusion criteria of the field; Lighthill was not an AI expert or insider, yet his judgment was deemed authoritative, thus damaging the symbolic capital of AI researchers themselves. In the aftermath of the Lighthill report, British AI experienced a period of retrenchment which lasted for approximately a decade (Crevier, 1993).[31]

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[30] A position formally held by Sir Isaac Newton and later by Stephen Hawking.

[31] In the history of AI, this period of retrenchment is known as the 'first AI winter.' From roughly 1973-1982, AI was subject to financial setbacks (Crevier, 1993).

5.2.3. Second shift: The Alvey Programme (1983-1988) and the commercialisation/militarisation of symbolic AI

In 1983, a second field-configuring development occurred with the launch of the Alvey Programme (1983-1988). Alvey was a major £350m[32] industry-military-state backed programme for 'advanced information technologies' which ran for five years (Oakley and Owens, 1989). The first of its kind in Britain, it brought together the Science and Engineering Research Council (SERC),[33] the Ministry of Defence (MOD), and the Department for Trade and Industry (DTI) forming a new, neoliberal privatised regime of AI R&D (Garvey, 2019). This stood in stark contrast with the previously largely British state-funded regime of AI R&D in the 1960s and 70s.

The justification for Alvey rested on the supposed need to respond to a "rival" public-private partnership in Japan (DTI, 1982; Oakley and Owens, 1989). Following World War II, Japan had undergone a period of sustained economic growth (Johnson, 1982). Encouraged by their successes in consumer electronics and the automotive industry, Japan's Ministry of International Trade and Industry (MITI) launched the Fifth Generation Computer Systems Project (FGCS). With a budget of approximately £365m (100 billion yen) over 10-years, the FGCS aimed to develop world leading intelligent machine systems based on high-level symbolic programming (Garvey, 2019).

Sensing an opportunity to mobilise support for AI R&D which had struggled post-Lighthill, several prominent members of the British AI establishment (and other

[32] Approximately £940m at present value (2021)
[33] Previously, the SRC; it was renamed in 1981.

IT professionals) argued that the Japanese effort posed a significant threat to British economic competitiveness and military security (Oakley and Owens, 1989). For example, Alex d'Agapeyeff, the president of the British Computer Society, claimed at a London meeting in December 1981 that the Japanese were declaring 'economic war' (cited in Fleck, 1987, p.150). One of my few respondents who had first-hand experience working in British AI during the 1980s noted:

> "[AI researchers] became involved because they wanted to promote more funding for AI. So, they...talked to government and persuaded them that it is important that they put money into this, that the health of the economy depends on it, and so on." (Interview #26, Professor of AI, university)

However, while this fear and nationalistic pride-based strategy was effective at securing funding and instilling a shared sense of urgency, it came at the further expense of the British AI field's autonomy. A key condition of Alvey' funds was that AI R&D must be 'transferred' (the term fashionable at the time) from the lab into commercially and militarily useful products (DTI, 1982). The area of AI which received the bulk of funding was 'Intelligent Knowledge Based Systems' (IKBS) (Fleck, 1987). These systems diverged considerably from the early founders' interests in investigating the basic mechanisms giving rise to intelligent behaviour. Also known as 'expert systems,' IKBSs are top-down, bureaucratic, rule-based programs that make simple inferences from a knowledge base of domain-specific 'facts.' The promise of IKBSs were that they could both assist and replace the work of technical specialists in organisations (Forsythe, 2002). In this way, Alvey served to institutionalise Lighthill's particular vision of AI as a field addressing 'industrial needs,' stripping the British AI field further of field-specific symbolic capital.

These developments also took place during a period of major restructuring of British universities which saw the autonomy of academics diminish. These changes have been variously referred to as the 'marketisation' (Shore and Selwyn 1998), 'commodification' (Willmott, 1995), and 'neoliberalisation' (Lave et al., 2010) of the university. The main characteristics of the changes were the increased role of external evaluation, the transfer of academic research to commercial bidders, and the acceleration of the academic lifeworld (Stengers, 2018). Describing some of these changes, another respondent noted:

> "It's the way the Western university system has gone since the 1980s…It's all having to apply for grants, and justify everything you do, and explain how it's going to be beneficial. But the curiosity-led research seems to be a lot harder to do these days than it used to be…no one has time just to develop ideas and test out things on a whim." (Interview #23, senior AI research fellow, university)

In sum, the Alvey programme, together with the broader marketisation of university research through the 1980s further eroded the relative autonomy of the AI field vis-à-vis the economic and military fields. While Alvey reinvigorated British AI R&D, it did so in a new, neoliberal space, consolidating the position of values most guaranteed in commercial and military terms.

5.2.4. Third shift: Sub-symbolic AI and the 2018 AI Sector Deal—The intensification of a globalised neoliberal regime of AI R&D (2009-)

The end of Alvey in 1988 marked the beginning of another turning point for the British AI field. Judged by market and military actors, Alvey was a failure (Oakley and Owen, 1989). IKBSs had a number of shortcomings. Given their rule-based programming, a small development in knowledge or a change in practice rendered IKBSs obsolete or too narrow to be useful (Collins, 2018). Furthermore, knowledge proved time-consuming to 'extract' limiting the efficiencies of expert systems (Forsythe, 2002). Consequently, the DTI, MOD, and SERC cut their funding and British AI fell into another period of retrenchment (Crevier, 1993).[34]

It was at this point that the AI field began to experience a 'paradigm shift' in Kuhn's (1962) sense of the concept. In section 5.2.1., I explained how AI initially formed by differentiating itself from cybernetics. While cybernetics modelled intelligent behaviour at the level of the physiological mechanisms underlying thought (i.e. the sub-symbolic level), the AI field initially built models at the symbolic level. However, by the late 1980s, the limits of the symbolic approach were widely apparent and belief in the idea that intelligent behaviour could be captured by a simple set of logical rules or axioms waned (Russell and Norvig, 2009).[35] Consequently, attention slowly turned toward sub-symbolic approaches which had developed at the fringes of the AI field throughout the 1950s-1980s (Guice, 1998; Olazaran, 1996)

[34] In AI folklore, this period of retrenchment is known as the 'second AI winter.'
[35] There is now a tendency in the field to refer, often derogatorily, to the symbolic processing approach as 'Good Old Fashioned Artificial Intellligence' (GOFAI), a term coined by John Haugeland (1985).

The key difference between symbolic and sub-symbolic approaches is that whereas the former focuses on the explicit '*top-down*' embedding of human rules, logic, and knowledge into computer programs, the latter focuses on building models that learn, '*bottom-up*,' ways to generalise from examples (i.e. data) and search for hidden statistical patterns in their input (Collins, 2018). While basic sub-symbolic techniques were developed as early as the 1950s (e.g. Rosenblatt, 1958) and refined in the 1980s (e.g. Rumelhart et al., 1986), it was not until the late 2000s that they became ascendant (Halevy et al., 2009).

Three main factors contributed to this shift: (1) developments in computer hardware radically reduced the training times for data-driven learning algorithms.[36] (2) The amount of data on which to train models increased exponentially;[37] consequently, they became highly effective at accomplishing various tasks, from automated language translation to image recognition, which had previously seemed unattainable using symbolic-based methods.[38] Summarising these two changes, my respondents noted:

> "The step change was really the massive, I mean, the exponential growth in the data that's available—and the compute power." (Interview #12, professor of AI, public-private partnership)

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[36] For example, in 2009, researchers discovered the chips used in PCs and video game consoles—Graphical Processing Units (GPUs)—could accelerate the training time of deep neural networks by almost one hundred-fold (Hao, 2018).

[37] Since 2000, the amount of semi-structured and unstructured data such as audio, video, text and images has doubled every 2 years. In 2006, there was around 0.16 Zetabytes of data (Guo et al., 2014). In 2020, that figure reached 44 Zetabytes. In more practical terms, a zettabyte is equivalent to about 250 billion DVDs (Arthur, 2011).

[38] This is not to say the new approaches were not without serious epistemological flaws. Rather, new sub-symbolic techniques such as neural networks and genetic algorithms largely ignore or downplay the social character of knowledge (Katz, 2017). They are essentially strategies for finding the most effective simple explanations within a hugely varied and hidden set of possibilities.

Another senior data scientist from a private firm noted:

> "...most people realise that there wouldn't be much in the way of AI if it weren't for data and the capability to manage, store and compute all of this data. So yeah, data really is queen, or king, or whatever." (Interview #18)

(3) A third, often underrepresented factor driving this change was the major role played by large supranational technology firms, notably, Google, Facebook, Amazon, and Apple, who began to view the statistical analysis of vast quantities of data as central, if not crucial, to their business models (Katz, 2017).[39] This novel logic has, with subtle differences, been variously diagnosed under the notions of 'surveillance capitalism' (Zuboff, 2015; 2019), 'computational capitalism' (Stiegler, 2019), and 'algorithmic governmentality' (Berns and Rouvroy, 2013); the central tenant being the commodification of personal data for the purposes of profit-making and/or behavioural modification. For these firms, most of whom were not even trading at the time of Alvey, sub-symbolic AI is instrumental to executing these goals, hence their strong desire to increase their relative strength over the field.

These three changes radically reconfigured power relations within the British AI field. Two resources which had previously mattered little in the AI field, data and compute power (or what Bourdieu might call 'informational capital'), became key weapons and stakes in the struggle to gain ascendancy within the field. Furthermore, large supranational technology firms, who held a disproportionate share of these resources (see section 5.3. below) became 'taken in and by the game' of AI, recognising

[39] See, for instance, Google CEO Sundar Pichai's keynote speech at I/O where he announced the company was shifting from a 'mobile-first' strategy to an 'AI-first' one. Available at: https://blog.google/technology/ai/making-ai-work-for-everyone/

its economic potential (Bourdieu and Wacquant, 1992, p.116). Other socioeconomic actors, from defence institutions to political strategists, also began to see the potential of data-driven AI to be put toward various economic, military, and political ends (HoL, 2018).

By the mid-2010s, British AI was revived, albeit with a different set of paradigmatic assumptions and new supranational corporate interests. However, one final aspect to this shift is that AI did not only undergo a renaissance within Britain but in a period of just five years (2015-2020), 36 nations launched national AI strategic initiatives (Future of Life Institute, 2020). In response to this competition, in 2018, the British government announced a £950m 'AI Sector Deal,' only the second major public-private investment partnership in the British AI field's history. Like Alvey, justification for the deal rested on the "need" to maintain a techno-scientific edge over rival public-private partnerships and to 'keep Britain at the forefront of the artificial intelligence and data revolution' (HM Government, 2017, p.10). However, in contrast to the 1980s, where international competition in AI was largely restricted to Japan, Britain and the US, under the new data-driven paradigm, competition became much more multipolar and multisector. Furthermore, while under Alvey the state remained one of the biggest funders of AI R&D, by 2018, private capital dwarfed state investment by a scale of at least 10-1 (MGI, 2019). In this way, 2018 marked the intensification of a globalised neoliberal regime of AI R&D, one with data-driven AI, large supranational technology companies, and private enterprise culture increasingly at its core.

5.2.5. Section summary

Above, I traced the history of the British AI field through a series of field-configuring developments. From the 1973 Lighthill report through the 1980's Alvey Programme to the 2018 AI Sector Deal, the 'rules of the game' and the players active in the British AI field have transformed. Although the British AI field was never a field of pure 'restricted production' (Bourdieu, 1996), in the 1960s and early 70s, the field enjoyed a high degree of autonomy from external forces. However, beginning with the Lighthill report and intensifying through later public-private partnerships, AI researchers lost considerable consecration powers, and industrial, state, and military actors greatly increased their power to shape research priorities and define 'legitimate activity' in the British AI field. Furthermore, the AI field transformed from a paradigmatic focus on logic, knowledge, and reasoning (symbolic AI) to data, learning, and statistics (sub-symbolic AI). Under this new paradigm, actors with access to large data banks and extensive compute power gained, within a short period of time, considerable influence within the field.

So, what then are the species of capital which win recognition in the British AI field today and give actors more power to set legitimate orientations, whether temporal or otherwise? The distribution of recognition is such that actors possessing significant financial resources (economic capital), data and computing infrastructure (informational capital), industrial-state-university relations (social capital), technical expertise of data-driven AI, and commercial, entrepreneurial, military and engineering savvy (cultural capital) are accorded a great deal of positive recognition. By contrast, those actors principally focused on symbolic AI or who pursue knowledge regarding intelligent behaviour for its own sake (i.e. curiosity-based research) are accorded increasingly negative symbolic capital.

Table 5.1. Logic and dominant capital of the British AI field over time

	1960s: The emergence of British AI	First shift 1973-1982: The post-Lighthill period	Second shift 1983-1988: The Alvey programme	Third shift 2009- Data-driven AI
Orientation of field	**Field of restricted production** Definition of capital and distribution of positions is based on rules internal to the field	**Declining autonomy vis-à-vis economic and military fields**		**Field of large-scale production** Definition of capital and distribution of positions is based on rules external to the field
Funding regime	**State supported**	State supported	Neoliberal, privatised	**Neoliberal, privatised, globalised**
Dominant actor(s)	Individual elite AI researchers; state	State	Industry; military; state	Large supranational technology firms; industry; state; military
Dominant capital(s)	**Scientific** Scientific orientation (knowledge for knowledge' sake); basic AI	**Increasing commercialisation, militarisation and neoliberalisation**		**Economic, informational, military** Commercial, entrepreneurial, military and instrumental orientation; applied AI
Main Product(s)	Study and formalisation of intelligent behaviour (some work on 'toy problems')	Transitioning toward 'applied AI'	IKBS for commercial and military use	Algorithms for detecting patterns, intelligent agents, and robotic process automation technologies
Dominant paradigm	**Symbolic (logic-driven) AI**	Symbolic AI	Symbolic AI	**Sub-symbolic (data-driven) AI**
Proclivity toward speed	**Limited**	**Growing emphasis on speed (dromologics)**		**High**

5.3. THE RISE OF TECHNO-SCIENTIFIC TIME AND MACHINE-INSTANTANOUS TIME

Now that I have established the specific symbolic capital operating within the British AI field, it is worth exploring actors' current and historical possession of these resources, since they affect their ability to monopolise control of the definition of the forms of legitimacy prevailing in the field. I begin by discussing those actors associated with techno-scientific time and machine-instantaneous time, i.e. large supranational technology firms, the British government, defence institutions, consultancies, VC firms, and private sector organisations. As a reminder, actors oriented towards techno-scientific time contend that the British AI field is in a competitive race where accelerated innovation and limited (self-)regulation are the appropriate organising principles. Actors oriented toward machine-instantaneous time hold that AI systems ought to be engineered to transcend human temporalities, enhancing productivity and efficiency by predicting, classifying, and executing decisions, 24/7, and at tempos far beyond the limits of the body-mind.

In chapter 4, I noted the strongest proponents of techno-scientific time and machine-instantaneous time were *large supranational technology companies*, e.g. Google, Facebook, Amazon, and Apple. [40] These firms have also rapidly accumulated and monopolised the most important forms of capital in the British AI field, principally, economic capital, informational capital, university-industry-state

[40] Of the four firms listed, only one (Apple), was trading at the time of Alvey in the 1980s. This showcases the rapid reconfiguration of the AI field at the hands of large supranational technology firms.

relations (i.e. social capital), and technical expertise of sub-symbolic AI (i.e. cultural capital). Arguably the most important forms among these in gaining power over the field is 'economic capital,' since money and liquid assets can be converted into other types of capital (Bourdieu, 1986; MacLean et al., 2014). Money can be used to: acquire and label data, buy or license computing infrastructure, recruit leading AI experts, and sponsor prestigious conferences and initiatives. In terms of economic capital, the combined annual revenue of the four largest technology companies—Facebook, Alphabet (Google), Apple, and Amazon—was $773bn (£564bn) in 2019, nearly four times the GDP of Scotland.[41]

In the British AI field, large supranational technology firms have exchanged this considerable economic capital to enhance their recognition in the field. For example, in 2014, Google bought DeepMind for approximately £400m, a leading British AI company now famous for building the first AI system to defeat professional players in the strategy board game 'Go.'[42] In 2020, Google's DeepMind subsidiary employed well in excess of 400 AI researchers,[43] making it much larger than any British academic AI research department. By comparison, University College London (UCL), which has one of the largest AI departments in Britain, has approximately 115 academics.[44] Furthermore, DeepMind is only one of Google's AI divisions, with 'Google AI' and 'Google Brain' being other major research arms. In 2020, at

[41] Author's own count, drawing on company annual reports.
[42] New Scientist ranks this 4th among the 'top 10 scientific discoveries' of the 2010s. Available at: https://www.newscientist.com/article/mg24432613-200-new-scientist-ranks-the-top-10-discoveries-of-the-decade/
[43] Author's own count, September 2020 using Linked-In and removing administrative and support staff.
[44] Author's own count, September 2020: https://www.ucl.ac.uk/ai-centre/research

prestigious AI conferences such as ICML and NEURIPS, Google's collective AI research team published nearly five-times as many papers as the University of Oxford, the largest single British university contributor (Ivanov, 2020).

Part of the lure of large supranational technology firms such as Google is their comparatively high salaries and data and computing infrastructure (i.e. informational capital) (Gibney, 2016). My respondents from organisations across the British AI field frequently mentioned the "incredible," "disgusting", and "extremely high" salaries offered by these firms. Many graduates are able to attract starting salaries of around £80,000-£100,000, while elite university AI professors are offered up to ten-times their academic salaries to work at these firms (Murgia, 2019). Discussing these issues in her response to the Special Committee on AI, Professor Maja Pantic, who works part time as a Senior AI lead at Facebook and part time at Imperial College London noted:

> "Salaries…and research funding schemes provided by the government to academia, are [sic] incomparable less attractive than those offered by the AI industries, especially the AI giants like Google, Facebook, Apple, and Amazon. Consequently, schooled AI researchers—graduated MSc students, PhD students, and Professors—leave academia in great numbers to work for one of those AI giants. This brain drain from academia results in two major drawbacks: (1) academia is left with no new generation of AI researchers who could continue AI research in public domain…and (2) the four AI industrial giants listed above amassed intellectual and innovation capital, with the fair prospect of owning 90% of all innovation in the years to come." (HoL, AIC0215)

The other attraction is access to what I termed 'informational capital.' For example, the AI system 'AlphaGo Zero' created by Google DeepMind which attained superhuman proficiency in Go, a previously elusive goal for AI researchers, played a total of 4.9m simulated matches against itself over 3-days (Silver et al., 2017). Analysis of the approximate cost to hire the computational infrastructure required to train this system reveals it would amount to $35m (Huang, 2020). Such an enormous amount of money or computational power essentially excludes AI researchers located outside of large supranational technology firms from conducting majorly influential research. In one interview, a senior data scientist at a medium-sized research institution noted:

> "You see a Google DeepMind paper and it has about 20 authors on it...they do crazy things like they run, I can't remember the numbers exactly, but it's a crazy number of really expensive GPUs or TPUs for a crazy number of days, and there was someone who estimated the costs recently, but it was a cost, just for this tiny improvement on this game scenario, and it's a cost that's completely out of reach of any SME...definitely in the millions...And it makes a lot of people who want to work on state-of-the-art AI want to work there. (Interview #1)

A final set of examples to illustrate the extent to which large supranational technology firms have colonised symbolic capital in the British AI field is their use of economic capital to engage in political corporate social responsibility around AI. Indeed, in response to their role in depleting universities of academics who are comparatively, though by no means completely, autonomous to pursue AI R&D in the public interest, firms such as Google have turned toward philanthropic donations. There are now at

Universities of Oxford, Cambridge, and UCL, 'DeepMind Professorships of AI and Machine Learning.' At Cambridge, it took a £4m donation to attract Professor Neil Lawrence, then Director of Machine Learning at Amazon, to this role (Williams, 2019). In addition, Google, Facebook, Amazon, and several other major technology firms have formed consortiums such as the 'Partnership on AI to Benefit People and Society' (PAI) which claim to bring diverse actors together to deliberate issues of AI governance and 'educate the public.'[45] Paid for by its for-profit partners, the PAI is essentially a well-funded platform for establishing legitimate (and ostensibly 'ethical') practices in the field, most often through the production of value statements and guidelines for best practice (Greene et al., 2019). However, by its very nature, the PAI is simultaneously a platform for de-democratising AI governance, shifting the issues away from state governance and public institutions into the private sphere. By spending considerable amounts on researching and promoting AI governance and 'ethical AI,' large supranational technology firms work hard to manufacture a shared sense that they take these matters seriously and can be left to self-regulate, even if this is not necessarily the case. Collectively, the various factors discussed above give large supranational technology firms significant power and prestige within the British AI field.

In addition to large supranational technology companies, the *British government* remains a major player in the British AI field largely on account of its extended networks of influence (social capital), material resources (economic

[45] https://www.partnershiponai.org/faq/

capital), and powers of juridical intervention (Bourdieu, 1998). However, the neoliberal reforms first put in place in the 1980s and coinciding with Alvey were deliberately designed to reallocate decision-making power from the government to markets (Harvey, 2005). Under the current Conservative government, these efforts remain largely intact. For example, the 2018 'AI Sector Deal' frames the government's role as being one of 'securing the UK's position as the best place to start and grow an AI business' (HM Government, 2019a). Similarly, the Office of AI, set up in 2018 to oversee the Deal's implementation is steered by a 21-member 'AI council.' An analysis of this council's composition reveals more than half its members are from industry (HM Government, 2019b); its chief advisor is Demis Hassabis, the CEO and co-founder of DeepMind. In this way, it is hard to see the government's role as being much other than to leverage state resources and authority in service of the market rather than for genuinely publicly beneficial outcomes. As I demonstrated in chapter 4, the shared narrative among leading British AI policymakers I interviewed was their broad-based support for an "industry-led standard on AI" (Interview #29). Thus, whilst in theory the British government has significant powers to shape the distribution of symbolic power and resources between different actors in the AI field, in practice they appear to be legitimising the commercialisation of AI and de-democratising AI governance, handing corporations considerable powers to determine legitimate practice in the field.

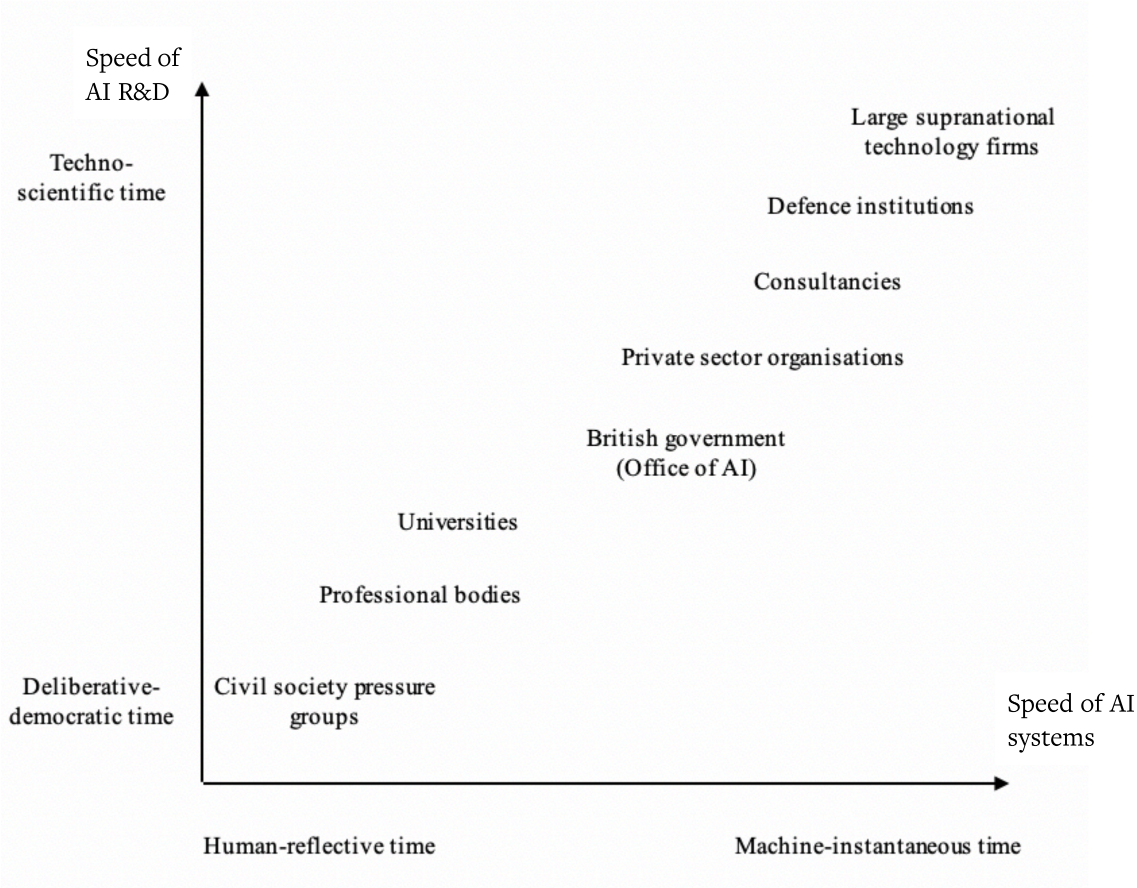
Defence institutions, most notably the Ministry of Defence (MOD), also remain influential in the British AI field; the MOD has an annual budget of £55bn in 2020-21

(HM Treasury, 2020). In late November 2020, the British Prime Minister Boris Johnson announced a large boost in defence spending, some £16.5bn over four years, with a particular focus on building a 'digital backbone' for a 'modernising' Ministry (Brown and Rahim, 2020). A new 'UK defence centre on artificial intelligence' has been declared, though its official name not yet given (Warrell, 2021). It is notable, however, that in the government's 'Industrial Strategy' and the 'AI Sector Deal' there is no mention of the MOD or military, despite both alluding to be a 'national AI strategy' (HM Government, 2017, 2018). This is odd given the centrality of the MOD in the Alvey programme, the last major public-private British AI R&D regime. However, one explanation for this is that many industrial actors have grown uneasy about the use of AI for military ends. Returning to the figure of Demis Hassabis, he has repeatedly made clear his ideological opposition to the militarisation of AI, while hundreds more British AI researchers have signed open letters opposing AI-enabled warfare (e.g. Future of Life Institute, 2015). This marks something of a change from the Cold War years of the 1980s when the DTI and MOD enjoyed a close relationship. However, despite the reservations of some commercial actors, there can be little doubt the current Conservative government considers AI as a technology that will, as Boris Johnson puts it, 'revolutionise warfare' such that the UK 'will not be able to defend against AI-enabled threats without ubiquitous AI capabilities and new warfighting paradigms' (Warrell, 2021, n.p.). In this way, defence institutions such as the MOD remain major players in the British AI field on account of their volumes of economic capital and considerable investment in the game; as I highlighted in chapter 4, they see it necessary to partake.

Other players, such as consultancies, VC firms, and private sector organisations have also acquired significant stakes in the British AI field. *Consultancies* including KPMG, Deloitte, Price Waterhouse Coopers (PWC), and McKinsey and Company have established both roles and entire departments dedicated to AI consulting (e.g. The Forrester Wave, 2019). *VC firms* have increased their stake in the British AI field; in 2018, VCs invested approximately £1bn in British AI start-ups, a sixfold increase on 2014 figures (Tech Nation, 2019). Finally, close to 50 *private sector organisations* from Rolls-Royce to Cisco were part of the £950m AI Sector Deal, pledging financial support for the deal, and in return gaining access to AI experts and various industrial-state-university relations.

Taken together, these actors, who by varying degrees are oriented toward the temporal parameters of techno-scientific and machine-instantaneous time, have a significant symbolic monopoly in the field. Using their considerable resources, they are able to set parameters that favour economistic and militaristic tendencies within the field.

Figure 5.1. Revisiting the position-taking characteristics of key institutional actors in the British AI field along temporal dimensions



By contrast, those actors increasingly oriented toward deliberative-democratic time and human-reflective time—i.e. civil society pressure groups, professional bodies, and to a lesser extent, universities—have far fewer resources. To recall, actors oriented toward deliberative-democratic time contend that the frames and broad directions of British AI should be set by inherently slow deliberative and democratic processes. Actors oriented toward human-reflective time are generally sceptical of the greater speeds of computer-mediated algorithmic thought which miniaturise the time-lag between action and event, and risk undermining meaningful human control and reflection.

In chapter 4, I noted the strongest advocates of deliberative-democratic time and human-reflective time in the British AI field are *civil society pressure groups*. As such, they represent the opposite end of the temporal spectrum from large supranational technology firms. Contrastingly, the power resources available to civil society pressure groups are diminutive. For example, the Ada Lovelace Institute has an estimated budget of £5m committed over five years.[46] Big Brother Watch had an annual turnover of just £110,000 in 2018 and £174,000 in 2019.[47] Thus, in terms of economic capital these groups own the smallest amounts—in some cases, less than a single AI researcher's salary at a large supranational technology company. In order to enhance their symbolic capital, some groups have recruited or partnered with influential individual actors in the field. For example, in 2020, the Ada Lovelace Institute recruited Dame Wendy Hall as its new Chair. This makes strategic sense on account of Hall's considerable networks of influence; a one-time President of the British Computer Society and a Dame Commander of the Order of the British Empire (DBE), it was Hall who co-authored the report—'Growing the Artificial Intelligence Industry in the UK'—which became the basis for the 2018 AI Sector Deal (Hall and Pesenti, 2017). However, Hall's broadly pro-industry stance is again suggestive of the compromises being met in order to enhance civil society pressure groups standing in the field. The same is also true for *professional bodies* such as the Society for the Study of Artificial Intelligence and Simulation of Behaviour (AISB) who, in order to fund

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[46] https://www.nuffieldfoundation.org/news/the-nuffield-foundation-announces-new-5-million-ada-lovelace-institute

[47] https://bigbrotherwatch.org.uk/content/accounts/2018-account-bbw.pdf

themselves, must rely partially on donations from corporate sponsors. As such, while there is some room to speak critically of commercial practices in the field, clearly the power dynamics and relative lack of funding and influence amount to a thinly veiled veneer of dissent.

As far as economic capital matters, *universities* are perhaps better placed to compete for key positions within the field—at least those universities with extensive endowments and modern computing facilities. For example, in 2019, UCL launched a £77m AI research centre, making it one of the largest in Europe.[48] However, the marketisation and neoliberalisation of the British university has resulted in a hybridised order where commercial logics and academic cultures frequently clash (Hoffman, 2017; Lave et al., 2010). Retrenchment in state funding for public higher education which began in the 1980s led research-intensive universities to seek alternative revenues, mixing public and private spheres. Accordingly, in university-based British AI research, promotions often hinge on the ability to bring in corporate grants, file patents, and/or engage in industry partnerships. One example of what this hybridised format looks like is the University of Edinburgh's 'Bayes Centre.' Opened in late-2018, this £45m centre is described as the 'University's innovation hub for Data Science and Artificial Intelligence [which] brings together PhD students, academic researchers and university staff working alongside tech-focused businesses, start-ups, and spin out initiatives.' Thus, whilst new centres like this can enhance the reputation of universities by giving them access to more informational and economic capital,

[48] https://www.ucl.ac.uk/ai-centre/innovation

there is a cost of autonomy for AI researchers to reject commercial practices in the field. Furthermore, even at those universities with state-of-the-art facilities, it is unclear that these are enough to mount a challenge to the dominance of supranational technology companies. As one of my respondents, a director of one large university-industry partnership, put it:

> "I think one thing related to what I said before, about who sets the pace, the people who have the data and the compute power set the pace. And a lot of that is just Big Tech. I think universities and governments would be kidding themselves a little bit if they said that they set the pace. It's more like that we're trying to engage and contribute…it's a bit like brain and brawn. So industry has more resources, and can do these things much faster. But very often they end up picking up the talent from academia." (Interview #12)

To sum, the actors identified as pertaining to the parameters of democratic-deliberative time and human-reflective time have relatively limited power and influence in the British AI field. They are either extremely limited in terms of economic capital, the overriding differentiator in the struggle to wield power in the field, or they are able to enhance their ownership of this form of capital but must do so by partnering with corporate actors that dilute their powers to transform the systems of authority within the field.

5.4. HABITUS: FAST SUBJECTS AND FAST THOUGHT

Having traced the history of the British AI field, its relative autonomy, and the changing symbolic capital held by various institutional actors in the field, I now turn to explore more directly the question of how speed is reproduced within the British AI field. To do so, I draw on Bourdieu's concept of habitus, which he uses to explain the production and reproduction of fields through actors' orientations, strategies and practices that are conditioned by history. For Bourdieu, habitus stands as a mediating concept between the poles of field (i.e. groups of interrelated actors) and capital (i.e. forms of influence and recognition within the field) (Stern, 2003).

Through the concept of habitus, Bourdieu opposes the idea that an individual or institutional actor's values, beliefs, and practices emerge from a subjectivity that is not socially affected. Rather, actors always think, act, and interact within structural limits. As actors are socialised into fields, they come to develop a sense of the possible and the impossible, the likely and the unlikely, the vulgar and the distinguished, the good and the bad, and so on (Bourdieu, 1996). Based on their position in a field and their access to, and possession of, various forms of capital resources, actors develop a sense of the possible position-takings, that is, to the 'space of possibles' open to them in a given field (Bourdieu, 1996, p.234). In this way, actors do not only develop subjective but also intersubjective understandings of the meanings particular values and practices hold, whether they regard time, speed, political leanings, or otherwise. Habitus is thus a mechanism linking individual meaning and the possibilities for improvised action within the macro-structural settings in which it is embedded.

Habitus can also be viewed as an 'internationalisation of history' (Vincent, 2004, p.140) where, over time, actors develop a 'feel for the game' that is based on their past struggles and conflicts within the field.

One central tenet of this thesis is to argue that the incursion of the market and the military into the AI domain and into scientific fields more broadly has helped to crystalise a particular set of dispositions and tendencies where speed is perceived as largely positive, necessary, and/or incontestable. Within the British AI field today, the intense temporal regimes of techno-scientific time and machine-instantaneous time have gained largely agreed ascendancy over other temporalities such as deliberative-democratic time or human-reflective time and acceptance as the pragmatic, habituated way of thinking and going about things.

In the case of techno-scientific time, the need for speed in AI R&D has become deeply rooted in actors' habitus and assumes a more or less natural status. One factor which appears to engender this structural proclivity toward speed, shaping actors' social expectations about their pacing, is the synchronisation 'requirements' of a globalised, neoliberal regime of AI R&D. The commercialisation and militarisation of British AI and its embedding into the global economy, which largely began during Alvey (1983-1988) and intensified under the current AI Sector Deal, has conditioned an outlook which is defined by imperatives of gaining time, competition, and speed.

The habitus of AI government policymakers is particularly instructive. By all accounts, those policymakers I spoke with represented influential actors within the British AI field—they have the power to enact laws and regulations, consecrate strategic plans, and/or shape agendas. However, the ideological choices of the governing political party, i.e. the British Conservative Party, have long held that decision-making powers ought to be redistributed from governments to markets (Brown, 2015). Furthermore, there is a deeply-held belief that economic growth is a necessary prerequisite for national stability and progress. As one senior policymaker put it:

> "with technologies such as AI…it is necessary that we invest as much as possible…to make sure that the ecosystem is there for economic growth. And so that then translates into the well-being and prosperity of the society and of the people." (Interview #30)

In this way, British AI policymakers see their primary role as putting the state's capital in service of the market and a growth-based economic paradigm. In Britain, this neoliberal agenda has been in place since the 1980s, and whilst the agenda itself can be nuanced, materialising in different shapes and degrees depending on the governing political party, all British governments since the 1980s, from Thatcher through Blair to Johnson have been characterised by light touch regulation (Hall, 2003; Hall and Soskice, 2001). Thus, over many years, British government policymakers have developed a strong disinclination to impeding or slowing-down (AI) markets through formal regulation, moratoria, and other forms of deceleration, since these tend to impede international competitiveness and economic growth. To a large extent, the only strategic option which appears available to them is to *encourage* market actors to develop AI responsibly (i.e. self-regulation). Strict *enforcement* deliberately limiting the speed of AI R&D (e.g. formal regulation) is mostly 'unthinkable' (Bourdieu, 1977, p.77).

A key factor in shaping the habitus of British AI policymakers is the growing power of large supranational technology firms. As previously mentioned, these actors have quickly accumulated and monopolised the most important species of capital in the AI field. Given their extensive control of these resources and the relative ease with which they can relocate capital to other nations, the influence of British AI policymakers is depleted. If British policymakers curb global corporations, the firms may relocate to more favourable regulatory environments, and given that competition between nations is intensifying (Future of Life Institute, 2020), British AI policymakers are predisposed to produce conditions most favourable to high-speed AI R&D. This increases Britain's attractiveness to large corporations invested in AI since the ability to innovate rapidly is a key factor in market competition—it is what economic actors want.

In addition to AI policymakers, the habitus of those AI researchers, developers, and managers I spoke with at large supranational technology firms, private sector organisations, VC firms, and consultancies were also broadly in line with the notion that an emphasis on speed was a necessary attribute of success in the AI field. Accounts such as: "…it's always about moving fast" (Interview #9, ML engineer), "…it's a fast-paced competitive race" (Interview #5, CEO, private sector firm), and "…you've got to be committed to staying ahead of the competition" (Interview #32, ML engineer) provide ample support for this understanding. While there are differences in the conventions and customs of these various institutions, they are unified in their commercial logic of profit-making and an instrumentalist approach to AI.

As discussed in chapter 4, one of the most powerful temporal structuring devices within these institutions is the strongly held perception that the introduction of novel AI systems or products before one's competitors offers a distinct temporal advantage which grants the leading producer additional profits as competitors seek to catch up. Accordingly, actors within these institutions internalise a sense of urgency in developing and rolling out AI systems, whether they are competing against other corporations or simply against other individuals within their organisation; relative speed is a marker of status and competitive advantage. In addition, given their profit-seeking motives, corporate actors, whether knowingly or not, often inculcate an understanding of time as being a scarce resource, i.e. 'time is money.' Because AI researchers and developers tend to be paid for their time and not for the products or services they produce, there is a lot of emphasis on increasing activity within the same unit of time. 'Saving time' in this way is equivalent to making (relative) profit for the firm. Thus, high-speed social practice in AI R&D within these different institutions is highly valued and internalised as the appropriate temporal orientation. This is not to say that all individuals internalise these temporal norms and structures to the same degree; depending on their relative power within their respective institutions, they may have some room for manoeuvre. However, whether at the institutional or individual level, the decision to ignore the predominant socio-temporal norms can lead to economic or social exclusion. In capitalist relations, social rhythms and velocities are sanctioned by various penalties. Firms which are slow to innovate are likely to lose competitiveness, while comparatively slow researchers or developers may be dismissed or lose out on promotions.

The final set of actors whose habitus I wish to consider are AI researchers situated in universities. As I explained in chapter 4, these actors were more likely to speak out against the dangers of high-speed AI R&D and positioned themselves toward the middle of the techno-scientific time, deliberative-democratic time spectrum. However, it is increasingly the case that university-situated AI researchers are subjected to commercial logics of gaining time, competition, and speed.

The key factor here is the marketisation and neoliberalisation of British universities which began in the 1980s. As discussed in section 5.1.3., these changes increased the role of external evaluations,[49] synchronised academic timescapes with commercial 'partners,' and institutionalised a competitive pressure to publish research (or "perish"). As AI researchers are socialised into British universities, these temporal ordering devices become internalised in the body. As with profit-driven firms, social tempos within universities are increasingly regulated through different penalties, e.g. precarious contracts, scholarly irrelevance, and so on. Thus, to the extent that individual researchers wish to avoid sanctions that accompany a comparatively slow pace of publishing research they will largely comply with the

[49] Most notably, the introduction of the Research Assessment Exercise in 1986; later replaced by the Research Excellence Framework in 2014.

dominant temporal regimes. This is particularly true for early career researchers (ECRs) who are most vulnerable to the precarity of probationary and fixed-term contracts.[50] As one doctoral researcher in AI noted:

> "As much as I'd like to think that if I handed my CV in and someone from Carnegie Mellon handed their CV in, [sic] he's gonna have 6-10 publications to top conferences. I'm gonna have 2-3. Maybe, maybe I'll have 4. And as much as I'd like to think that they'll see through it and go, "You know, this is really good quality," it's hard to deny when you've got 10 versus 3 publications at these top conferences, it's a massive advantage for them. As much as you try and stick to your guns and go, "You know what, no, my paper is good quality," it still is *unnerving* to know that while you're taking your time and not getting anywhere, someone else is taking the other route which is: just get those publications quick and dirty, just stack them up. So, unnerving in that sense that a lot of people publish, and they publish a lot around you. Be it in your year, or years below you - that's even worse! And it makes it just harder to stick to your guns and practice slow science....It's easier said than done.' (Interview #11, my emphasis)

Two things stand out in this account. First, the respondent highlights that despite their apparent eagerness to counteract imperatives of competition and speed (i.e. to exercise a degree of temporal agency), to practice this as an individual would likely result in personal cost. To decelerate or to fall behind is "unnerving." As far as this fear is embodied it generates without strictly determining high-speed social action in AI R&D. Second, the researcher's reference to Carnegie Mellon University, a leading

[50] Bengio (2020) estimates that competitive pressures in the AI/ML field have resulted in PhD researchers ending up with 50% more papers than 20 years.

US-institute in AI research, speaks to the global nature of competition. In an interconnected global labour market, it is not enough to synchronise among local peers or in domestic realms, but actors feel it necessary to entrain with the temporal patterns of competitors in other nations. This gives rise to a deep sense of powerlessness to change the temporal parameters in the British AI field. Importantly, this is not an issue only for ECRs, but even those in ostensibly powerful positions. As a Professor of AI from an Oxbridge institution put it:

> "...the incentives for researchers are set up around the world so that the ones with the most publications benefit the most...And if that were to change, it can't change just in one country. So the UK would be powerless to make that change, because people who are on the UK job market are also on the North American job market...So this issue can only be solved by, you know, a huge international effort, a huge international change in how we evaluate applications, and I just don't see that happening. Yeah, so it's very structural, it's baked into the most fundamental incentive systems." (Interview #27)

Thus, although universities may, at face value, be in a better position to exercise influence over the temporal regimes that structure the British AI field, speed is nevertheless perceived as an incontestable imperative among important actors in universities. With a sizeable majority of economic and informational capital within AI largely being held by corporate actors, it is they—i.e. large supranational technology firms—who are perceived to set the pace on a global scale. Although speed may be deeply engrained in actors' habitus, this comes not as a result of inevitable technological forces, but of the structure of the field as influenced by specific decisions made by actors at particular points in time—be that the Alvey Programme, or the neoliberalist policies of Margaret Thatcher in the 1980s.

In the case of machine-instantaneous time, AI systems and their respective producers do not exist independently of an institutional framework that legitimises them. Although AI systems may at times appear to function as autonomous objects—for example, automatically placing an order for a stock, detecting and responding to cyberattacks, predicting consumer behaviour—they are not so. Just as speed imperatives in AI R&D are ultimately the result of contingent choices made within the broader context of a struggle between actors, AI systems are not an inevitable technology effect, but they originate in the social world, where they are always implicated in structures of domination and the reproduction of these structures. Following Stern (2003, p.370), who argues that 'technologies are essentially subsets of habitus,' I contend that AI systems can be viewed as crystallisations of socially organised action. They come to embody a form of practical reason, and as speed is so intensely valued by the actors who dominate the British AI field—large supranational technology firms, the MOD, the British government, and so on—imperatives for instantaneity and speed become widely embedded within many AI systems.

The aforementioned example of the Google search algorithm provides a perfect illustration. Within Google, speed operates as a near categorical imperative, thus marginalising other legitimate concerns such as minimising bias or obtaining the most reliable information relevant to the search. Yet, Google's AI algorithm is a product of contingent choices by multiple actors—Google directors, managers, engineers, users, clients, and so on—rather than a deterministic force. The reason speed is preferred over other aspects that could make Google's algorithm unique is that fast search is seen as the favoured means to maximise profitability.

As another example, within defence institutions, the ability to recognise and respond to cyberattacks in fractions of a second is considered vital to protecting the interests of the British state. As Pedro Domingos (2015, p.19) writes in the Master Algorithm:

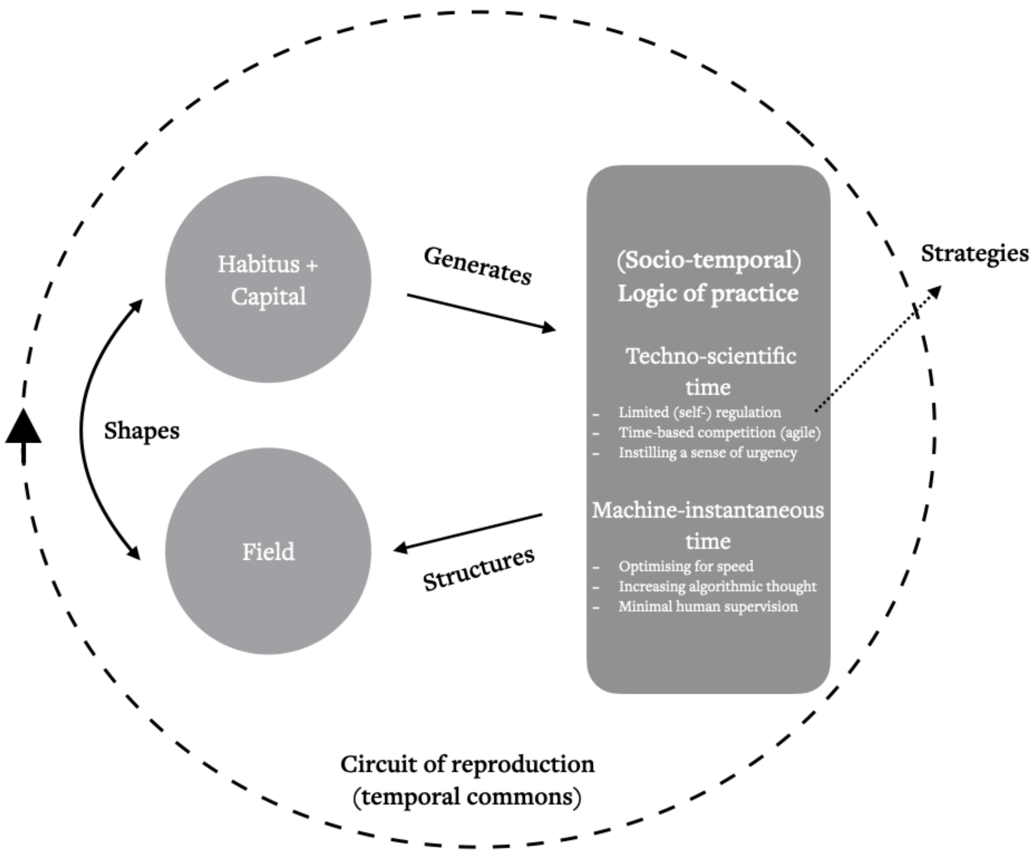
> 'If cyberwar ever comes to pass, the generals will be human, but the foot soldiers will be algorithms. Humans are too slow and too few and would be quickly swamped by an army of bots. We need our own bot army, and machine learning is like West Point for bots.'

Thus, just as the commercialisation and militarisation of the AI arena has resulted in high-speed forms of social action in the research and development of AI, it is also the case that it leads to a speeding up of AI systems themselves. For commercial and military actors, more often than not, the need for speed takes on a kind of 'practical sense' which is subsequently embedded within AI systems (Bourdieu, 1972). Although exceptions exist, practically and fundamentally, AI systems are widely geared toward speed and instantaneity.

In sum, this section has drawn on Bourdieu's concept of habitus to explain the reproduction of speed within the British AI field. I have argued that over time the commercialisation and militarisation of AI research has helped to crystalise a particular set of dispositions and tendencies (i.e. habitus) in the AI field where speed is perceived as largely positive, necessary, and incontestable. Actors' habitus in turn generates practice and practices serve to reproduce the field. In this thesis I have focused on what might be termed a 'socio-temporal logic of practice' which actors in the British AI field enact through the various speed strategies[51] outlined in chapter 4. For techno-scientific time, these were: limited (self-) regulation, time-based competition, and instilling a sense of urgency. For machine-instantaneous time, they were: optimising for speed, increasing pre-programmed algorithmic thought, and minimising human supervision. As actors practice these various strategies and approaches it creates a causal loop of generation and reproduction of speed as a dominant feature of the temporal commons.

[51] To recall, following Bourdieu's theory of practice, strategies are understood here as: 'the product of a practical sense, of a particular social game. This sense is acquired…through participation in social activities' (Bourdieu in, Lamaison, 1986: 112).

Figure 5.2. Adapting Bourdieu's theory of practice to explore the reproduction of speed in the British AI field



5.5. POSSIBILITIES FOR CHANGE

In this final section, I explore the sub-question of how, despite considerable power relations orienting the British AI field towards the fast temporalities of techno-scientific time and machine-instantaneous time, the field might move increasingly in the direction of deliberative-democratic time and human reflective-time. One of the main criticisms levelled at Bourdieu's conceptual tools is that they are overly deterministic, that is, they leave little room for change and agency (e.g. Fowler, 1994;

Mutch, 2003). If institutional and individual actors are embedded within and internalise external structures of (temporal) domination, how might alternative practices and temporalities emerge? Bourdieu himself rejected these criticisms. He stresses: 'Any field presents itself as structure of probabilities of rewards, gains, profits or sanctions with a degree of indeterminacy' (Bourdieu and Wacquant, 1992, p.18). Thus, while some practices and outcomes are more *probable* (e.g. orientations toward techno-scientific time), it does not mean they are *guaranteed*. Similarly, implicit in Bourdieu's idea of the habitus is that it *orients* values, beliefs, and actions without strictly *determining* them.

Likewise, in this study, the British AI field is revealed as dynamic and changeable. While symbolic AI occupied a dominant position from the 1960s through 1980s, the once heterodox sub-symbolic school is currently the more prestigious school. While many of the field's founders viewed AI as a site of restricted production, following the Lighthill report (SRC, 1973), and broader socio-economic changes to the university, more applied forms of AI knowledge production became ascendant. Thus, although techno-scientific time and machine-instantaneous time are identified as the currently dominant temporal regimes, they are not fixed once and for all. The temporal commons in the British AI field is socio-materially constructed and therefore remains open to change. It is always an ongoing process, even if not all agents have equal power to shape it. In recognition of this, I explore a number of latent possibilities for change.

5.5.1. AI as a matter of growing public concern

First, there are strong indications that the British AI field has become a matter of heightened public concern (e.g. Fast and Horvitz, 2017; Martínez-Plumed et al., 2018). Jermier et al. (2006) argue that social fields which attract less public scrutiny and government supervision, such as telecommunications, can impose field-level expectations more easily. By contrast, fields which are perceived as having significant public consequences may attract greater government supervision, protection regulations, non-governmental organisational (NGO) activity, and other external interventions (De Clercq and Voronov, 2011; Jermier et al., 2006).

In the British AI field, all but one of the five biggest civil society pressure groups focused on AI and data were founded in the last ten years.[52] This reflects the growing level of interest in AI governance and the steering of particular values, beliefs, and practices of major players in the AI field. To the extent that public concern and pressure intensifies, it may make moratoria, formal regulation, and other mechanisms for decelerating AI R&D increasingly possible, shifting the field toward a more deliberative-democratic time. Similarly, at risk of exposure from increased democratic oversight, some organisations may be less likely to optimise AI systems for speed, particularly if these involve costly trade-offs, for example, between speed and reliability, or speed and accuracy. Hence, a growing public interest in issues concerning AI safety and ethics may change, in Bourdieusian terms, actors'

[52] The Ada Lovelace Institute (2015), Big Brother Watch (2010), Campaign to Stop Killer Robots (2012), Liberty (1934), Open Rights Group (2015)

understanding of how to 'play the game,' opening up possibilities for alternative temporalities.

5.5.2. External and internal forces limiting the power of large supranational technology companies

Second, large supranational technology companies are identified as both the most powerful actors in the British AI field and the most ardent proponents of techno-scientific time and machine-instantaneous time. However, the hegemony of 'Big Tech' has attracted a growing chorus of critical voices from across the political spectrum (Hern, 2020). Hence, it appears increasingly possible that these corporations may be broken up or more stringently regulated, something they have largely avoided up to this point.[53] Such an exogenous force is likely to destabilise the power structures through which techno-scientific time and machine-instantaneous time are partially reproduced.

In addition, large supranational technology firms are becoming increasingly vulnerable to change from within; employee 'algo-activism' is intensifying (Kellogg et al., 2020). For example, in 2018, more than 3000 Google workers successfully pressured the company to end a contract with the US Pentagon using AI to improve the targeting of drone strikes (Wakabayashi and Shane, 2018). In December 2020, Google discharged Dr. Timnit Gebru, a co-lead of Google's 'Ethical AI' team for attempting to publish research on the ethical harms of large-scale AI language models

[53] A new 'Digital Markets Unit' will launch in Britain in April 2021, with the stated aim of limiting the power of large digital platforms (HM Government, 2020).

used by Google in many of its products. In response, 2700 Google employees signed a letter condemning the move while others resigned in protest (Wong, 2020). This increased activism has culminated in the formation of the Alphabet Workers Union, which aims to give Google staff more power to force changes to the conditions and practices of their work (Conger, 2021). While these changes are not specific to Britain, in 2020, the first UK union for technology workers—United Tech and Allied Workers—was formed (Mellino, 2020). From a Bourdieusian standpoint, this process of unionisation can be read as increasing the capital base held by technology workers, shifting those strategies and actions which feel available to them. For example, whereas a single AI developer may feel powerless to challenge Google's 'Gospel of Speed'—that is, the rule which states: 'Don't launch features that slow us down' (Hoelzle, 2012)—unionisation opens up the 'space of possibles' available to a person in a given field of practice (Bourdieu, 1993, p.64).

5.5.3. AI researchers regaining some autonomy

Third, in the British AI field's history, the stages at which AI researchers lost the most autonomy to establish priorities and define legitimate activity among themselves were when 'outsiders' such as Lighthill successfully undermined their respectability. However, it seems fair to say that since the 2010s AI researchers have regained some of their legitimacy (and with it, regained some autonomy). In a special issue dedicated to AI, the Economist (2016, p.2) declared it 'the hottest field in technology.' Many of my respondents spoke of a "bloody war for talent" (Interview #14, large supranational technology firm) and a "shortage of trained AI and ML experts" (Interview #32, private sector). Thus, this shortage of AI researchers, whether real or perceived, arguably gives top researchers more power to negotiate contracts that put them increasingly in control of the parameters of their work. This may mean pursuing less applied work or focusing on ends that are established through more democratic means rather than those aligned with the dominant logics of commercial and military institutions. The growing respectability of AI researchers may also aid the movement toward 'slow science' within the AI field, or more specifically, within university AI departments (see chapter 4). Calls for 'slow science' (Stengers, 2018) can partly be seen as attempts by university-situated researchers to call for greater temporal autonomy, i.e. the ability to set their own tempo, to choose their research questions away from the grip of evaluations and market-driven short-term performance targets. Given the ongoing exodus of many trained AI researchers from universities to industry, this may enhance their power to reshape the temporal commons within the academy as there is less competition for places there.

5.5.4. Pacifying the macro-level drivers of speed and acceleration: toward post-growth and demilitarisation

Finally, while the possibilities presented above may precipitate a shift away from the extremes of techno-scientific time and machine-instantaneous time, it is unclear to what extent speed logics will cease being hegemonic in the British AI field without more radical change at the macro-level. As I have demonstrated in the current and previous chapter, both the British government and corporate actors have repeatedly identified AI as instrumental to increased economic growth and productivity, thus deeply embedding it in a growth-based economic paradigm. Furthermore, in times of austerity, public institutions such as the Ministry of Defence remain strong advocates for intensifying AI-enabled augmentation and automation for the purposes of cost-cutting, efficiency, and in the case of the MOD, maintaining defensive and offensive capabilities relative to other states (Bloomfield and Vurbakis, 2015). Finally, international competition between nation states within a global economy strongly discourages regulatory restraints or policies which might slow AI innovation. As one set of legal scholars put it in their response to the Special Committee on AI:

> "Without doubt, the strict regulation of AI will hinder the development of AI, but the competition between the divergent regulatory regimes…will accelerate its development." (HoL, AIC0051)

Another of my interviewees, a senior government policymaker argued:

> "…to this day, we have not yet come up with an alternative to a growth-based paradigm for economics, right? To run our affairs, growth still matters, and over-regulation that is heavy handed and prevents experimentation is a bad thing for growth." (Interview #28)

Thus, radical change in the direction of deliberative-democratic and human-reflective time arguably must rest on pacifying the drivers of speed and acceleration at the macro-level; the main two being what Rosa (2003) has called the 'economic motor' and Virilio (1986) the 'war engine.'

For the former, Rosa and colleagues (2017) argue that capitalist societies such as Britain operate in a mode of what they term 'dynamic (de)stablization' where they 'require (material) growth, (technological) augmentation, and high rates of (cultural) innovation in order to reproduce [themselves] and preserve the socioeconomic and political status quo' (p.53). Without expansion, acceleration, and innovation, British industries would close down, job losses accrue, and hence public expenditures would grow, and tax revenues fall.[54] In other words, the British economy does not need to grow in order to reach some new progressive state but just to maintain the status quo. In this way, capitalist systems resemble a bicycle which are less stable when slowing down or coming to a halt but gain in stability with the speed of their forward motion. Fundamentally, this drives societies such as Britain toward widespread imperatives of escalation in the realms of speed and production.

However, paradoxically, Rosa et al., (2017) also argue that this mode of stabilisation through escalation is the formula for modern society's success as well as its breakdown. In other words, the current mode of 'dynamic stabilisation' is simultaneously *de*-stabilising; we must keep growing and accelerating, yet we cannot. The authors point to a confluence of crises stemming from a mode of dynamic (de)stabilisation: the climate crisis, the psychosocial crisis, and the democratic crisis (p.55). Incidentally, the speed pathologies theorised in chapter 4 are illustrative of two of these crises: the temporal desynchronisation identified between the speed of AI R&D and democratic institutions ability to effectively steer it is related to what Rosa

[54] The ensuing monetary and fiscal crisis is likely to put political legitimation at risk, too.

et al. call 'the democratic crisis.' Similarly, the experience of fear and precarity in the face of rapid developments in AI relates to 'the psychosocial crisis.' Although not the focus of this thesis, energy-demanding AI[55] can also be implicated in the climate crisis where the capitalist economy demands the extraction and consumption of resources at rates faster than ecological systems can replenish or absorb them. In this way, the structural need for growth and escalating speeds entails a high price, not just within the interorganisational context of AI, but, as Rosa et al. (2017) argue, within societies more broadly.

Thus, radical change to the temporal commons in the British AI field arguably requires imagining alternatives that move beyond Britain's current mode of dynamic (de)stabilisation. One possibility which is rapidly growing in influence is the notion of a 'post-growth society' (e.g. Banerjee et al., 2020; Johnsen et al., 2017). In effect, this is '…a society that does not need to grow, accelerate, and innovate just to maintain the status quo or to secure its structural reproduction' (Rosa et al., 2017, p.64). The contours of a post-growth society, although only beginning to take shape, include various policies from a universal basic income (UBI), to cooperative organising, to reducing workweeks, etc. (Banerjee et al., 2020, NEF, 2020). At the heart of these is the notion of more participatory forms of 'economic democracy' (Meiksins Wood, 1995) where workers and citizens have more of a say over the forms, means, and ends of (techno-scientific) production. As a sign of the growing influence of these policies,

[55] See Lu (2019) Creating an AI can be five times worse for the planet than a car. New Scientist. Available at: https://www.newscientist.com/article/2205779-creating-an-ai-can-be-five-times-worse- for-the-planet-than-a-car/

at least three sizeable British political parties—the Liberal Democrats, the Scottish National Party, and Green Party—include UBI on their agendas. Several large British organisations, such as 'The Wellcome Trust,' are moving to embrace a four-day workweek (Coote et al., 2020). Finally, there are over 7000 registered co-operatives in Britain (NEF, 2019).

While the post-growth movement may initially seem impertinent to the British AI field, my respondents oriented toward deliberative-democratic time and human-reflective time were in part taking up the cause of post-growth even if they did not express it in those terms. As I explained in chapter 4, actors oriented toward deliberative-democratic time were not calling for the unreserved deceleration of AI R&D but ways to put escalatory logics in the realm of speed on a leash. What was crucial for respondents from civil society pressure groups in particular was the ability to slow down AI R&D when it was necessary to do so, for example, to deliberate and mediate diverse interests regarding a controversial area of AI development such as facial recognition technologies. More fundamentally, however, to the extent that the British AI field is embedded within the wider economic and political fields, it makes considering struggles regarding 'post-growth' occurring in those fields an important part of comprehending struggles over the temporal commons within the British AI field—the two cannot be separated.

Nevertheless, it is important not to underestimate how difficult a task transitioning toward a post-growth society might be. In the face of globally interconnected economies and technologies, it is hard to see how such an agenda might be enacted. Surely, Britain could not overcome escalatory capitalist tendencies on its own. It would likely require international and supranational instruments which are notably absent (Rosa et al., 2017). Having said that, there is a growing global understanding of the need for change and post-growth ideals are being discussed and proposed in diverse groups from Occupy to Extinction Rebellion to the Spanish *Indignados* through the French *Convivialists*. While these remain fringe movements for the time being, if such movements grew in influence, they may bring radical effects to the temporal commons within the British AI field, opening up possibilities which appear available to policymakers and other key actors.

As for the latter, pacifying the 'war engine,' Virilio (1986) believes that military rivalries are the prime mover of high-speed forms of social-material action. The narratives from defence institutions in the British AI field offered support for this claim. However, similar to movements toward post-growth, there are also social movements towards demilitarisation, understood here as a process of reducing state forces, including police forces, and securitisation (Smyth, 2004). As previously mentioned, within the British AI field, there is growing ideological opposition to the militarisation of AI (Future of Life Institute, 2015). More broadly that that, the brutal and widely circulated footage of the killing of George Floyd in the United States in May 2020 led to global movements calling for both police and military forces to be defunded and for a reallocation of state funding toward other public aims (e.g. Elliott-Cooper, 2020).

Nevertheless, pacifying the war engine arguably runs up against the same problem as moving beyond the mode of dynamic (de)stablisation, that is, it demands global cooperation. If Britain were to shrink its armed forces while other nations maintained their current levels, it would be at a military disadvantage. Notwithstanding these challenges, to date, at least 30 countries have come out in support of a complete ban on lethal (AI-enabled) autonomous weapons (Human Rights Watch, 2020). Furthermore, while the dominant trend for most governments over the past 50 years has been to assume that expanding military power is a logic of contemporary statecraft, a small number, most notably, Germany (Sterns, 2014) and Costa Rica (Booth, 2021), have turned in other directions. In Britain's case, the demilitarisation of Northern Ireland via the Good Friday Agreement gives some precedent for a broader process of reducing military influence (Smyth, 2004). However, the British government's recent £16.5bn 'defence' spending boost clearly seems to suggest a move in the opposite direction (Warrell, 2021). Thus, it is important not to overstate how marginalised a position British demilitarisation is.

5.6. CHAPTER SUMMARY

Building on the previous chapter which outlined various actors' temporal position-takings in the British AI field, this chapter focused on revealing the power resources which actors bring to the struggle over the temporal commons. Specifically, the focus was on addressing my second research question: *how is speed reproduced/resisted within the British AI field?*

Analysis focused first on historically tracing the shifting logic and capital of the British AI field which revealed how the field has followed a relative decrease in autonomy to the benefit of players from the economic and military fields. I identified three main shifts behind this reduced autonomy: (1) AI researchers' loss of field-specific symbolic capital following the Lighthill review (1973-1982); (2) The commercialisation and militarisation of AI under the Alvey Programme (1983-1988), and (3) Data-driven AI and the intensification of a globalised neoliberal regime of AI R&D via the AI Sector Deal (2009-ongoing). These changes allowed new species of capital into the field, including what I have called 'informational capital' (i.e. data and compute power) and provided more legitimacy to 'economic' and 'military' species of capital, e.g. money, commercial and military savvy, and so on. Following this, I objectified the structural relations underpinning the field, revealing the considerable power and influence actors oriented toward techno-scientific time and machine-instantaneous time have. On account of their relative power, these actors, which include large supranational technology firms, defence institutions, and VCs, among others, are able to set parameters that favour economistic and militaristic tendencies within the field.

Having traced changes to the capital and logics of the British AI field, I drew on Bourdieu's concept of habitus to theorise the reproduction of speed within the social space. I argued that the incursion of the market and the military into the AI domain has helped to crystalise a particular set of dispositions and tendencies (i.e.

habitus) where speed has become perceived as largely positive, necessary, and incontestable.

Finally, I concluded by exploring some possibilities for change where the dominant temporal regimes of techno-scientific time and machine-instantaneous time might be subverted. Specifically, I discussed four destabilising possibilities: (1) a growing public interest in AI, (2) increased internal and external activism against large supranational technology companies, (3) some regaining of AI researchers' autonomy, and (4) broader social movements toward post-growth and demilitarisation.

CHAPTER 6.
DISCUSSION

6.1. INTRODUCTION

The previous two chapters presented the findings of this study; in chapter 4, I unpacked the temporal landscape of multiple and competing voices within the British AI field, investigating the question: *how do differently positioned actors in this social field experience and make sense of time and speed*? In chapter 5, I analysed the power relations underpinning these conflicts and struggles, addressing the question: *how is speed reproduced/resisted within the British AI field*? Both chapters drew on Bourdieusian sociology to map out the positions of key institutional actors and the socio-organisational power relations which constitute the British AI field. These questions and the analysis itself were informed by a detailed reading and problematisation of the MOS speed literature and related texts. Table 6.1. is a reminder of the five assumptions problematised and the five alternative assumption grounds offered.

Table 6.1. Revisiting the problematising review

Key assumptions in the MOS speed literature	Alternative assumption grounds and agendas
Believing that speed is predominantly a good thing	Taking full stock of speed pathologies

Assuming speed should be evaluated in relation to economic value	Adopting a stakeholder approach to evaluate performance
Amplifying dominant perceptions of speed	Broadening the sample by considering marginalised voices
Privileging the antecedents to speed	Exploring how speed is contested and resisted
Treating speed as a general ontological premise	Questioning the perceived omnipresence of speed

The current discussion chapter is composed of two main parts. In part one, I discuss the findings of this thesis in light of the problematising review and my empirical study. Specifically, I discuss a number of key themes which can be gleaned from the two main finding's chapters: (1) the ambiguity of speed, (2) a dialectic of speed, (3) the socio-materials reproduction and resistance of speed, and (4) the problem of slow and the need for temporal autonomy. I connect these particular themes to the alternative agendas and assumptions regarding speed first outlined in chapter 2, the overriding goal being to move these alternatives forward. Overall, the aim of part one of this chapter is to make clear the implications of my empirical findings for MOS speed theory and to build up a more complete story of what my various themes reveal about the topic.

In part two, I explore the implications of my findings for building more empirical and theoretically-informed policy and practice in the British AI field. While the primary aims and objectives of this thesis have clearly been set out as problematising MOS speed theory, the empirical context in which I conducted my inquiry is a site of growing scholarly and societal concern. Thus, I bring my findings into discussion with the literature and policymaking discussions concerning AI. Specifically, I discuss: (1) overcoming technological determinism in analyses of AI, (2) implications of a temporal lens for AI governance, and (3) policymaking and practice beyond a single actor, present-day focus. Overall, the purpose of part two is to delve into the meaning and importance of my findings for understanding and critiquing issues of power and speed in the context of British AI.

6.2. PROBLEMATISING SPEED IN THE CONTEXT OF BRITISH AI

6.2.1. The ambiguity of speed

How do the findings and methodological approach of this empirical research help to address the theoretical shortcomings identified through my problematising review of the MOS speed literature? Under this subsection, I discuss how my findings and the specifically relational approach adopted in this study help to move forward the alternative assumptions and agendas of: (1) taking full stock of speed pathologies, and (2) adopting a stakeholder approach to evaluate performance.

By drawing on the relational sociology of Pierre Bourdieu, this study reveals the highly contested nature of time and speed in a socio-organisational context, i.e. the British AI field. My analysis demonstrates that there are a variety of temporal standpoints in the British AI field across the dimensions of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time. These positions are not held by indifferent bystanders but engaged political actors who seek to produce and impose the 'legitimate' temporal orientations.

I captured differences in actors' socio-temporal meanings through the themes of 'speed advantages' and 'speed pathologies.' Speed advantages are perceived socio-economic goods emerging from speed and its emphasis. Respondents from large supranational technology firms, private sector organisations, VC firms, defence institutions, and the British government displayed a largely positive attitude towards the fast temporalities of techno-scientific time and machine-instantaneous time. In their accounts, speed is a vital medium through which to secure time leads ('competitive advantages'), create excitement ('thrill'), maintain relative standing ('net positive'), and be economical with time ('efficiency gains').

By contrast, speed pathologies are negative consequences and perceived socio-political pathologies which emerge from speed and speed logics. Specifically, respondents from civil society pressure groups and, to a lesser extent, professional bodies and universities, highlighted the dangers of high-speed AI R&D and rapid computer-mediated algorithmic thought. In their accounts, speed represents a serious threat to the possibilities for democratic politics, legislative planning, and human oversight ('temporal desynchronisation'), it compresses the time and space required for ethical deliberation ('temporally-induced skimping'), and results in an environment of fear and instability ('precarity').

The specifically relational, multi-actor approach adopted in this study is useful for the purposes of correcting the hither fore tendency in MOS to ignore, suppress, or overlook the 'dark' or pathological side of speed in socio-organisational contexts (Grey, 2009; Linstead et al., 2014). Contrary to mainstream MOS perspectives, I have not honed in exclusively on for-profit firms or elite executives. When the standpoints of those actors are centralised, investigators have tended to over-emphasise the positive modalities of speed since corporations and managers arguably have more to gain and less to lose from an emphasis on speed and 'gaining time' (e.g. Siggelkow and Rivkin, 2005; Kiss and Barr, 2017). Rather, I elected to focus on a wide range of institutional and individual perspectives. By examining the perspectives of a broader set of stakeholders whose performance criteria reaches beyond the narrow confines of shareholder value or economic growth, speed is revealed as deeply problematic, even pathological.

Within the socio-organisational context of British AI, civil society pressure groups such as the Ada Lovelace Institute or Big Brother Watch help to elucidate these alternative 'darker' perspectives on high-speed social action in the research and development of AI. In the British AI field, civil society pressure groups tend to share, inter alia, the goals of increasing democratic participation in AI governance and prioritising public interests over private ones. However, the temporal prerequisites of democratic deliberation are inherently slow, and in an increasingly pluralistic society such as Britain, they are arguably getting even slower (Rosa, 2010). Organising the public, formulating and weighing arguments, reaching consensus, and casting deliberate decisions are time-demanding processes (Rosa and Scheuerman, 2009). Thus, as stakeholders, civil society pressure groups evaluate high-speed AI R&D and accelerated innovation as increasingly incompatible with their interests in democratic participation and oversight. Accordingly, they compete to reduce the degree to which speed is accentuated and valued positively within the British AI field.

By contrast, large supranational technology firms such as Google or Facebook are predominantly, though not exclusively, governed by profit motives. The ability to innovate and experiment quickly is a key factor in market competition, as alluded to in popular organisational discourses such as Facebook's (2012) 'The quick shall inherit the Earth' or 'Move fast and break things.' As such, speed is in line with their principal interests and is thus perceived in increasingly positive terms. These actors struggle to have speed recognised as a key imperative and positive-enabling force within the British AI field.

While my analysis has mainly focused on mapping different position-takings between institutional actors, there were also observable differences at the individual level. For example, in chapter 5, I drew on accounts from early career researchers in AI as partly representative of the university perspective. For these individuals, imperatives for speed and accelerated publishing engendered feelings of fear and anxiety; however, for management and executives, to the extent that performance targets are reached or exceeded as a result of workers' increased velocity, speed is perceived much more positively.

By stressing opposition and competition, a key strength of Bourdieu's relational perspective, this study provides nuance and avoids engineering an overly simplistic fast (bad), slow (good) dichotomy (Hsu, 2015; Vostal, 2014). Indeed, equally as it is important to problematise the creed for speed in the British AI field and MOS more broadly, it is important to remain vigilant against the ways in which an 'ethic of slow' might be harnessed for socially conservative or oppressive forms of organising (Vostal, 2014). Speed is neither inherently negative nor positive. It is possible, for instance, that the speeding up of various goal-directed processes via AI systems (i.e. machine-instantaneous time) may open-up more time and space for democratic participation (Glezos, 2012). However, as discussed in chapter 4, there is a need to remain aware of how power relations might make this possibility more or less likely. Similarly, to simply advocate for a complete slowdown of AI R&D would be to negate the potentially enjoyable, even emancipatory possibilities of speed experience (Vostal, 2016). Notwithstanding the risk of symbolic violence, that is, 'the violence which is exercised upon a social agent with his or her complicity' (Bourdieu and Wacquant, 1992, p.167), many of my respondents perceived the intense temporalities of techno-scientific time as thrilling and exciting. Thus, *speed is normatively ambiguous;* it both poses profound dangers and yet contains positive implications (Connoly, 2008; Vostal, 2016).

My findings demonstrate the fruitfulness of examining how speed and speed logics may affect different individual and institutional interests in unique and sometimes contradictory ways. It highlights the value of adopting a stakeholder approach to evaluating speed, rather than continuing the mainstream trend of investigating how speed impacts the financial performance of organisations. As I stated in chapter 2, central to new and arguably better conversations about speed in MOS should be questions such as: Beneficial for whom? Harmful to whom? Beneficial and harmful for what and under what circumstances (Bluedorn and Waller, 2006)? Within the socio-organisational context of AI, the emphasis on speed and increasingly fast algorithmic thought proves beneficial for corporate and military institutions; on the other hand, it appears antithetical to the democratic, safety, and humanist concerns of other actors such as civil society pressure groups. Such questions and an understanding of the normative ambiguity of speed appear increasingly important given that a growing number of organisations are reporting a stronger desire to aim at imperatives beyond profit (Brooke, 2019), and to be more inclusive of the demands of multiple stakeholders (Agle et al., 2008).

In addition, as outlined in chapter 2, my findings affirm the need for more research in MOS that takes greater stock of speed pathologies. While Perlow et al.'s (2002) much cited paper identifies the potential for speed pathologies in socio-organisational contexts, their discussion is restricted to the possibly detrimental effects of speed on managerial concerns of growth and profitability. However, this thesis clearly demonstrates the risks of speed and speed logics to much broader and arguably more pressing socio-political issues such as the capacity for democratic politics, critique, safety, psycho-social health, and individual autonomy. Speed compresses the time and space necessary for these important practices, processes, and outcomes. In light of the ambiguity of speed, following Virilio (1986) it seems wise to recommend MOS scholars and organisational practitioners to exercise a critical disposition toward speed, precisely because it retains the potential for a multiplicity of material expressions, both pathological and 'productive.'

6.2.2. The socio-material reproduction/resistance of speed

Building on the above discussion, chapter 2 saw a critique of the tendency in mainstream MOS speed theory to amplify dominant perceptions of speed (e.g. top management teams; corporate firms). I argued for the importance of considering the temporal experiences and meanings of marginalised voices, both institutional and individual. In addition, I problematised the mainstream MOS bias toward investigating how speed may be mobilised and greater speeds of innovation, decision-making, or production manifested (e.g. Kownatzki et al., 2013; Schoonhoven et al., 1990). These two problems are clearly interrelated. Managers and corporate executives tend to view time as a scarce resource, where doing more in less time is equivalent to relative profit; furthermore, as my own analysis demonstrated, for corporate and military actors in the British AI arena, the ability to secure time leads in AI R&D was viewed as a key factor in gaining competitive advantage. Given that speed is often positively equated with economic performance, many MOS speed theorists reason that it is necessary to uncover the mechanisms through which greater speed can be attained (e.g. Forbes, 2005; Kiss and Barr, 2017). The corollary of this, however, is a lack of understanding regarding how speed and speed imperatives might be resisted. Hence in this subsection, I discuss the implications of my findings for moving forward the alternative agendas and assumptions of: (1) broadening the sample by considering marginalised voices, and (2) exploring how speed is contested and resisted.

In this thesis, I focused on the reproduction/resistance of speed through socio-material mechanisms in the British AI field. To do so, I engaged in what Emirbayer and Johnson (2008, p.2) call a 'generative reading' of Bourdieu's concepts, that is, I took what I believed is most productive about them, and combined them with other valuable ideas, for example, the notion of a 'temporal commons' which is struggled over (Bluedorn and Waller, 2006). Following Bourdieu, I conceptualised the British AI field as a structured social space, a semi-autonomous domain of activity with its own rules/logic where different actors with different power resources compete for the transformation or preservation of the field. In this study, I focused on actors' struggles to shape the field's temporal commons, that is, the set of values, beliefs, behaviours, and structures regarding time and speed which are considered 'appropriate' (see also Reinecke and Ansari, 2014). Specifically, I focused on actors' divisions over what they consider to be the appropriate pace at which to research and develop AI (techno-scientific time versus deliberative-democratic time) and the appropriate temporalities of AI systems themselves (machine-instantaneous time versus human-reflective time). It is along these four dimensions that the temporal commons is principally contested and shaped in the British AI field.

Crucial to understanding this struggle is that individual and institutional actors occupying a particular field do not have equal access to, or ownership of, power and resources, which results in a considerable imbalance in their struggle over the temporal commons (Bluedorn and Waller, 2006). Drawing on Bourdieu's concept of 'capital,' I examined the structure and volume of capitals held by various actors in the British AI field. In particular, I demonstrated the growing influence which industrial and military actors have acquired in establishing priorities and defining legitimate activity in the British AI field. Over a period of approximately fifty years, power relations within the British AI field have been radically reconfigured. In the field's early history (1960s-early 70s), AI researchers, who were mostly positioned within universities, had significant autonomy to define legitimate activity among themselves, including the temporal conditions of scientific thought. Inclusion into the field required a high-degree of scientific knowledge regarding the principles underlying intelligent behaviour. However, following the Lighthill report (1973) and the commercialisation/neoliberalisation of AI and the broader university in the 1980s, the inclusion criteria shifted and the state, industrial firms, and defence institutions became increasingly influential in setting agendas. AI researchers lost AI-specific symbolic capital. From the late 2000s until the present day, the shift toward sub-symbolic or 'data-driven' AI also served to increase the relative influence of those actors in possession of considerable data and computing infrastructure, resources which were previously of little value within the AI field.

Why does this matter? Within the British AI field, the distribution of recognition is now such that actors possessing significant economic capital, data and computing infrastructure, industrial-state-university relations, and commercial, entrepreneurial, and military savvy are accorded the most positive recognition. In the previous chapter, I identified large supranational technology firms such as Google and Facebook as monopolising these forms of symbolic capital; indeed, in the testimony of Professor Maja Pantic, she estimated these firms could own up to 90% of innovation capital; the combined revenue of the four largest technology companies in 2019 was twice the size of the total combined GDP of Wales, Scotland, and Northern Ireland. At the same time, these actors are the strongest proponents of the fast temporalities of techno-scientific time and machine-instantaneous time. Disparate power and influence in the British AI field mean that these stronger actors can heavily influence other actors—perhaps most importantly, the British government—to encourage strategies and practice that prioritise speed and acceleration above other concerns. As I discussed in chapter 5, given the extensive powers of large supranational technology firms, British government policymakers are reluctant to infringe upon their autonomy by slowing-down AI R&D through formal regulation, temporary moratoria, or other structures; if they do, large corporations will threaten to shift jobs and innovation elsewhere, damaging Britain's prospects for economic growth. Although not specific to the AI field, Habermas (2001) has described such conditions as amounting to a 'post-national constellation,' this being where the authority of the nation state is declining as the power of large corporations and other global actors grows (see also Rhodes and Fleming, 2020).

As a mediating concept between the poles of field and capital, I drew on Bourdieu's concept of habitus (internalised dispositions) to explain how the incursion of the economic and military fields into the AI arena has crystalised a particular set of dispositions and tendencies where speed is perceived as largely positive, necessary, and incontestable. Within these fields, competitive logics of the market and interstate military rivalries are rife; struggling not to lose ground on competitors, there is a structural necessity for speed and acceleration. The decision to ignore the dominant socio-temporal norms and drop out of the 'race' is rarely without sanction or punishment. Thus, to the extent that institutional actors acting in a global market seek to avoid sanction for constraining growth or stifling innovation, they will look for ways to accelerate AI R&D. To the extent that individual actors want to avoid punishment for a comparatively sluggish pace of producing research or deploying products, they will internalise the dominant temporal regimes (i.e. techno-scientific time). Although these dispositions relate to AI R&D, following Stern (2003), I argued that AI systems can be theorised as subsets of habitus, i.e. as crystallisations of socially organised action. Because speed is a key organisational imperative for many of the actors who dominate the British AI field—large supranational technology firms, defence institutions, and so on—imperatives for instantaneity and speed become widely embedded within AI systems.

However, although these temporal regimes have gained ascendancy as the pragmatic way of thinking and going about things in the British AI field, domination is never complete within fields; the temporal commons is not wholly enclosed. As I have pointed out, some actors (i.e. civil society pressure groups and, to a lesser extent, professional bodies and universities) orient themselves toward the slower temporalities of deliberative-democratic time and human-reflective time. For the former, actors advocated for temporary moratoria, formal regulation, pharmaceutical-style testing of AI systems, and an ethic of 'slow science.' For the latter, respondents advocated for the intentional deceleration of AI systems and greater human involvement in decision making. These various strategies represent attempts at tempering and resisting the British AI field's escalatory tendencies in the realm of speed. The particular differentiated interests represent agentic forces in the field while the distribution of power and resources between actors represent structural forces (Özbilgin and Tatli, 2011).

Nevertheless, it is important not to overestimate the force actors oriented toward deliberative-democratic time and human-reflective time are able to exercise over the field. As I stressed in chapter 5, the yearly salary of a top AI researcher at a large supranational technology firm exceeds the entire operating budget of most civil society pressure groups in the British AI field; in this sense they represent deeply marginalised voices. While universities and professional bodies have more capital at their disposal, their accumulation of the relevant forms of capital have involved relinquishing a certain degree of autonomy in favour of economic actors. This is not to say that civil society pressure groups and other marginalised actors in the British AI field are wholly unable to subvert the dominant temporal regimes. Although they have less capital, there is still room to act skilfully to succeed in their goals; Bourdieu (1993, p.150) illustrates this by using the analogy of a card game. While large supranational technology firms might be thought of as holding 'a pair of aces' in the game, giving them an advantage over other players (i.e. more capital), a skilful player dealt a much poorer hand can still win. For example, the civil society pressure group 'the Campaign to Stop Killer Robots' had a global budget of less than £1m in 2020. However, through a carefully crafted, if intentionally alarming video entitled: 'Slaughterbots,' it has garnered over 3.25 million views on YouTube. Such skilful play has increased its profile and calls for a moratorium on lethal autonomous weapons, arguably beyond its 'objective probabilities' (Bourdieu, 2000, p.213).

In sum, this subsection discussed the findings of the thesis in light of the alternative assumptions of considering marginalised voices and exploring how speed is contested. Specifically, I discussed the power relations which underpin actors' struggles over the temporal commons in the British AI field, being inclusive of both dominant and dominated/marginalised voices. Furthermore, I explored resistance to speed within the British AI field under the temporal parameters of deliberative-democratic time and human-reflective time. While these two temporal regimes follow different premises, they are united in opposition to a temporal commons which accentuates speed above other concerns such as democratic deliberation and meaningful human control.

6.2.3. A dialectic of speed

In chapter 2, I problematised the mainstream MOS assumption that speed should be taken as a general and basic premise from which to theorise. Over recent decades, a growing number of MOS scholars have developed highly general theoretical axioms of high-velocity environments (e.g. Oliver and Roos, 2005), hyper-competition (e.g. D'Aveni, 2010; Wiggins and Ruefli, 2005), and continuous morphing (e.g. Rindova and Kotha, 2001), which risk overemphasising the degree to which speed saturates various environments. In contrast, I offered the alternative agenda of questioning the perceived omnipresence of speed.

The findings of my empirical study speak to the importance of this agenda. Within the British AI field, I observed the coexistence of opposing forces of speed/acceleration and slow/deceleration. Following Kern (2004), I label this coexistence a 'dialectic of speed.' One example which highlights this tension is how, on the one hand, AI was often framed as a set of techniques and technologies which is rapidly revolutionising British society. Indeed, this is how the British government and other dominant actors tend to frame AI (e.g. HM Government, 2017, p.4; PwC, 2017, p.4). However, AI systems are facilitating familiar exercises of non-stop, 24/7 calculation, prediction, bureaucratic rule execution, and so on. Certainly, when one begins to fill out the British AI field empirically as I have done in chapter 5, the power relations constituting the field have remained remarkably similar over the past few decades. Hence, behind a hyper-dynamic surface in the British AI field lie deep-rooted forms of structural inertia, slowdown, and conservatism. Existing relations of power and control remain effectively the same, preserving the status quo rather than rapidly changing it (Crary, 2013).

A further fast/slow coexistence in the field prevails between the fast temporalities of AI systems (i.e. machine-instantaneous time) and the slow, often hidden or invisible labour required to sustain these temporalities. In the 1980s, when Intelligent Knowledge Based Systems (IKBS) were dominant, the empirically slow, difficult, and problematic processes of collecting and encoding expert knowledge into pre-programmed algorithms were largely hidden from view as these "fast systems" were being sold to industry (Forsythe, 2001). In the current data-driven AI paradigm, it is not the procurement and programming of knowledge which is time-consuming, but rather, labelling and annotating the data required to train, validate, and tune models (Collins, 2018). Much of this painstakingly slow and tedious work is outsourced to developing countries, where poorly paid workers operating in sub-standard conditions are responsible for data-labelling (Murgia, 2019). For many of my respondents who were AI and ML experts in highly paid positions, this kind of work never crosses their desks and remains largely invisible. Thus, the temporal stories told about how AI systems ′save time' by speeding up goal-directed processes often fail to account for how this rapidity and speed is both produced and paid for (Wajcman and Dodd, 2016).

Finally, the concepts of 'hyper-accelerated standstill' (Rosa, 2003, p.17), and 'polar inertia' (Virilio, 1999) offer explanatory power for understanding the speed experiences of many of the respondents of this study, particularly those from defence institutions and profit-seeking firms. In chapter 4, I empirically demonstrated how many of my respondents experienced AI R&D analogous to an "arms race" or "rat race." In order to get ahead, individuals and institutions seek ways to accelerate their processes, either producing AI systems or theories more quickly or utilising them to augment existing capabilities. However, because other actors follow suit, everyone and everything ends up running faster and faster just to stay in the same place—actors go nowhere, fast. In MOS scholarship, this phenomenon is sometimes addressed by the concept of the 'Red Queen Effect' (Derfus et al., 2008). The implications of this effect are significant; mobilising greater and greater speeds requires more energy—social, political, cultural, and natural (e.g. oil, gas, earth minerals, etc.). Thus, to the extent that greater levels of energy need to be invested just to stay in the same place, this is socially, politically, and environmentally unsustainable in the mid- to long-run.

In sum, these findings add weight to the argument, first outlined the problematising review, that highly general assumptions about speed and acceleration rarely live up to empirical examination (e.g. Wiggins and Ruefli, 2005; for a similar argument, see: du Gay, 2017). Despite many participants' constant references to speed and an ever-greater need for acceleration, numerous forms of inertia, slowdown, and conservatism were simultaneously present.

6.2.4. The problem of slow and the need for temporal autonomy

In section 6.2.1., I drew on my empirical findings to make the case for speed as a deeply ambiguous medium; depending on an individual or institutional actor's interests and power resources, speed contains both positive implications as well as profound dangers. As far as speed is capable of producing thrill and excitement at the individual level or manifesting some degree of socio-economic stability at the societal level, there seems to be limits to reasoning which calls for an unreserved embrace of deceleration or an 'ethic of slow.' However, in popular (e.g. Honoré, 2004; 2013) and academic (e.g. Berg and Seeber, 2015) debates around social temporality, slow is often advocated for as the solution to pathologies of speed. In this subsection, I draw on my analysis to develop the idea of 'temporal autonomy' as a means of overcoming this fast/slow dichotomy (Hsu, 2015; Vostal, 2015). Specifically, I argue that speed is perhaps not the central issue, but rather, the need for speed all of the time. Thus, by 'temporal autonomy,' I am referring to the power to set one's own pace away from the structural necessity to speed up or accelerate (Flaherty et al., 2020, Rosa, 2019).

The issue is well-illustrated in the struggle between techno-scientific time versus deliberative-democratic time. Within the British AI field, techno-scientific time contends that AI R&D is a competitive race where accelerated innovation and limited (self-) regulation are the appropriate organising principles. Under this regime, emphasis is placed on identifying accelerators and limiting restraints to greater speeds in AI R&D; indeed, any action which might curb or slow down AI R&D appears unavailable to individual and institutional actors operating under this regime.

In the British AI context, the justification for speed at the macro level rests on the need for economic growth and on maintaining Britain's geopolitical standing. This connects with Rosa and colleagues' (2017) analysis of modern industrial societies operating according to a mode of 'dynamic stabilisation.' To slow down or decelerate risks a break down in modern society's form and structure. It also speaks to Virilio's (1986, 2005) analysis of speed being driven by interstate military rivalries; nation states are bent on engineering high-speed technologies in order to secure tactical or strategic advantages in (cyber) warfare. At the individual level, the grounds for speed rest on the need to entrain with the actions of other individuals who are competing. It has become crucial to lead and shape individual lives by 'staying in the race' to keep up competitiveness (Rosa, 2010). A refusal to do so can lead to various socio-economic penalties which many actors are ill-equipped to face.

However, despite both the seriousness and reasonableness of these claims, it is also the case that a constant need for speed and acceleration within British AI has grave costs. Speed has its price. As I have extensively documented, it creates crises of desynchronisation, temporally-induced skimping, and precarity. These are not minor inconveniences, but rather, in the case of the former, at least, undermine the very promise of enlightened modernity, that being the deliberate and democratic political shaping of our society and of the technologies we want to use and develop (Rosa and Scheuerman, 2009). Democratic processes and institutions cannot be sped up to the same degree as techno-scientific development, thus, our fundamental ability to exercise ethical and political autonomy is disintegrating.

Such a contradiction calls for ideas that enable the comforts and conveniences of speed and slowness to be grasped simultaneously. Hence, although temporal desynchronisation, temporally-induced skimping, and precarity are unquestionably pathologies resulting partly from speed, what is most significant is arguably not speed per se, but rather, the seemingly incessant need for speed and the lack of discretion to slow down and speed up when it is desirable to do so.

As previously argued, under the dominant regime of techno-scientific time, the prospect of a temporary moratorium does not appear within the 'space of possibles' available to actors; there is only one speed, the fastest one possible. However, under deliberative-democratic time, the emphasis is not on the blanket imposition of slowdown, but rather, on creating the necessary time and space for the exercise of autonomy over the frames and pace of AI R&D. If, for example, after processes of deliberation, opinion formation, argument weighing, and so on, it can be decided that we wish to engineer and use facial recognition technologies, speeding up the rate at which we research, develop, and deploy such systems to democratically chosen ends, is not problematic. In fact, it may be a good thing, as technology is shaped with human betterment and democratic ideals in mind—and hopefully, environmental protection too.

Thus, while speed/slowness are clearly part of the issue, the bigger issue seems to be temporal autonomy, and what is underlying autonomy is power. This shifts the crux of the matter from speed/slow to self-determination over the ability to go fast/slow. It raises questions about what might grant agency and control. The potential solutions here will likely need to be structural for a number of reasons. As discussed in the previous chapter, Britain's current mode of dynamic stabilisation is such that to limit growth and technological innovation without major structural changes would be to invite fiscal and monetary crisis and reduce social stability. PwC (2017) estimates that by 2030, Britain's GDP will be 'up to 10.3% higher as a result of AI'; thus AI is viewed as instrumental to Britain's prospects for economic growth, making it improbable that under a mode of dynamic stabilisation, slowing down AI R&D is an option. Furthermore, Britain's embeddedness in an interconnected global market means that even if British policymakers sought to slowdown AI R&D or AI systems, without other nations following suit, Britain's economic and national competitiveness would surely fall relative to other countries. This is arguably the most significant structural challenge as genuine control over the pace of AI R&D requires international collaboration between sometimes deeply rivalrous states.

In addition to structural change at the geopolitical level, changes are also likely needed at the national level; in particular, there is a need for the realisation of new forms of 'economic democracy' (Meiksins Wood, 1995) which do not entirely give up on markets yet are able to put their escalator propensities on a leash. As previously mentioned, ideas for 'alternative organising' (e.g. Phillips and Jeanes, 2018) such as 'cooperatives' are likely to be instrumental here. Cooperatives grant individuals greater control over strategic investments and the means/ends of production. They allow for this by bringing together an association of persons who are united voluntarily to meet their common economic, social, and cultural needs through a jointly-owned and democratically governed enterprise (Schneider, 2018). One of the primary benefits of cooperatives is that they offer more enhanced forms of public control over the pace of socio-organisational life. If workers wish to decrease their labour time or the pace at which they must work they are more empowered to do so, whereas in corporations, power is concentrated in the hands of shareholders and managers.

Finally, within universities, where a considerable amount of AI research and development is still performed, once again, institutional changes are likely needed if AI researchers are to have greater autonomy to set their own pace (Vostal, 2016). What good does it do to tell an AI researcher to slowdown if they are faced with an 'audit culture' (Ruth et al., 2018) that imposes speed and punishes slow? While it is arguably possible for the privileged few to slowdown, perhaps because they have more permanent contractual agreements or a small army of doctoral students to carry the publishing load, for the majority of researchers it is not possible without suffering consequences for employment and career options (Martell, 2014). Thus, an overhaul of the audit system of universities is arguably needed, but as highlighted in the previous chapter, even if British universities enacted such changes, in an interconnected global labour market, British academics would likely be at a disadvantage for jobs over those individuals from countries with more performance and market-driven temporal structures.

I explore these ideas and options for change in more detail in the conclusion by bringing the thesis into conversation with ideas of 'post-growth organising' (e.g. Banerjee et al., 2020) and 'alternative organising' (e.g. Phillips and Jeanes, 2018).

6.3. ISSUES FOR POLICY AND PRACTICE IN THE BRITISH AI FIELD

In the previous section, I placed the main findings of this research in perspective with the problematising review and my overall goal of moving alternative agendas forward. In this section, I explore implications of the thesis beyond the development or problematisation of MOS speed theory. As outlined at the beginning of this chapter, the findings of the study are of value to informing policy and practice in the British AI field. Over the past few years, there has been a significant increase in scholarly and societal interest in the topic of AI, both within (e.g. Fleming, 2019; Lindebaum et al., 2020; Raisch and Krakowski, 2021) and without (e.g. Agrawal et al., 2018; Bloomfield, 2018; O'Neill, 2016) the MOS field. In the next three subsections, I discuss some of the implications of my study for adding to these perspectives and discussions regarding AI policy and practice.

6.3.1. Overcoming technological determinism in analyses of AI

In response to the expanding use of AI systems for the governance of socio-organisational life, societal and scholarly interest in AI has increased considerably over recent years. Despite this growing interest, it has been argued that the analytical focus of much mainstream scholarly analysis on AI tends to focus on how AI will 'change' or 'impact' organisations and society (e.g. Bloomfield, 2018; Fleming, 2019; Moore, 2018). Questions are mainly posed around how organisations and society might 'adapt' to the newest 'wave' of AI products or systems (e.g. McAfee and Brynjolfsson, 2017; MGI, 2017). In this way, AI is widely framed as an inevitable seismic shift to which society can only react. This deterministic view was prevalent in the accounts of many of my respondents. Most tellingly, it is prominent in official framings from the British government: ‘As with previous revolutionary technologies, these changes cannot be resisted and it would be irresponsible to fail to prepare’ (HM Government, 2017, p.37).

The problem with technological determinism, however, is that it is at best myopic, and at worst erroneous, to believe organisations and society simply change and/or adapt to AI systems. Rather, it is more appropriate to see this the other way around. As Clegg et al. (2008, p.545) succinctly put it: ‘Technology does not determine organisational behaviour; in fact, it is the organisational relations of power and knowledge that are significant.’

Seeking to overcome this deterministic view, Fleming (2019) has recently employed the concept of ‘bounded automation’ to highlight the various socio-organisational forces which may reshape AI systems as they are diffused into organisations and society more broadly. Similarly, drawing on labour process theory and, in particular, Edwards’ (1979) perspective of ‘contested terrain,’ Kellogg and colleagues (2020) offer a comprehensive review of the many ways in which workers are individually and collectively resisting AI (algorithmic) systems.

However, while these studies go some way toward detailing the myriad ways in which AI systems can be refashioned or put to strikingly different uses depending on organisational power relations, the analytical focus is predominantly directed at how actors might resist ′ready-made’ AI systems. In other words, the scholarly gaze is primarily placed on the consumers, end-users, and/or targets of AI systems. This omits, or leaves largely unexamined, many of those involved in the organised production of AI systems, i.e. the individuals and institutions involved in developing and refining algorithms and AI systems.

One contribution of this study, then, is to closely examine the various socio-organisational forces and power relations which have historically shaped AI in the first place. As I have demonstrated throughout this thesis, AI is not the outcome of an inevitable or unchangeable logic of technological development but is designed by actors working in a social field where certain ways of thinking and acting are privileged while others are marginalised. The thesis has focused primarily on the temporal orientations or 'socio-temporal norms' (Blount and Janicik, 2001; Rubin, 2007) which are prioritised and subsequently embedded within AI systems. However, by theorising AI systems as crystallisations of socially organised action (Stern, 2003), I have emphasised their fundamentally social and therefore, contested nature. Thus, while power relations in the field may favour certain outcomes, no developments are guaranteed; individual cases such as the regulation of the speed of HFT algorithms point to this. Thus, the findings of this thesis add to the growing body of literature on the social shaping of technology which rejects strongly deterministic analyses of (AI) technologies (e.g. MacKenzie, 2016; Wajcman, 2010).

6.3.2. Implications of a temporal lens for AI ethics and AI governance

In chapter 5, I highlighted the growing attention being paid to issues of 'AI ethics' (e.g. Greene et al., 2019; Hagendorff, 2020). Indeed, during my interviews, while respondents were often divided over the 'legitimate' temporal orientations, they were largely undivided by a sense of the importance of AI ethics; this was the case whether they represented large supranational technology firms or civil society pressure groups. The growing importance of AI ethics appears promising, particularly in relation to previous waves of interest in applying AI to various industrial and state tasks. Despite the problematic use cases, biases, and reasoning errors of many applied AI systems during the 1980s and 1990s, AI ethics appears very little in the literature of that period (for exceptions, see: Adam, 2000; Forsythe, 1993). Thus, to the extent that ethical issues are both taken seriously and more widely debated within the AI field, this is a positive development.

There are, however, some reasons to be sceptical. Critical perspectives on AI ethics have argued that the prominence of discussions of 'ethical AI'—which are principally led by large supranational technology firms—may be designed first and foremost to pre-empt political discussion (Greene et al., 2019). In other words, the goal of corporate actors is to appear to be taking the consequences of their use and development of AI seriously, so as to avoid legally-binding regulation; or worse, democratic and collective scrutiny of their desire to employ AI systems to pursue their self-interests—that is, profit over public good. Thus, in much the same way as business ethics has been critiqued for 'comprising a set of organised practices that are defined in a terminology of ethics and responsibility but whose principal purpose and achievement is to support the expansion of corporate sovereignty' (Rhodes, 2019, p.96), this same pernicious idea may be operating in the field of AI ethics.

Still, putting aside concerns of ethics washing and an ethics theatre for a moment, one perspective that is arguably missing from debate and discussions regarding AI ethics is a temporal perspective. One of the key insights from my analysis is that democratic deliberation in an ethically pluralistic society, such as Britain, takes considerable time. Processes of multi-stakeholder engagement, argument weighing, organising collective interests, and so on is temporally demanding (Rosa, 2010; Scheuerman, 2004). Thus, so far as large supranational technology firms, defence institutions, private sector organisations, VC firms, and most alarmingly, the British government, advocate for a temporal regime premised on a logic of speed and acceleration, it seems to contradict the temporal prerequisites for genuinely democratic and ethical deliberation. If dominant actors in the field are mainly interested in incessantly speeding up AI R&D and algorithmic processing times, it begs the question: what space is left for ethical reflection and deliberation, let alone public debate and exchange? As Virilio (1986, 2005) and others have noted (Harvey, 1989), when speed accelerates, space and time are compressed; yet this is precisely what democratic politics, ethics, and critique require.

Thus, the findings of this thesis suggest the need to bring discussions of time and speed to the centre of debates concerning the possibility for genuinely robust and 'ethical AI.' The temporal commons in the British AI field has important implications for the socially responsible development and use of AI systems, yet for the most part, the values, beliefs, behaviours, and structures regarding time and speed which constitute the temporal commons are absent from discussions regarding ethical AI.

6.3.3. Policy and practice beyond a single-actor, present-day focus

In this final subsection, I discuss some implications of the current study for informing policy and practice in the British AI field. A familiar mainstay of contemporary critical research is that it lacks any basis for a universal role as a collective conscience (Alvesson and Deetz, 2020). What critical research can offer, however, is a counterpoint to dominant ideals and regimes of understanding.

One of the contributions of this study is to provide a broad and more inclusive picture of the competing interests and agendas toward time and speed in the British AI field—a multi-actor context—on the basis of considerable original empirical evidence. This is important as a number of high-level policy advisory councils such as the British government's 'AI Council' are composed heavily of leaders from industry. Although the AI Council includes elites from academia and public sector groups, many of them have either spent, or continue to spend, considerable time in industry (HM Government, 2021). Effective and democratic policy and practice at national and organisational levels should be based on an empirically- and theoretically grounded understanding of the British AI field. By mapping out the field as a struggle between diverse actors with different power resources across the dimensions of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time, this study brings to the fore not only dominant temporal perspectives but dominated ones.

In addition, by focusing on actor's struggle over the temporal commons, I have investigated an under-researched and under-theorised area of AI. Other than two known papers (Armstrong et al., 2016; Cave and ÓhÉigeartaigh, 2018), sociological analysis of the temporal dimensions of AI R&D and AI systems are almost entirely lacking despite their social, political, ethical, and technological consequences.

A second but closely related contribution arising from this study is that it offers a historical understanding of the social, political, and economic context in which the British AI field emerged. Emirbayer and Johnson (2008) advise that to address domination within fields, researchers should undo the mechanisms of dehistoricisation and universalisation; otherwise, there is a risk of simply replacing one modality of domination with another. In chapter 5, I traced the history of the British AI field back to the 1950s and 60s, revealing a series of shifts which altered the power relations in the field and transformed the 'legitimate' temporal orientations. From the 1973 Lighthill report through the Alvey programme and the new public management of the 1980s, I highlighted the intensification of applied concerns and the growing marketisation and commercialisation of AI research. These changes increasingly synchronised British AI research with the tempos of 'rival' research groups from other nations and institutions. It engineered audit cultures designed to root out the slow and infuse the academy with logics of speed, competition, and saving time (Shore and Wright, 2000; Stengers, 2018). Moreover, with economic actors increasingly in control of the priorities of AI R&D, AI systems were increasingly designed to 'think like a corporation' (Penn, 2018), programmed with a desire for 'precision, speed, unambiguity' (Weber, 1978, p.973). The 2018 AI Sector Deal represents a further extension of this neoliberal privatised regime of AI where AI development is framed in terms of a fiercely competitive race for technological superiority.

However, what I hope to have made clear is that these shifts are not inevitable processes, but the result of specific choices made by groups of people in particular places, at particular points in time. A danger of focusing exclusively on actors' present-day accounts is that it may be increasingly difficult to see the prevalent temporal conditions as socially and materially constructed. Socio-temporal norms and structures can appear as unalterable circumstances, akin to facts of nature, deeply rooted in a person's habitus. Thus, a key step toward pointing to alternatives beyond dominant regimes of understanding is to make known the institutionalisation processes that have naturalised these 'facts'—i.e. to reveal 'the need for speed' as arbitrary and socio-materially constructed. As Adam (2003, p.100) reminds us: 'Speed is not a value in and of itself. In many societies across the world, speed and haste carry a negative value. They denote a lack of decorum. In these cultures, it is considered undignified to rush and carry out daily routines at great speed.'

6.4. CHAPTER SUMMARY

Set against the theoretical problematisations made in the literature review, this chapter provided an initial discussion of how my findings assist in moving forward my five alternative agendas and assumptions regarding speed. I arranged the discussion into four themes: (1) the ambiguity of speed, (2) the socio-material reproduction/resistance of speed, (3) a dialectic of speed, and (4) the problem of slow and the need for temporal autonomy. In addition, I discussed some of the implications of my study for theoretically-informing conversations regarding AI policy and practice. Specifically, I discussed: (1) overcoming technological determinism in analyses of AI, (2) implications of a temporal lens for AI ethics, and (3) informing policy and practice beyond a single-actor, present-day focus.

I now turn to conclude the thesis: reiterating the main findings, distilling the focal contributions of the work, outlining some of the study's limitations, and finally, suggesting several opportunities for future research.

CHAPTER 7.
CONCLUSION: KEY FINDINGS, CONTRIBUTIONS, LIMITATIONS, AND OPPORTUNITIES FOR FUTURE RESEARCH

7.1. INTRODUCTION

In this final chapter, I summarise the main findings of the research by briefly revisiting the two research questions and reiterating their purpose. Next, I distil the findings of the current study into four key contributions: (1) Problematising the MOS speed literature, (2) Comprehending speed pathologies in the British AI field, (3) Building and extending the use of Bourdieu's conceptual framework in MOS, and (4) Informing policy and practice in the British AI field. These two sections explain and develop the relevance and significance of the work. Following this, I identify several limitations inherent in my research design. Finally, I outline a number of opportunities for future research for scholars interested in speed, temporality, and related areas.

7.2. KEY FINDINGS OF THE RESEARCH

This thesis set out to problematise speed in and around organisations. It began with the lament that MOS, whilst being a discipline with a long and deep engagement with the theme of speed (e.g. Taylor, 1911; Weber, 1978), has since developed its scholarship regarding speed according to several problematic assumptions and agendas. In particular, the economistic and managerialist mainstream of the field, with a predisposition to view time as a key source of competitive advantage and as a scarce commodity which can be 'saved' by doing more in less time, has largely overlooked, ignored, or suppressed the pathologies of speed. Indeed, the value of speed in MOS is predominantly judged by the market-sanctioned metrics of efficiency and profit. I have argued that many voices are excluded or marginalised in the struggle over the meaning of time and speed in socio-organisational contexts, and speed is most often treated as an inescapable and omnipresent condition of modern organisation.

One central contribution of this thesis is to develop and provide insight, conceptual and empirical, and build theory on alternative agendas and assumptions, of which I set out five. Inspired by the work of critical social theorists such as Paul Virilio (1986) and Hartmut Rosa (2010, 2015, 2019)—both of whom, incidentally, remain relatively untapped theoretical resources for MOS scholars interested in speed, temporality and related issues—I began by emphasising the importance of considering, scrutinising, and problematising potential speed pathologies. I have argued for the need for stakeholder-driven approaches to the evaluation of speed, which would produce more nuanced, contingency-based understandings of speed in socio-organisational settings. Building on this, I noted the importance of considering the perspectives of marginalised voices (e.g. junior workers, civil society pressure groups), in a timely recognition that not all individual or institutional actors have an equal say in shaping the 'temporal commons' (Bluedorn and Waller, 2006). I underscored the need to examine speed resistance and opportunities for temporal agency. Finally, whilst acknowledging powerful structural imperatives for speed (i.e. competitive dynamics, modes of 'dynamic stabilisation', audit cultures, etc.), I highlighted the importance of remaining conscious of and attending to various forms of inertia which often exist beneath hyper-dynamic surfaces.

I have examined these critical re-conceptualisations of speed through an in-depth empirical investigation of the British AI field. Initially, my research was guided by the broad question of how to map the British AI field as a 'structured social space, a field of forces' (Bourdieu, 1998, p.40-41) between differently positioned actors. I originally aimed to provide a broad picture of the competing agendas and interests of various individual and institutional actors in the British AI field on the basis of original empirical evidence. My justification for doing so was that empirical studies of AI are notably lacking—particularly those of a sociological and critical bent (Bloomfield, 2018; Fleming, 2019). This was surprising given the objective size of the field,[56] actors' visceral commitment to it (as documented in chapters 4 and 5), and perhaps most importantly, the field's ability to impact millions of people socially and politically.

However, early during my fieldwork, I realised a prescient and striking set of divisions in the field, which hitherto had not been examined, centred around actors' struggle over the 'temporal commons.' Specifically, this manifested in discussions over what actors considered to be the 'legitimate' pace at which to research and

[56] Allott and colleagues (2018) estimate there are at least 750 organisations involved in AI production in London alone; the AI Sector Deal is worth £950m (HM Government, 2017); meanwhile, MGI (2017) estimate large supranational technology firms collectively spent over $20bn on AI in 2016.

develop AI, and the 'appropriate' temporalities of AI systems. As the fieldwork continued, I formed an impression that these latent structures were far more generative of the field's progress and unfolding than had previously been documented. Consequently, I began to read and problematise the literature pertaining to speed in MOS and related areas. On the basis of this reading and concurrent processes of data collection, analysis, and research introspection, I derived two research questions. The next section will now set them out alongside the answers offered by this thesis.

7.2.1. Research question 1

Research question one asked: *how do differently positioned actors in the British AI field experience time and speed*? The central aim of this question was to examine the contested meaning of speed among diverse stakeholders with varying and often conflicting interests and power resources. This question was developed through concurrent processes of data collection and problematisation of the MOS speed literature. Specifically, it was informed by my questioning the one-sided thesis that speed is predominantly a good thing, and the over-representation of economistic and managerial perspectives on speed. As such, I designed the research question to account for potential speed pathologies in the context of British AI and to consider more diverse perspectives on speed than has traditionally been the case.

Findings for this research question revealed the British AI field to be divided along the dual temporal parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time.

Table 7.1. Revisiting the temporal parameters

Techno-scientific time	**Deliberative-democratic time**
A temporal regime predicated upon the idea that AI R&D is a competitive race where accelerated innovation, and limited (self-) regulation are the appropriate organising principles.	A temporal regime underpinned by the notion that the frames and broad directions of AI R&D should be set by inherently slow deliberative and democratic processes.
Machine-instantaneous time	**Human-reflective time**
A temporal regime which holds that AI systems and decision-making algorithms ought to be engineering to radically transcend human temporalities.	A temporal regime underpinned by a rejection, or scepticism of post-humanist computer-mediated algorithmic thought which risks undermining meaningful human control.

The first divide related to actors' struggle over the 'appropriate' pace of AI R&D. Actors oriented toward techno-scientific time—i.e. large supranational technology companies, defence institutions, VC firms, consultancies, and the British government—generally perceived speed as a positive-enabling force. This thesis has presented their accounts under the theme of 'speed advantages' and identified three sub-themes: 'competitive advantage,' 'thrill,' and 'net-positive.' In line with their priorities for economic growth, profit, and national security, these actors advocated for limited (self-)regulation and accelerated AI R&D. By contrast, actors oriented toward deliberative-democratic time—i.e. civil society pressure groups, and to a lesser extent, professional bodies and universities—expressed deep concern with rapid AI R&D. Their accounts were analysed via the three sub themes of 'temporal desynchronisation/domination,' 'temporally-induced skimping,' and 'precarity.' In the overall, respondents from these institutions highlighted significant dangers and psycho-social pathologies emerging from the intense temporalities of techno-scientific time, and they advocated for various reforms—e.g. moratoria, formal regulation, pharmaceutical-style testing of AI systems, and an ethic of 'slow science'—to produce the time and space required for multi-stakeholder, democratic deliberation and rigorous safety testing in the field.

The second divide related to actors' competition to define the appropriate speed of AI systems, that is, their digital temporalities. Actors oriented toward machine-instantaneous time—i.e. large supranational technology companies, private sector organisations, VC firms, defence institutions, and the British government—saw the continued acceleration of human thought and action via AI systems as crucial to securing 'competitive advantage' and 'efficiency gains.' The empirical data provides considerable insight that these actors believe human thought alone to be too slow and inefficient. Actors oriented toward human-reflective time—i.e. civil society pressure groups—stressed the dangers of using AI systems to organise decision times at speeds beyond the feasible realm of human reflection or intervention. This has important implications for the limits of the development of AI. They highlighted further pathologies of 'temporal desynchronisation,' this time, between psychic individuals and intensive computing systems.

Overall, the findings of this thesis have empirically established that there is no single, consolidated view of speed or its importance in the British AI field, regardless of how loudly or persistently some powerful actors may argue for a seemingly harmonised position. More so than that, the thesis has offered a new interpretive angle by theorising a framework for understanding how these rival perspectives may be conceptualised along the parameters of techno-scientific time versus deliberative-democratic time and machine-instantaneous versus human-reflective time and offered fresh perspective on a major societal concern. This framework can be revisited on page 127 (chapter 4).

7.2.2. Research question 2

The second research question asked: *how is speed reproduced/resisted within the British AI field*? As with my first research question, this question was constructed through concurrent processes of data collection and literature reviewing. Specifically, the purpose of this question was to address the problematisations that argued for the need to consider the speed experiences of marginalised voices, to study how speed is contested and resisted, and finally, to question the perceived omnipresence of speed.

The findings relating to this research question unpacked the power relations underpinning actors' struggles over the temporal commons in the British AI field. Whereas respondents adopted a variety of temporal standpoints, obviously not all actors in the British AI arena have similar levels of legitimacy and authority to shape the temporal commons. Actors oriented toward the temporal regimes of techno-scientific time and machine-instantaneous time (i.e. large supranational technology companies, defence institutions, VC firms, private sector organisations and the British government,) have a disproportionate share of power resources (i.e. capital) in the field.

In chapter 5, I set out the findings to this research question, tracing the history through which these actors have accumulated influence and authority in the British AI field, exploring changes to the logic and capital of the field. The British AI field follows a history of a relative decrease in the autonomy of the field to the benefit of players from the economic and military fields. I identified three main shifts behind these changes: (1) The reduction of field-specific symbolic capital following the 1973 Lighthill report, (2) The commercialisation and militarisation of AI under the Alvey Programme (1983-1988), and (3) Data-driven AI and the intensification of a globalised neoliberal regime of AI R&D via the AI Sector Deal (2009-). This incursion of the market and the military into the AI domain and into scientific fields more broadly has helped to crystalise a particular set of dispositions and tendencies (i.e. habitus) where speed has become perceived as largely positive, necessary, and incontestable. The thesis has provided fresh insight on how the synchronisation requirements of a globalised neoliberal regime generate high-speed forms of social action in AI R&D which actors then reproduce through their ongoing activities and interactions. Similarly, imperatives for instantaneity and speed become widely embedded within many AI systems because the players who dominate the British AI field—large supranational technology firms, the MOD, and so on—value increasingly fast processing, decision and calculation speeds. However, while techno-scientific time and machine-instantaneous time characterise the dominant temporal positions that actors take in the British AI field, domination is not complete within this space. In challenging the taken for granted assumptions, I explored various possibilities for resistance and change where actors oriented toward the slower temporalities of deliberative-democratic time and human-reflective time may succeed in subverting the dominant temporal regimes.

7.3. KEY CONTRIBUTIONS TO THE RESEARCH

Building on the above, the purpose of the current section is to distil the analysis and findings of the thesis and present its significant original contributions, of which there are four: (1) Problematising the MOS speed literature, (2) Comprehending speed pathologies, (3) Building and extending the use of Bourdieu's conceptual framework in MOS, and (4) Informing policy and practice in the British AI field.

7.3.1. Contribution 1: Problematising the MOS speed literature

By *problematising* the speed literature, this thesis makes an important contribution to MOS by opening up new lines of inquiry and offering an alternative agenda for researchers interested in speed, temporality, and related issues (Alvesson and Sandberg, 2020). Through a detailed reading of 65 texts (appendix 1), I identified five problematic assumptions in the mainstream MOS speed literature and suggested five alternatives.

Mainstream assumptions and agendas:

- Believing that speed is predominantly a good thing
- Assuming speed should be evaluated in relation to economic value
- Amplifying dominant perceptions of speed
- Privileging the antecedents to speed
- Treating speed as a general ontological premise from which to theorise

Alternative assumptions and agendas:

- Taking full stock of speed pathologies
- Adopting a stakeholder approach to evaluate performance
- Broadening the sample by considering marginalised voices
- Exploring how speed is contested and resisted
- Questioning the perceived omnipresence of speed

There are two main strengths and offerings of my problematising review which I will now outline. First, problematising may be thought of as a form of 'provoking theory' (Sandberg and Alvesson, 2020). Provoking theory aims to show alternative, eye-opening ways of seeing phenomena rather than simply add to existing theories. To draw from one example in my problematising review, rather than seeing 'continuous morphing' (e.g. Rindova and Kotha, 2001) as representative of fast and continuous transformation, I showed how we might reframe this phenomenon as the hardening and solidification of existing social structures and power relations. In doing so, the goal is not to refine our understanding of some given phenomenon, i.e. continuous morphing. Rather, it is to challenge extant knowledge with the goal of stretching the ways in which we think about taken-for-granted phenomena. Indeed, in my empirical study of the British AI field, I have shown how it is possible to adapt this problematisation to challenge some of my respondents' accounts of high-speed 'revolutionary change' in AI. Although it is true that new AI products and systems are being designed and deployed at unprecedented speed (Hall and Pesenti, 2017), beneath this hyper-dynamic surface lies various forms of inertia, conservatism and slow (hidden) labour. This uncovers new insights and opens up new ways of thinking about temporal pacing in the AI arena. Hence the five problematisations and five counterpoints presented in this thesis make a contribution to MOS by expanding our ways of thinking about speed and related issues. They open up new conversations rather than just continuing old ones (Patriotta, 2017)

Second, there is a methodological contribution to my approach also; although variations of problematising as an approach to reviewing literature and generating research questions have existed for some time (Alvesson and Sandberg, 2011), the specific problematising review outlined in chapter two presents one of the first attempts, to my knowledge, at operationalising the principles laid out in Alvesson and Sandberg's (2020) paper: '*The Problematizing Review: A Counterpoint to Elsbach and Van Knippenberg's Argument for Integrative Reviews*.' In recent years, organisation scholars have called for more impactful review pieces (e.g. Patriotta, 2020; Breslin et al., 2020) as the limits to 'gap-spotting' or 'gap-filling' have become more apparent (Sandberg and Alvesson, 2010).[57] However, specific examples of alternatives to the conventional review styles of integrative, systematic, narrative, and meta-analysis reviews are still

[57] Although gap-spotting sometimes involves complex, constructive and creative processes, it also tends to 'under-problematise' existing literature and reinforces various assumptions (Sandberg and Alvesson, 2010).

lacking. Thus, by presenting a problematising review on the theme of speed in MOS, I offer an early prototype which researchers might adopt or repurpose in their attempts to problematise other domains.

7.3.2. Contribution 2: Comprehending speed pathologies in the British AI field

A second contribution made by this thesis is toward *comprehending* speed pathologies in the British AI field and offering new insights. The purpose of comprehending theory is: 'to develop a meaningful interpretation of the social world, or some significant part of it…so that people may have a clearer understanding of their world, its possibilities of development, and the directions along which it may move' (Blumer, 1954, p.3; see also: Sandberg and Alvesson, 2020). In this thesis, I have presented various 'thick descriptions'[58] such as narratives, metaphors, and discourses to explain how actors experience speed in the British AI field. Although my findings suggest speed is experienced both as a positive-enabling force and a negative-oppressive one, it is the darker, more pathological side of speed which MOS has typically been overlooked, ignored, or suppressed (Linstead et al., 2014). It is for this reason that I emphasise speed pathologies as a focal contribution of this thesis.

The notion of a 'speed pathology' in MOS was first identified by Perlow et al. (2002) who found that organisations could become trapped in a pathological context

[58] Thick descriptions are rich, dense, and evocative accounts of human experience (Geertz, 1973; Ponterotto, 2006). More so, they operate as forms of translation in that they offer (as applied to a specific field/culture) an account that non-members can find intelligible and compelling. In this way, they have phenomenological depth as well as narrative complexity.

where speed trumps other concerns, eventually hampering economic performance. However, Perlow and colleagues' (2002) understanding of speed pathologies were limited by their focus on economistic concerns, understood in their account as 'growth objectives' (p.932). By broadening the sample to include a broad range of interrelated stakeholders with divergent interests and non-economistic agendas—e.g. civil society pressure groups, policymakers, and so on—this study reveals speed and speed imperatives to have significant social, ethical, and political costs which can no longer be overlooked or suppressed by MOS.

The current study defined speed pathologies as *socio-political harms emerging from speed and an emphasis on doing things quickly*. The speed pathologies identified in my respondents' accounts were: (1) temporal desynchronisation/domination, (2) temporally-induced skimping, and (3) precarity. The first speed pathology was based on the understanding that not all systems, processes, or social fields are equally *speedable* (Rosa, 2010, 2015). In the British AI field, respondents highlighted a growing temporal disjuncture between the fast tempo of AI R&D and the time-demanding practices of democratic deliberation and legislative planning. In other words, the acceleration of AI R&D and its translation into commodities for private and public use is quicker than democratic institutions' ability to effectively regulate and make sense of the emergent social dynamics engendered by such processes. Given the possibilities for AI in impacting humanity's everyday lives, this in itself should be recognised as a major societal concern. Findings revealed how this time lag is purposely exploited by some actors who seek to capitalise on temporal disjunctures.

In addition, my analysis uncovered problems of temporal desynchronisation whereby AI systems execute actions on timescales far exceeding human response times. As sub-second phenomena proliferate due to the growing application of AI systems to human affairs, respondents emphasised the deteriorated capacity for human intervention and oversight.

The second speed pathology, temporally-induced skimping, relates to the relationship between imperatives for speed and the curtailment of safety precautions and ethical deliberation. A sense of urgency and strong first-mover advantages in the British AI arena pushes actors to minimise activity not specifically and wholly aimed at techno-scientific advancement, thus leaving ethical and political deliberation struggling to catch up. Respondents employed various metaphors such as an "arms race" and "winner-takes-all" to describe the temporal conditions in the British AI field. However, under such conditions, socially responsible research and innovation becomes less viable as actors downgrade precaution and seek paths of least resistance. To the extent that MOS legitimises speed and equates speed with competitive advantage, there is a risk in further fuelling this kind of behaviour in other contexts.

The third speed pathology, precarity, theorises the relationship between compulsive logics of speed and an environment of fear and instability. This thesis has pointed out the psycho-social burden a rapid succession of developments in AI might cast onto others, including the precarisation of workforces in other social fields. Taken together, these three speed pathologies expand our understanding of how speed can be implicated in the production of various harms. Following Grey (2009, p.27) these points serve to underline the fact that 'there is something deeply problematic about speed—we (individuals, organisations, and society) pay a price for it.'

However, as grave as these pathologies may be, one of my substantive points is that we must beware of reaching for simple solutions to speed pathologies—the most obvious being deceleration and slowness. For a start, speed and acceleration contain positive possibilities and, as some my respondents highlighted, are capable of producing thrill and enjoyment (Vostal, 2014). Furthermore, although slow movements such as 'slow science' (Berg and Seeber, 2015) or 'slow computing' (Kitchin and Fraser, 2020) present opportunities for resistance to a temporal commons with hypertrophied concerns for speed, we must remain vigilant to how 'slow' may be a form of privilege for the powerful who have sufficient resources (i.e. capital) to withdraw from the race (Sharma, 2015). This is not to undermine the potential for collective action where marginalised groups come together to fashion an alternative politics of time (Bluedorn and Waller, 2006). However, just as I have called for a need to problematise *speed* in MOS, there is a need to problematise *slow* too.

One of the concepts I have engaged to appreciate the problem of deceleration is Rosa and colleagues (2017) notion of 'dynamic (de)stabilisation.' As laid out in chapter 5, the authors identify dynamic stabilisation as a defining feature of modern societies like Britain; such a society: 'requires (material) growth, (technological) augmentation, and high rates of (cultural) innovation in order to reproduce itself and preserve the socioeconomic and political status quo' (Rosa et al., 2017, p.53). The problem is that, within capitalist economies, a failure to grow and innovate results in companies closing, job losses growing, and, as a consequence, public expenditures increase while tax revenues decrease. In other words, without growth and innovation, capitalist economies lose their competitiveness and cannot maintain the status quo and reproduce their structure (Rosa et al., 2017). Fundamentally, this leads to progressive logics of escalation in the realms of production, speed, and social change—it is at the core of what capitalist economies and societies do.

This point is all the more important for understanding the British AI context as the British government have made AI R&D central to their 'Industrial Strategy' and plans for economic growth (HM Government, 2017).[59] As this thesis demonstrates, many organisations view the deployment of AI systems as crucial to their own strategies for expansion, increased productivity, and competitiveness. Accordingly, there is a strong desire to speed-up both AI R&D and the computer-mediated temporalities of AI systems. However, this leaves the difficult question of how one might alleviate the pathologies of speed—temporal desynchronisation/domination, temporally-induced skimping, and precarity—if we cannot simply slow down.

Paradoxically, Rosa et al. (2017) contend that the logic of '[s]tabilisation through escalation is the formula for its success *as well as for its downfall*' (p.55, my emphasis). In other words, the current mode of dynamic stabilisation is

[59] Recall that PwC (2017, p.4) estimate that by 2030, UK GDP will be 'up to 10.3% higher as a result of AI—the equivalent of an additional £232bn.'

simultaneously *de*stabilising; we are required to grow and accelerate, yet we must not! As laid out in chapter 5, those authors point to a convergence of crises arising from the current mode of dynamic (de)stabilisation: the climate crisis, the financial crisis, the psychosocial crisis, and the democratic crisis. All these, incidentally, are effectively crises of desynchronisation; between economic/material production and environmental reproduction, between the turnover-rates of financial markets and the "real economy" of material production/consumption, between the speedability of the human mind-body and the pace of life/socio-technical change, and similar to the accounts of my respondents, between techno-scientific innovation and democratic will-formation and decision-making.

It is for this reason that comprehending speed pathologies also requires an understanding of the engines of speed and acceleration at the macro level. Recall the senior policymaker who articulated: "...to this day, we have not yet come up with an alternative to a growth-based paradigm for economics, right? To run our affairs, growth still matters" (Interview #28). That respondent used this narrative to justify minimal regulation and rapid experimentation in the British AI context (i.e. techno-scientific time). However, while it may be true that without economic growth and the speeding up of AI R&D/AI systems as a means of manifesting growth, the British economy may end up in fiscal and monetary crisis and struggle to reproduce its structure,[60] it is also the case that the need for speed in techno-scientific production undermines the deliberate and democratic political shaping of AI; we are greatly

[60] Over the past decade, this has been observed in the evolving economic and political crisis in Greece.

constrained in our capacity to put AI toward public ends rather than private ones. Not only that but it runs the risk of manifesting temporally-induced skimping and precarity. Thus, I do not rehash my respondent's argument in defence of 'techno-scientific time' which I have revealed as deeply problematic. Rather, it is a plea to explore the possibilities of more radical action; imagining alternatives that move beyond the current mode of dynamic (de)stabilisation (Rosa et al., 2017; Rosa, 2019).

Post-growth organising (e.g. Banerjee et al., 2020; Johnsen et al., 2017), alternative organising (e.g. Phillips and Jeanes, 2018), and related theoretical perspectives are likely to offer possibilities. It is notable that a common characteristic among those scholars who seek to outline the contours of a 'post-growth society' that they each embrace ideas of more participatory forms of economic democracy (Meiksins Wood, 1995; Parker et al., 2014). This rather closely reflects what my respondents oriented toward deliberative-democratic time were advocating—not a fundamental slowdown or deceleration in the British AI arena, but greater temporal autonomy. By temporal autonomy I am referring here to the ability to make choices over the pace at which to research and develop AI, rather than the current structural imperative to go at one speed, the fastest possible. Of course, it is difficult to see how such an agenda for social transformation might be enacted in the face of globally interconnected markets and technologies. Britain would struggle to overcome escalatory logics in the realm of speed on its own. Thus, there appears to be a need for global instruments to control these tendencies—a point raised by several of my respondents. Fortunately, there does appear to be a growing global understanding of the need for change—both within the AI arena (e.g. Erdélyi and Goldsmith, 2018) and the global economy more broadly (Rosa et al., 2017). By elucidating speed pathologies in the British AI arena, this thesis makes a small but important contribution to that understanding.

7.3.3. Contribution 3: Building and extending the use of Bourdieu's conceptual framework

A third contribution of this thesis is to *build* and *extend* the use of Bourdieu's conceptual framework by extending its reach and investigating a novel context (i.e. British artificial intelligence) and applying his concepts to advance theorising of time/speed in and around organisations. In recent years, scholars have called for a deeper engagement with Bourdieu's conceptual framework in organisation studies (e.g. Emirbayer and Johnson, 2008; Kerr and Robinson, 2012; Harvey et al., 2020). Bourdieu has been applied to the investigation of: accounting (Carter and Spence, 2014), management education (Vaara and Faÿ, 2012), leadership (Kerr and Robinson, 2011), innovation and learning (Slutskaya and De Cock, 2008), and architecture and space (Kerr and Robinson, 2016), among other topics. However, although the work of Bourdieu is gaining more attention, to my knowledge, this study represents the first time his concepts and analytical tools have been systematically applied to the field of artificial intelligence. Furthermore, whilst practice-based theories of time in organisation studies are undoubtedly influenced by Bourdieu (e.g. Orlikowski and Yates, 2002; Kaplan and Orlikowski, 2013), Bourdieu's concepts have seen very limited application to the investigation of time or speed in and around organisations.

My Bourdieusian analysis of the British AI 'field' contributes to scholarly understanding of AI in a number of important ways. First, organisation scholars have criticised mainstream analyses of AI (e.g. Barrat, 2013; McAfee and Brynjolfsson, 2017) for being overly deterministic (Fleming, 2019; Kellogg et al., 2020). There has been a tendency to view AI as an inevitable seismic shift to which individuals and organisations can only react (Greene et al., 2019). Consequently, much of the analysis asks how AI will change society, rather than how society, as a 'plurality of social fields' (Siisiainen 2003, p. 191), will change, or has changed, AI. However, by examining the British AI field as a (semi-)autonomous domain of activity with its own rules/logic, where various actors with different power resources struggle for the transformation or preservation of the field, reveals the AI domain as at odds with mainstream views. Rather than AI being an independent field/technology capable of causing change in society or organisations, a Bourdieusian approach to AI reveals how competition and struggle between various individual and institutional actors with varying objectives and degrees of influence shapes AI and pulls it in different directions. In the current thesis, I have revealed the extent to which the AI field has become dominated by economic and military players whose power and influence alter legitimate activity in the field. In other words, actors operating according to the wider laws of capitalist economy and national security, have become increasingly responsible for the interpretation and consecration of appropriate practices and norms in the field. Although my focus was on how struggles between differently positioned actors shape the temporal commons in the British AI field, the findings are of broader appeal and relevance to those seeking to overcome binary divisions of AI/society or technology/society (e.g. Fleming, 2019; Kellogg et al., 2020; Raisch and Krakowski, 2021).

In a further extension of Bourdieu's framework, I make the contribution of theorising AI systems as crystallisations of habitus. Although Bourdieu did not focus much on technology (for exceptions: see Bourdieu, 1990; Bourdieu, 1996), Stern (2003) argues that technologies are structured by human practices and in turn they may structure human practices. Thus, from a Bourdieusian standpoint, we can say AI systems embody in material form particular internalised dispositions (i.e. habitus). In this thesis, I focused on how AI systems, as crystallisations of socially organised action, often come to embody certain temporal assumptions and priorities, specifically, imperatives for speed and instantaneity, which operate as a mode of heuristic and 'practical reason' for dominant actors in the field.

In addition to applying Bourdieu's theoretical tools to a novel empirical context, this thesis also demonstrates how Bourdieu has the potential to enrich the analysis of speed in and around organisations for reasons I will now outline. First, his relational perspective helps us to look for struggle and competition over the value, and crucially, the meaning of speed between actors. To date, MOS has predominantly focused on mobilising speed and mapping out its antecedents. However, if speed can be implicated in the production of various pathologies, then it seems important to analyse how speed and fast subjectivities may be resisted (Czarniawska, 2013). By dividing the British AI field into techno-scientific time versus deliberative-democratic time and machine-instantaneous time versus human-reflective time, this thesis has unpacked the struggles between British AI actors over differing temporal orientations and relationships to speed.

Second, Bourdieu's conceptual tools facilitate the important contribution of making power relations explicit (Jones et al., 2016). Bourdieu's sociology is a continuous engagement with the potential and scope for agency available to the powerless (Srinivas, 2013). Power is critical to the study of time and speed because some actors bring disproportionate power resources (i.e. capital) to changing parts of the temporal commons, while others, often equally affected, have little power or influence at all. At times, some actors may not even realise they have agency to shape the temporal commons since temporal norms and structures can exist 'behind the backs of actors' (Rosa, 2010, p.315) (see point 3 below). A key finding in this study was the relatively limited temporal agency experienced by actors in the British AI field, even those in seemingly authoritative positions, such as senior AI government policymakers. The embedding of the British AI field into the global economy and the current mode of dynamic (de)stabilisation (Rosa et al., 2017) creates something of an 'acceleration totality' where there is a structural necessity to grow and speed up AI R&D, however unevenly this growth and acceleration may be distributed.

Third, history is crucial for Bourdieu. This is important because the experience of time can take on the form of a seemingly objective facticity (Rosa, 2010)—it becomes deeply rooted in actors' habitus as something akin to a 'second nature' (Bourdieu and Wacquant, 1992, p.133). In this way, actors can fail to see the temporal commons as something socio-materially constructed. However, by dehistoricising, it is possible to see that speed imperatives and temporal structures are social fabrications. In my analysis of the British AI field, I revealed how imperatives for speed are the result of contingent choices made by groups of people at particular points in time, not unalterable circumstances or facts of nature. Of particular importance in the history of British AI is the neoliberalisation of the university and the commercialisation of AI under Margaret Thatcher in the 1980s. This important moment began to institutionalise an entrepreneurial, metric-driven ethos and a relentless pressure to do more in less time within academic AI research; other candidates for important moments and actors include the Lighthill report (SRC, 1973) and the 2018 AI Sector Deal as outlined in chapter 5. More broadly still, the institutionalisation of a new 'time thrift' in Industrial Britain beginning as early as the 17th century and manifested through new time-keeping technologies (e.g. the clock), increased supervision, a changing division of labour, and the provision of monetary rewards have likely played an important role in socialising actors in the British AI field to a temporal commons which valorises speed (e.g. Thompson, 1967; Weber, 1978).

Fourth, Bourdieu helps us to understand how speed is produced and reproduced through the habitus (i.e. internalised dispositions). In this thesis I have argued that the commercialisation and militarisation of AI R&D and its embeddedness in a global, interconnected market has crystallised a particular set of dispositions where speed is largely viewed as positive, necessary, and absolute.

7.3.4. Contribution 4: Informing policy and practice in the British AI field

My final focal contribution of this thesis is to provide a more empirically and theoretically-grounded understanding of the British AI field. Such an understanding is important for the development of effective and democratic policy in the AI arena. Here, this thesis seeks to make a practical contribution. As I have previously argued, effective policymaking in this social space requires a commitment to investigating the contested terrain of British AI, including the power relations underpinning the field. Yet it remains that high-level AI policy advisory councils in Britain, most notably, the British government's 'AI Council,' are disproportionally composed of elite actors from industry[61]—and as such they can only ever reflect, rather than perturb, power relations in the field. Accordingly, as a researcher committed to promoting equality and diversity and a multitude of voices and representation in this space it seems important to allow alternative perspectives to be heard, which is what I have achieved by bringing to the fore both dominant and dominated temporal perspectives.

In addition, this thesis provides knowledge and understanding of an under-researched area of AI, that is, its (socio-material) temporal dimensions. What I hope to have made clear throughout this thesis is that these dimensions have important social, political, ethical, and technological consequences in the AI arena, and therefore, they warrant more theoretical treatment. As interests grows in 'ethical AI' (Greene et al., 2019; Hagendorff, 2020), AI governance (Sharma et al., 2020) and

[61] For a list of members, see: https://www.gov.uk/government/groups/ai-council#membership

related areas, understanding of the temporal dimensions of AI development and AI systems is likely to become increasingly important. This thesis thus contributes to the emerging body of work that examines socio-temporal aspects of AI (Armstrong et al., 2016; Cave and ÓhÉigeartaigh, 2018).

7.4. LIMITATIONS OF THE RESEARCH

Rorty (1989) advises that we should always think and write with the understanding that other, and perhaps even better, ways of addressing the subject matter than the one currently being pursued may be at hand. In this spirit, I note four limitations with my research design and highlight important trade-offs.

7.4.1. Making greater use of a dual subjective-objective approach

First, I have previously discussed that the analysis of speed submits to both a subjective, phenomenological approach, and simultaneously an 'objective,' calculable one (Shipp and Jansen, 2021).[62] Rosa (2010) recommends that, ideally, researchers interested in speed adopt a combination of both, so investigators might first ask their respondents how they experience time and/or speed imperatives in a socio-organisational setting, and second, calculate how much time is spent on definable episodes of action, for example, the time elapsed between initial development of an

[62] I have put *objective* in quotations marks because, as Holt and Johnsen (2019, p.1561) point out, 'time can only ever be objectified subjective time,' meaning that there is no objective time as such, only versions of time woven into and embodied in human practices, of which clock time [measurable, quantifiable, and 'objective'] is the most dominant form.

AI system and its introduction into the marketplace. If possible, these measurements are then compared with other cases or historical junctures. In this research, however, I relied principally on a subjective, phenomenological approach, although minor references have been made to calculable rates of incident, for example, the growing speed at which HFT-algorithms can execute actions (MacKenzie, 2019), or the intensifying rate of publications by AI doctoral students (Bengio, 2020). Thus, future inquiries could make greater use of the dual subjective-objective approach. This could be in the form of a combination of qualitative interviews and more quantitative time-use studies (e.g. Perlow, 1999). One advantage of this approach is that the investigator may be better equipped to probe the difference between the pace *presented* by respondents (e.g. "everything is occurring at breakneck speed"), and the *actual* tempo they are performed or occur at (Saward, 2017).

Having said that, a key strength of the approach adopted in this thesis is that it has not remained at the level of interpretive phenomenological analysis. Rather, I moved beyond actors' local meanings and knowledge to assess the broader system that makes such meanings possible (Alvesson and Deetz, 2020; Richardson and Howcroft, 2006). The use of Bourdieu has been critical here. A Bourdieusian approach emphasises that actors are embedded in broader socio-material structures and power relations which are generative of, without strictly determining, actors' temporal meanings and practices (Bourdieu, 1977; Orlikowski and Yates, 2002). For Bourdieu, the objective aspect is not related to the measurement of clock time, but rather, analysing and objectifying the power structure arising from the unequal distribution of capital within a field. These ‘objective relations’ exist independently of AI researchers’, or policymakers’ will, shaping those options, values, and strategies which feel available to them (Bourdieu and Wacquant, 1992, p.82). This is something which Rosa’s (2010) recommended approach to the analysis of speed and/or acceleration is likely to miss if it remains at the level of phenomenology and quantitative measurement.

7.4.2. Limits of a (relatively) small data sample

A second limitation of the study is that the sample interview data is relatively small with respect to the overall population of actors in the targeted field. Since approximately 2010, the total number of actors in the British AI field has mushroomed. Hall and Pesenti (2017) estimate that a new AI start-up is built in Britain every week. The launch of the £950m ‘AI Sector Deal’ in 2018 has further led to a burgeoning of new actors in the field, from university AI training centres, to start-ups, to new AI-focused consultancies and civil society pressure groups. As I highlighted in chapter 3, in London alone, Allott et al., (2018) estimate some 750 actors are engaged in the organised production of AI. Thus, the 33 multi-actor interviews conducted as part of this research cover only a limited proportion of total actors in the field.

However, two minor concessions may be granted. First, previous research has shown that ‘small samples’ are capable of offering significant explanatory power when respondents ‘embody and represent meaningful experience-structure links’ (Crouch and McKenzie, 2006, p.493; for a similar argument, see: Berg Johansen and de Cock, 2017). The interviews were conducted with representatives of a wide range of organisations that are influential in the British AI field. Furthermore, the views and experiences of both elite actors and those more junior were gathered to ensure that key institutional views from differently positioned actors were represented in the study. Second, this research does not rely on interviews alone. Notably, the data obtained from the call for evidence issued by the House of Lord's Special Committee on AI was instrumental in gathering a much greater volume and diversity of individual and institutional perspectives than I could feasibly gather through primary research as the sole investigator (some 240 written responses, accumulating to over 2000 pages). In addition, my analytic themes were made more robust by observing 20 AI conferences and events and analysing various historical texts and documents (Voss et al., 2002). Collecting and analysing data from multiple sources, a process known as 'data triangulation' (Denzin, 1978; Yin, 2009), has therefore helped to reduce the limitations of my relatively small interview sample.

Nevertheless, future research could consider incorporating an even broader sample of actors than those investigated here. For example, the views and policies of institutional actors outside the British context, such as foreign governments or overseas research institutes, could be explored. Given the global nature of competition in the AI field, their particular orientations toward time/speed have important implications for the British context. Another option might be to conduct a comparative case study (e.g. Andriopoulos and Lewis, 2009; Eisenhardt, 1989b), exploring struggles over the temporal commons in different domestic AI fields. For example, Garvey (2019) notes that despite Britain and the United States' framing Japan's Fifth Generation Computer Systems Project as an economic and military threat, the FGCS was in fact '[t]he first national, large-scale AI R&D project to be free from military influence and corporate profit motives' (p.621). Whereas Britain's Alvey program was heavily commercialised and militarised, the FGCS was deliberative, open and oriented around public goods (Garvey, 2019). These characteristics are very similar to those described by my respondents oriented toward deliberative-democratic time.

7.4.3. Challenges with generalisability: toward accommodation

A third limitation of this study is the difficulty involved in making generalisations from a single case, such as the reproduction of speed or the possible presence of speed pathologies. This is a criticism frequently levelled at Bourdieu's research (e.g. Jenkins, 1992, Wacquant, 1993). Because Bourdieu's concepts of field, capital and habitus offer a complex understanding of cause and effect, it is difficult to draw easily generalisable conclusions (Oakes et al., 1998). The orientations toward speed via the parameters of techno-scientific time and machine-instantaneous time, for instance, are highly mediated by the structure and capital of the British AI field. However, by focusing on a single case, I sacrificed breadth for depth (Harvey et al., 2020), and did so with a view of infusing history with theory (Scott, 1992; Zald, 1990), putting Bourdieu's concepts to work in illustrating the contested nature of time/speed within a particular socio-organisational setting.

Furthermore, some scholars suggest rejecting concerns with generalisability in favour of 'accommodation' or 'transferability' where investigators and readers use their basic knowledge of comparable contexts to assess likeness and difference (e.g. Duberley and Johnson, 2009; Kincheloe and McLaren, 1998; Lincoln and Guba, 1985). These comparisons are supported through the provision of 'rich details and thick descriptions' (Jack and Anderson, 2002, p. 473). In my view, there is likely to be some overlap between the findings presented here and other techno-scientific fields; for example, the nanotechnology field (Granqvist and Laurila, 2011), or the biotechnology field (Powell, 1999; Shapin, 2008), particularly along the lines of techno-scientific time versus democratic-deliberative time. It also seems that the "race" rhetoric and speed strategies surrounding efforts to develop a COVID-19 vaccine may have some similarities with the study conducted here (e.g. Boffey and Sabbagh, 2021; Callaway, 2020a). For example, when the Russian Ministry of Health became the first nation to approve a vaccine for public use in August 2020, it received widespread condemnation and disapproval as 'dangerously rushed' (e.g. Callaway, 2020b). The Russian vaccine, named Sputnik V after the satellite that famously beat the Americans in the 'space race' to enter earth's orbit, did not complete phase 3 trials before rollout. Dr Anthony Fauci, the director of the United States' National Institute of Allergy and Infectious diseases stated that: "I hope that the Russians have actually definitively proven that the vaccine is safe and effective. I seriously doubt that they've done that" (Fauci, 2021 quoted in: Lavoipierre et al., 2021). It is not for me to determine here whether such accusations are correct, nor to assess the American effort, 'Operation Warp Speed,' but the themes of 'temporally-induced skimping,' 'temporal desynchronisation,' and 'precarity' all seem likely to be pertinent to the particular challenges here. Before COVID-19, the fastest vaccine—the mumps vaccine—took four years to develop, with most vaccines taking 10-15 years to come about (Broom, 2020). To authorise a COVID-19 vaccine in under a year is a fascinating case study for social and organisational scholars interested in the challenges of organising at considerable speed, with all its social, political, and ethical trappings.

7.4.4. Overemphasising conflict and struggle

Another potential limitation of this study relates to the specifically Bourdieusian approach adopted. Some scholars, particularly those in Science and Technology Studies (STS), have criticised Bourdieu's work for having a tendency to overemphasise struggle and conflict over collective action and consensus within fields (Camic, 2011). For example, in his discussion of the scientific field, Bourdieu (1975) describes conditions of 'competitive anarchy' (p.31) and 'ruthless violence' (p.33). He argues that the scientific field operates according to a divisive and 'agonistic logic' (Bourdieu, 1988, p.176), where actors have 'no other choice than to struggle to maintain or improve their position in the field' (Bourdieu, 1982, p.193).

However, STS scholars contend that just as controversies and competition wax in science and technology, so too they wane (e.g. Engelhardt and Caplan 1987;

Machammer et al. 2000; Mitchell 2000). Thus, by training his readers to look for opposition and antagonism, there is a risk that scholars adopting a Bourdieusian approach ignore or understate possibilities for collective consensus or resolution within fields. Given that competition between individuals and institutions appears to be a key driver of speed (Rosa, 2010; Virilio, 1986), and perhaps also of speed pathologies, it seems important not to miss or suppress opportunities for collaboration and consensus. For example, to the extent that AI R&D is framed as a competitive "arms race" for technological superiority between countries, this may make temporally-induced skimping more likely (Armstrong et al., 2016; Cave and ÓhÉigeartaigh, 2018).

In this thesis, one obvious risk of my own emphasis on struggle and division in the British AI field is that I may indirectly contribute to speed logics. By emphasising collaboration, perhaps even overemphasising it, scholars may be able to promote a politics of time that seeks to diminish the hegemony of speed. Of course, one needs to take seriously the question of how much collaboration between firms, research groups, or even nations would alleviate speed imperatives; even within the realms of market competition and industrial secrecy. It may just be that some groups come together in order to increase their relative power (and speed) over others. Without truly international collaboration or democratic control over the frames and pace of AI R&D it is unclear how accentuating cooperation would pacify the engines of acceleration.

7.5. OPPORTUNITIES FOR FUTURE RESEARCH

The line of enquiry I pursued in this thesis produces several potential avenues for future research, of which I want to mention three.

7.5.1. Exploring other aspects of the 'temporal commons' in the British AI field

First, in addition to Bourdieu's concepts of field, capital, and habitus, another central concept utilised here has been Bluedorn and Waller's (2006, p.355) notion of the 'temporal commons,' that is, 'the shared conceptualization of time and temporal values created by a culture-carrying collectivity' (see also: Reinecke and Ansari, 2015). Bluedorn and Waller (2006, p.359) argue that one attribute of such a commons is the 'extent to which it emphasizes speed and values it positively.' In this thesis, I have focused mainly on this attribute, exploring and elucidating actors' competition to define the legitimate speed orientations.

However, it is possible to look at other aspects of the temporal commons, such as the dominant conceptualisation of time. The proliferation of sub-second temporalities within the British AI field raises questions of whether metaphors of 'clock-time' are being replaced by tropes of 'machine-instantaneous time' where time is organised at speeds beyond attainable human consciousness (Hassard, 2002; Urry, 2009). Another attribute of the temporal commons is the extent to which actors emphasise punctuality, i.e. adhering to deadlines, showing up on time, performing actions precisely when scheduled—and value it (e.g. Bluedorn and Denhardt, 1988;

Hardy, 2015). As I have previously highlighted, the study of time in the context of AI hitherto remains a relatively untapped area despite its potential social, ethical, and political consequences. Thus, future research along these lines is encouraged.

7.5.2. Investigating speed experience as it relates to physical movement

Second, this thesis has dealt almost exclusively with speed as it relates to (in)voluntary time pressure—i.e. a sense of doing things quickly, speeding things up—in the British AI field. In other words, the focus has been on speed as it is typically associated with the "rat-race" metaphor. However, Tomlinson (2007) makes a useful analytic distinction between 'sedentary speed,' that is, speed which can be experienced 'without ever stirring from our office desk' (p.3), and speed as it is associated with physical movement (see also Hassan, 2003, p.2; Vostal, 2016). In this thesis, the findings were almost exclusively oriented toward the sedentary kind of speed. This is not to say that sedentary speed does not result in corporeal changes such as increased heart rate which could be considered physical movement, but such analysis is not primary.

Thus, future research seeking to open-up and expand the speed concept could explore those contexts where speed is experienced predominantly as it relates to rapid physical movement through space-time (Vostal, 2014). After-all, a good deal of work and organising involves the activity of traversing space at high-speed, from race car driving to horse-racing to fighter jet piloting; yet the potentially congenial, corporeal experiences of speed associated with this form of movement and work are under-explored (Duffy, 2009). Other possible avenues might include exploring jet lag as a physiological symptom of technologies of speed. There is no cure for the desynchronisation that results from the time-leaping effects of modern aviation; only time and patience allow for the human body's biological clock to reset (Lee, 2017). Examination of these corporeal experiences would further expand our knowledge and insights regarding the speed construct.

7.5.3. Studying speed as it relates to 'post-growth' and 'alternative organising'

Finally, by attempting to problematise speed in and around organisations, I have inevitably run-up against the problem of slow. Within academic (Berg and Seeber, 2015; Osbaldiston, 2013) and popular discourse (Honoré, 2004; 2013), slowness is often depicted (and 'sold') as the solution against the 'violence of speed' (Virilio, 2006, p.62). Honoré (2013), arguably the most well-known proponent of slow ideology, often frames an ethic of slowness as vital to counteracting the pathologies of accelerated society (Vostal, 2014). While he and other proponents of slow—slow science (Berg and Seeber, 2015), slow computing (Kitchin and Fraser, 2020), slow medicine (Sweet, 2017), and otherwise—note that speed still has a place in organisations and society, e.g. slow medicine does not provide an effective treatment for a heart attack, there is relatively little attention paid to the structural forces that *impose* speed and *constrain* slow. Indeed, for Honoré (2004, p.278-279), slow is entirely compatible with capitalism. Furthermore, he argues that it is mainly up to us as individuals to slow down; as he notes: ‘I do think [slowness] is possible for everyone’ (Honoré, cited in Scharrenberg, 2014, n.p.).

However, my findings serve as an alternative view. At an individual level, it is not clear that those with limited resources (i.e. capital) in the British AI arena can embrace an ethic of slow without severe penalty. While limited forms of deceleration are tolerated, e.g. a brief pause or rest, they must be taken on the basis that energy, productivity, and creativity are increased thereafter. Similarly, at a broader level, the embeddedness of British AI within the global economy makes policies and strategies that slowdown AI R&D or AI systems unattractive. There are powerful, near totalising structural imperatives to grow and accelerate—what Rosa et al., (2017) identify as a mode of ‘dynamic (de)stablisation.’ In this way, issues of speed and acceleration appear intimately tied with issues of political economy. Further problematisation and refinement of speed as a topic in MOS would benefit from closer engagement with theoretical perspectives on ‘alternative organising’ (Parker et al., 2014; Phillips and Jeanes, 2018) and ‘post-growth organising/society’ (Banerjee et al., 2020; Johnsen et al., 2017).

7.6. FINAL REMARKS

This chapter summarised the key findings and focal contributions of the thesis. Overall, this study contributes to the theory on time and speed in MOS, as well as to more general debates regarding the sociology of speed. It builds and extends the use of Bourdieu's conceptual framework in MOS by exploring a novel context, that is, the field of British artificial intelligence, and applying Bourdieu's concepts to further the study of time and speed in and around organisations. Finally, this thesis is of value to the formation of policy and practice in the British AI field that is both empirically- and theoretically-grounded.

In the spirit of reflexivity, this chapter also discussed a number of limitations to the empirical study. Research design inevitably entails trade-offs, and I have endeavoured to explain mine, noting the strengths and weaknesses of my various choices. Finally, the chapter outlined several opportunities for further research: (1) exploring other aspects of the temporal commons in the British AI arena, (2) investigating speed experience as it relates to physical movement, and (3) studying speed as it relates to 'post-growth organising/society.' These opportunities should be seen as possibilities to extend the alternative speed agendas outlined in my problematising review and developed throughout this thesis.

REFERENCES

Adam, A. (1998). ***Artificial knowing: Gender and the thinking machine***. London, UK: Routledge.

Adam, A. (2000). Deleting the subject: A feminist reading of epistemology in artificial intelligence. ***Minds and machines***, 10: 231–253.

Adam, B. (1994). ***Time and social theory***. Cambridge, UK: Polity Press.

Adam, B. (1995). ***Timewatch: The social analysis of time***. Cambridge, UK: Polity press.

Adam, B. (2003). When time is money: Contested rationalities of time in the theory and practice of work. ***Theoria: A Journal of Social and Political Theory***, 102: 94–125.

Agar, J. (2020). What is science for? The Lighthill report on artificial intelligence reinterpreted. ***The British Journal for the History of Science***, 53(3): 289–310.

Agger, B. (1989). ***Fast capitalism***. SUNY-Buffalo: University of Illinois Press.

Agger, B. (2004). ***Speeding up fast capitalism: Internet culture, work, families, food, bodies***. London, UK: Routledge.

Agle, B.R., Donaldson, T., Freeman, R.E., Jensen, M.C., Mitchell, R.K., and Wood, D.J. (2008). Dialogue: Toward superior stakeholder theory. ***Business Ethics Quarterly***, 18(2): 153–190.

Agrawal, A., Gans, J., and Goldfarb, A. (2018). ***Prediction machines: The simple economics of artificial intelligence***. La Vergne, US: Harvard Business Review Press.

Aguinis, H., Ramani, R.S., and Alabduljader, N. (2018). What you see is what you get? Enhancing methodological transparency in management research. ***Academy of Management Annals,*** 12(1): 1–28.

Albert, M. and Kleinman, D.L. (2011). Bringing Bourdieu to Science and Technology Studies. ***Minerva***, 49(3): 263–273.

Allott, S., Endsor, M., Goldstaub, T., Janvrin, E., Kingston, J., Miller, M., and Sachania, M. (2018). ***London: The AI growth capital of Europe***. Cognition X. Report commissioned by the Mayor of London.

Alvesson, M. (2003). Beyond neopositivists, romantics and localists: A reflexive approach to interviews in organizational research. ***Academy of Management Review***, 28: 13–33.

Alvesson, M. and Deetz, S. (2020). ***Doing critical research***. London, UK: Sage Publications.

Alvesson, M. and Sandberg, J. (2011). Generating research questions through problematiziation. ***The Academy of Management Review***, 36(2): 247–271.

Alvesson, M. and Sandberg, J. (2020). The problematizing review: A counterpoint to Elsbach and van Knippenberg's argument for integrative reviews. ***Journal of Management Studies***, Online first.

Alvesson, M. and Skoldberg, K. (2000). ***Reflexive methodology***. London: Sage Publications.

Alvesson, M. and Spicer, A. (2012). Critical leadership studies: The case for critical performativity. ***Human Relations,*** 65(3): 367–390.

Amis, J., Slack, T., and Hinings, C.R. (2004). The pace, sequence, and linearity of radical change. ***Academy of Management Journal,*** 47(1): 15–39.

Ancona, D., and Chong, C.-L. (1996). Entrainment: Pace, cycle and rhythm in organizational behavior. ***Research in Organizational Behavior***, 18: 251-284.

Ancona, D. G., Okhuysen, G. A., and Perlow, L. A. (2001). Taking time to integrate temporal research. ***Academy of Management Review***, 26: 512–529.

Ancona, D.G., Goodman, P.S., Lawrence, B.S., and Tushman, M.L. (2001) Time: A new research lens. ***Academy of Management Review,*** 26(4): 645–663.

Andriopoulos, C. and Lewis, M. W. (2009). Exploitation-exploration tensions and organizational ambidexterity: Managing paradoxes of innovation. ***Organization Science***, 20: 696–717.

Armitage, J. (1999). Paul Virilio: An introduction. ***Theory, Culture & Society***, 16(5-6): 1–24.

Armstrong, S., Bostrom, N., and Shulman, C. (2016). Racing to the precipice: A model of artificial intelligence development. ***AI & Society***, 31: 201–206.

Bachelard, G. (1968/1940). ***The philosophy of no: A philosophy of the new scientific mind***. New York, NY: The Orion Press.

Bakker, R.M., and Shepherd, D.A. (2017). Pull the plug or take the plunge: Multiple opportunities and the speed of venturing decisions in the Australian mining industry. ***Academy of Management Journal,*** 60(1): 130–155.

Banerjee, S.B., Jermier, J.M., Peredo, A.M., Perey, R., and Reichel, A. (2020). Theoretical perspectives on organizations and organizing in a post-growth era. ***Organization***, 1–21.

Barlow, J.P. (1999). I'm the Guy. ***Fast Company***, February-March: 84.

Barrat, J. (2013). ***Our final invention: Artificial intelligence and the end of the human era.*** New York: Thomas Dunne.

Bastani, A. (2020). ***Fully automated luxury communism: A manifesto***. Verso Books.

Bauer, F. (2015). A literature review and a suggested future research agenda on speed of integration in M&A. In: Risberg, A., Meglio, O., and King, D. (eds.) "***The Routledge companion to mergers and acquisitions.***" London: Routledge.

Bauer, F. and Matzler, K. (2014). Antecedents of M&A success: The role of strategic complementarity, cultural fit, and degree and speed of integration. ***Strategic Management Journal,*** 35(2): 269–291.

Baum, R. and Wally, S. (2003). Strategic decision speed and firm performance. ***Strategic Management Journal,*** 24(11): 1107–1129.

Bauman, Z. (1999). ***Liquid Modernity***. Oxford, UK: Polity Press.

Berg Johansen, C. and De Cock, C. (2018). Ideologies of time: How elite corporate actors engage the future. ***Organization***, 25(2), 186–204.

Berg, M. and Seeber, B.K. (2016). ***The slow professor: Challenging the culture of speed in the academy***. Toronto: University of Toronto Press.

Berns, T. and Rouvroy, A. (2013). Algorithmic governmentality and prospects of emancipation. ***Réseaux***, 177(1): 163–197.

Bifo, F.B. (2011). ***After the future***. California, US: AK Press.

Bloomfield, B. (2018/1987). **T*he question of artificial intelligence: Philosophical and sociological perspectives***.' Oxon, UK: Routledge.

Bloomfield, B.P. and Vurdubakis, T. (2015). Mors ex machina: Technology, embodiment and the organization of destruction. ***Organization Studies***, 36: 621–641.

Blount, S. and Janicik, G. A. (2001). When plans change: Examining how people evaluate timing changes in work organizations. ***Academy of Management Review***, 26: 566–585.

Bluedorn, A. and Waller, M.J. (2006). The stewardship of the temporal commons. ***Research in Organizational Behavior***, 27: 355–396.

Bluedorn, A. C. and Denhardt, R. B. (1988). Time and organizations***. Journal of Management,*** 14: 205–230.

Blumer, H. (1954). What is wrong with social theory? ***American Sociological Review***, 18: 3–10.

Blyton, J., Hassard, S. Hill, S., and Starkey, S. (1989). **Time, work, and organisation**. London, UK: Routledge: 35-56.

Boffey, D. and Sabbagh, D. (2021). 'We had to go it alone': how the UK got ahead in the Covid vaccine race. ***The Guardian*** (January 29th). Available at: https://www.theguardian.com/society/2021/jan/29/we-had-to-go-it-alone-how-the-uk-got-ahead-in-the-covid-vaccine-race.

Boltanski, L. and Chiapello, E. (2006). ***The new spirit of capitalism.*** London: Verso.

Booth, J.A. (2021). ***Costa Rica: Demilitarization and democratization***. Oxford, UK: Research Encyclopedia of Politics.

Bostrom, N. (2014). ***Superintelligence: Paths, dangers, strategies***. Oxford, UK: Oxford University Press.

Bourdieu, P. (1977). ***Outline of a theory of practice***. Cambridge, UK: Cambridge University Press.

Bourdieu, P. (1984). ***Distinction: A social critique of the judgement of taste***. Cambridge, MA: Harvard University Press

Bourdieu, P. (1986) 'The forms of capital', in J. G. Richardson (ed.), ***Handbook of Theory and Research for the Sociology of Education***. New York: Greenwood Press, 241–58.

Bourdieu, P. (1990). ***Photography: A middle-brow art***. California, US: Stanford University Press.

Bourdieu, P. (1991). ***Language and symbolic power***. Cambridge, UK: Polity Press.

Bourdieu, P. (1992). ***The logic of practice.*** Cambridge, UK: Polity Press.

Bourdieu, P. (1993). ***The field of cultural production***. Cambridge, UK: Polity Press.

Bourdieu, P. (1996). ***The rules of art.*** California, US: Stanford University Press.

Bourdieu, P. (1998). ***On television***. New York, US: The New Press.

Bourdieu, P. and Wacquant, L. J. D. (1992). ***An invitation to reflexive sociology***. Cambridge: Polity Press.

Bourdieu, P., Chamboredon, J., and Passeron, J. (1991). ***The craft of sociology***. Berlin: Walter de Gruyter.

Boxall, P. and Macky, K. (2014). High-involvement work processes, work intensification and employee well-being. ***Work, Employment and Society***, 28(6): 963–984.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. ***Qualitative Research in Psychology***, 3(2): 77–101.

Brooke, B. (2019). Beyond Profit and Politics: Reciprocity and the Role of For-Profit Business. ***Journal of Business Ethics,*** 239–251.

Broom, D. (2020). How long does it take to develop a vaccine? ***World Economic Forum.*** Available at: https://www.weforum.org/agenda/2020/06/vaccine-development-barriers-coronavirus/.

Brose, H.G. (2004). Introduction. Towards a culture of non-simultaneity? ***Time & Society***, 13(1): 5–26.

Brown, R. and Ramin, Z. (2020). UK announces military spending boost, AI, and 'space command' initiatives. ***CNN***. Available at: https://edition.cnn.com/2020/11/18/uk/uk-military-budget-increase-intl/index.html.

Brown, W. (2015). ***Undoing the demos: Neoliberalism's stealth revolution***. New York: Zone Books.

Brynjolfsson, E. and McAfee, A. (2014). ***The second machine age: Work, progress, and prosperity in a time of brilliant technologies***. New York, NY: W.W. Norton.

Callaway, E. (2020a). The race for coronavirus vaccines: A graphical guide. ***Nature*** (April 28th). Available at: https://www.nature.com/articles/d41586-020-01221-y.

Callaway, E. (2020b). Russia's fast-track coronavirus vaccine draws outrage over safety. ***Nature*** (August 11th). Available at: https://www.nature.com/articles/d41586-020-02386-2.

Camic, C. (2011). Bourdieu's cleft sociology of science. ***Minerva***, 29: 275–293.

Case, P., Lilley, S., and Owen, T. (2006). ***The speed of organization: Advances in organization studies.*** Copenhagen: Copenhagen Business School Press.

Casillas, J.C. and Acedo, F.J., (2013). Speed in the internationalization process of the firm. ***International Journal of Management Reviews***, 15(1): 15–29.

Cave, S. and ÓhÉigeartaigh, S. (2018). An AI race for strategic advantage: Rhetoric and risks. ***Association for the Advancement of Artificial Intelligence***.

Chalmers, D.J. (1992). 'Subsymbolic computation and the Chinese Room', in J. Dinsmore (ed.), ***The Symbolic and Connectionist Paradigms: Closing the Gap***. East Sussex, UK: Psychology Press.

Chalmers, D.J. (2010). The Singularity: A Philosophical Analysis, ***Journal of Consciousness Studies,*** 17: 7-65.

Chambers, J. and Gearhart, S. (2018). ***Reversing the cult of speed in higher education: The slow movement in the arts and humanities***. UK: Routledge

Chen, M.J. and Hambrick, D. (1995). Speed, stealth, and selective attack: How small firms differ from large firms' competitive behavior. ***Academy of Management Journal,*** 38: 453–482.

Chetty, S., Johanson, M., and Martín, O.M. (2014). Speed of internationalization: Conceptualization, measurement and validation. ***Journal of World Business***, 49: 633–650.

Clark, C. (2018). ***Time and power***. Princeton: Princeton University Press.

Clegg, S., Kornberger, M., and Pitsis, T. (2008). ***Managing and organizations: An introduction to theory and practice***. (2nd Ed.) London, UK: Sage Publications.

Collins, H. (2018). ***Artifictional intelligence: Against humanity's surrender to computers***. Cambridge, UK: Polity Press.

Combs, J.G., Crook, T.R., and Rauch, A. (2019). Meta-analytic research in management: Contemporary approaches, unresolved controversies, and rising standards. ***Journal of Management Studies***, 56(1): 1–18.

Conger, K. (2021). Hundreds of Google employees unionize, culminating years of activism. ***New York Times*** (Jan 4th). Available at: https://www.nytimes.com/2021/01/04/technology/google-employees-union.html.

Connolly, W. E., (2009). 'Speed, concentric cultures and cosmopolitanism', in H. Rosa and W.E. Scheuerman (eds.), ***High-speed society: Social acceleration, power, and modernity***. Pennsylvania: Pennsylvania State University Press, 261–287.

Coote, A., Harper, A., and Stirling, A. (2020). ***The case for a four-day week***. Polity Press.

Crary, J. (2013). ***24/7: Late capitalism and the ends of sleep***. London, UK: Verso Books.

Crevier, D. (1993). ***AI: The tumultuous history of the search for artificial intelligence.*** New York: Basic Books.

Crouch, M. and McKenzie, H. (2006). The logic of small samples in interview-based qualitative research. ***Social Science Information,*** 45(4): 483–99.

Cummings, M. M. (2014). Man versus machine or man + machine? ***IEEE Intelligent Systems***, 29: 62–69.

Czarniawska, B. (2013). Is speed good? ***Scandinavian Journal of Management,*** 29: 7–12.

Czarniawska, B. (2014). ***Social science research: From field to desk***. UK: Sage Publications.

D'Aveni, R.A. (1994). ***Hypercompetition: Managing the dynamics of strategic maneuvering.*** New York: Free Press.

D'Aveni, R.A., Dagnino, G.B, and Smith, K.G. (2010). The age of temporary advantage. ***Strategic Management Journal,*** 31(13): 1371–1385.

Davenport, T. H. and Kirby, J. (2016). ***Only humans need apply: Winners and losers in the age of smart machines***. New York, NY: HarperCollins.

De Clerq, D. and Voronov, M. (2011). Sustainability in entrepreneurship: A tale of two logics. ***International Small Business Journal***, 29(4): 322–344.

Delbridge, R. (1998). ***Life on the line in contemporary manufacturing: The workplace experience of lean production and the 'Japanese' model***. Oxford, UK: Oxford University Press.

Denzin, N. K. (1978). ***The research act: A theoretical introduction to sociological methods.*** New York, US: Praeger.

Derfus, P.J., Maggitti, P.G., Grimm C.M., and Smith K.G. (2008). The red queen effect: Competitive actions and firm performance***. Academy of Management Journal***, 51(1): 61–80.

DiMaggio, P. and Powell, W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. ***American Sociological Review***, 48: 147–160.

Domingos, P. (2015). ***The master algorithm: How the quest for the ultimate learning machine will remake our world***. Basic Books.

Dreyfus, H.L. (1965). ***Alchemy and artificial intelligence***. RAND paper.

Dreyfus, H.L. (1972). ***What computers can't do: A critique of artificial reason***. Boston, MIT Press.

DTI (Department of Trade and Industry). (1982). ***The Alvey Programme for advanced information technology***. National Audit Office.

du Gay, P. (2017). '"A pause in the impatience of things:" Notes on formal organization, the bureaucratic ethos, and speed', in J. Wajcman and N. Dodd (eds.), ***The sociology of speed: Digital, organizational, and social temporalities.*** Oxford: Oxford University Press, 86–101.

Duberley, J. and Johnson, P. (2009). 'Critical management methodology', in M. Alvesson, R. Bridgman, and H. Willmott (eds.), ***The Oxford handbook of critical management studies***. Oxford, UK: Oxford University Press.

Duffy, E. 2009. ***The speed handbook: Velocity, pleasure, modernism***. Durham, NC: Duke University Press.

Dykes, B.J., Hughes-Morgan, M., and Kolev, K.D. (2018). Organizational speed as a dynamic capability: Toward a holistic perspective. ***Strategic Organization***, 17(2): 266–278.

Edwards, P.E. (1986). Border wars: The science, technology, and politics of artificial intelligence. ***Radical America,*** 19(6): 39–53.

Eisenhardt, K. M. (1989a). Making fast strategic decisions in high-velocity environments. ***Academy of Management Journal,*** 32(3): 543–576.

Eisenhardt, K. M. (1989b). Building theories from case study research. ***Academy of Management Review***, 14(4): 532–550.

Elliott-Cooper, A. (2020). Defund the police is not nonsense. Here's what it really means. ***The Guardian*** (July 2nd). Available at: https://www.theguardian.com/commentisfree/2020/jul/02/britain-defund-the-police-black-lives-matter.

Ellwood, P., Grimshaw, P., and Pandza, K., (2017). Accelerating the innovation process: A systematic review and realist synthesis of the research literature. ***International Journal of Management Reviews***, 19(4): 510–530.

Elsbach, K. and van Knippenberg, D. (2020). Creating high-impact literature reviews: An argument for integrative reviews, ***Journal of Management Studies***, online first.

Emirbayer, M. (1997). Manifesto for a relational sociology, ***The American Journal of Sociology***, 103(2): 281–317.

Emirbayer, M. and Johnson, V. (2008). Bourdieu and organizational analysis. ***Theory and Society***, 37(1): 1–44.

Engelhardt, H.T. and Caplan, A.L. (1987). ***Scientific controversies***. Cambridge, UK: Cambridge University Press.

Erdélyi, O.J. and Goldsmith, J. (2018). Regulating Artificial Intelligence: Proposal for a global solution. ***Proceedings of the First AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society***: 95–101.

Etzkowitz, H. (2008). ***The triple helix: University-industry-government innovation in action***. New York, NY: Routledge.

Eubanks, V. (2018). ***Automating inequality: How high-tech tools profile, police, and punish the poor.*** New York: St. Martin's Press.

Facebook. (2012). ***Little red book***. Available at: https://v1.benbarry.com/project/facebooks-little-red-book

Fast, E. and Horvitz, E. (2017). Long-term trends in the public perception of artificial intelligence. ***Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence***: 963–969.

Fay, B. (1975). ***Social theory and political practice***. London: Allen and Unwin.

Fenwick, M., Kaal, W.A., and Vermeulen, E. (2017). Regulation tomorrow: What happens when technology is faster than the law. ***American University Business Law Review***, 6(3): 561–594.

Flaherty, M.G., Meinert, L., and Dalsgård, L. (2020). ***Time work: Studies of temporal agency***. Berghahn Books.

Fleck, J. (1987). 'Development and establishment in Artificial Intelligence', in B. Bloomfield (ed.), ***The question of Artificial Intelligence: Philosophical and sociological perspectives***. Oxon, UK: Routledge.

Fleming, P. (2019). Robots and organization studies: Why robots might not want to steal your job. ***Organization Studies***, 40(1): 23–37.

Fontana, A. and Frey, J. (2005). 'The interview: from neutral stance to political involvement', in N. Denzin, Y. Ands Lincon (eds.), ***The Sage handbook of qualitative research***, 3rd Ed. Thousand Oaks, CA: Sage, 695–728.

Forbes, D.P. (2005). Managerial determinants of decision speed in new ventures. ***Strategic Management Journal,*** 26: 355–366.

Ford, M. (2015). ***The rise of robots***. New York, US: Basic Books.

Forsythe, D.E. (1993). Engineering knowledge: The construction of knowledge in artificial intelligence. ***Social Studies of Science***, 23: 445–77.

Forsythe, D.E. (2002). ***Studying those who study us: An anthropologist in the world of artificial intelligence***. California, US: Stanford University Press.

Fowler, B. (1994). The hegemonic work of art in the age of electronic reproduction: An assessment of Pierre Bourdieu. ***Theory, Culture and Society***, 11: 129–154.

Furman, J. and Seamans, R. (2019). AI and the economy. ***Innovation policy and the economy***, 19(1): 161–191.

Future of Life (2015). ***Autonomous weapons: An open letter from AI & robotics researchers***. Available at: https://futureoflife.org/open-letter-autonomous-weapons.

Future of Life (2020). ***National and international AI strategies***. Available at: https://futureoflife.org/national-international-ai-strategies/.

Gane, N. (2006) Speed up or slow down? Social theory in the information age. ***Information, Community and Society***, 9(1): 20–38.

Gardiner, M.E. (2017). Critique of accelerationism. ***Theory, Culture & Society,*** 34(1): 29–52.

Garnelo, M. and Shanahan, M. (2019). Reconciling deep learning with symbolic artificial intelligence: Representing objects and relations. ***Current Opinion in Behavioral Sciences,*** 29: 17–23.

Garvey, C. (2019). Artificial intelligence and Japan's Fifth Generation: The information society, neoliberalism, and alternative modernities. ***Pacific Historical Review***, 88(4): 619–658.

Geertz, C. (1973). ***The interpretation of cultures: Selected essays***. New York: Basic Books.

Gibney, E. (2016). AI firms lure academics. ***Nature***, 532(7600): 422–423.

Glezos, S. (2012). ***The politics of speed: Capitalism, the state and war in an accelerating world***. London, UK: Routledge.

Glucksmann, M. (1998). "What a difference a day makes": A theoretical and historical exploration of temporality and gender. ***Sociology*** 32: 239–58.

Golsorkhi, D., Leca, B., Lounsbury, M., and Ramirez, C. (2009). Analysing, accounting for and unmasking domination: On our role as scholars of practice, practitioners of social science and public intellectuals. ***Organization***, 16(6): 779–797.

Gond, J.P., Mena, S., and Mosonyi, S. (2020). The performativity of literature reviewing: Constituting the corporate social responsibility literature. ***Organizational Research Methods***. 1–34.

Granqvist, N. and Laurila, J. (2011). Rage against self-replicating machines: Framing science and fiction in the US nanotechnology field. ***Organization Studies***, 32: 253–280.

Granqvist, N., and Gustafsson, R. (2016). Temporal institutional work. ***Academy of Management Journal***, 59: 1009–1035.

Greene, D., Hoffman, A.L., and Stark, L. (2019). Better, nicer, clearer, fairer: A critical assessment of the movement for ethical artificial intelligence and machine learning. ***Hawaii International Conference on System Sciences***, 1–10.

Greenwood, A. and Bernardi, A. (2014). Understanding the rift, the (still) uneasy bedfellows of History and Organization Studies. ***Organization***, 21(6): 907–932.

Greenwood, R., Raynard, M., Kodeih, F., Micelotta, E. R., and Lounsbury, M. (2011). Institutional complexity and organizational responses. ***The Academy of Management Annals***, 5: 317–371.

Grey, C. (2009). 'Speed', in P. Hancock and A. Spicer (eds.), ***Understanding corporate life***. London: Sage, 27–45.

Grudin, J. (2009). AI and HCI: Two fields divided by a common focus. ***AI magazine*** (winter ed.): 48–57.

Guice, J. (1998). Controversy and the state: Lord ARPA and intelligent computing. ***Social Studies of Science***, 28(1): 103–138.

Guo, H., Wang, L., Chen, F., and Liang, D (2014). Scientific big data and Digital Earth. ***Chinese Scientific Bulletin***, 59(35): 5066–5073.

Gurvitch, G. (1964). ***The spectrum of social time.*** Dordrecht: D. Reidel Publishing Co.

Habermas, J. (2001). ***Post-national constellation***. Cambridge, MA: MIT Press.

Hagendorff, T. (2020). The ethics of AI ethics: An evaluation of guidelines. ***Minds and Machines,*** 30: 99–120.

Halevy, A., Norvig, P., and Pereira, F. (2009). The unreasonable effectiveness of data. ***IEEE Intelligent Systems***: 1541–1672.

Hall, W. and Pesenti, J. (2017). **Growing the Artificial Intelligence Industry in the UK**, Report for HM Government, London, United Kingdom.

Hallen, B.L., Cohen, S.L., and Bingham, C.B. (2020). Do accelerators work? If so, how? ***Organization Science***, 31(2): 378–414.

Hambrick, D. C., and Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. ***Academy of Management Review***, 9: 193–206.

Hardy, M. (2015). ***Time management: How to break the late habit, embrace punctuality, and always be on time***. Create space publishing.

Harvey, C., Yang, R., Muellar, F., and Maclean, M. (2020). Bourdieu, strategy and the field of power. ***Critical Perspectives on Accounting,*** 73: 1–15.

Harvey, D. (1989). ***The condition of postmodernity***. Oxford: Blackwell.

Harvey, D. (2005). ***A brief history of neoliberalism***. Oxford: Oxford University Press.

Hashai, N., Kafouros, M., and Buckley, P.J. (2018). The performance implications of speed, regularity, and duration in alliance portfolio expansion. **Journal of Management**, 44(2): 707–731.

Hassan, R. (2003). ***The Chronoscopic society: Globalization, time and knowledge in the network economy***. New York: Peter Lang.

Hassan, R. (2010). Social acceleration and the network effect: A defence of social 'science-fiction' and network determinism. ***British Journal of Sociology***, 61: 356–374.

Hassard, J. (2002). Essai. Organizational time: Modern, symbolic and postmodern reflections***. Organization Studies***, 23: 885–892.

Hawk, A., Pacheco-de-Almeida, G., and Yeung, B. (2013). Fast-mover advantages: Speed capabilities and entry into the emerging submarket of atlantic basin LNG. ***Strategic Management Journal,*** 34(13): 1531–1550.

Hern, A. (2020). New UK tech regulator to limit power of Google and Facebook. ***The Guardian*** (November 27th). Available at: https://www.theguardian.com/technology/2020/nov/27/new-uk-tech-regulator-to-limit-power-of-google-and-facebook.

Hilgers, M. and Mangez, E. (2014). ***Bourdieu's theory of social fields: Concepts and applications.*** London, UK: Routledge.

HM Government (2017). ***Industrial Strategy: Building a Britain fit for the future***. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf.

HM Government (2018). ***AI Sector Deal.*** Available at: https://www.gov.uk/government/publications/artificial-intelligence-sector-deal/ai-sector-deal.

HM Government (2019a). ***AI Sector Deal: One Year On.*** *Office for Artificial Intelligence.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819332/AI_Sector_Deal_One_Year_On__Print_.pdf.

HM Government (2019b). ***Leading experts appointed to AI Council to supercharge the UK's artificial intelligence sector***. Available at: https://www.gov.uk/government/news/leading-experts-appointed-to-ai-council-to-supercharge-the-uks-artificial-intelligence-sector.

HM Government (2020). ***New competition regime for tech giants to give consumers more choice and control over their data, and ensure businesses are fairly treated***. Press release. Available at: https://www.gov.uk/government/news/new-competition-regime-for-tech-giants-to-give-consumers-more-choice-and-control-over-their-data-and-ensure-businesses-are-fairly-treated.

Hoelzle, U. (2012). The Google Gospel of Speed. ***Think with Google***. Available at: https://www.thinkwithgoogle.com/intl/en-gb/future-of-marketing/digital-transformation/the-google-gospel-of-speed-urs-hoelzle.

Hoffman, S.G. (2017). Managing ambiguities at the edge of knowledge: Research strategy and artificial intelligence in an era of academic capitalism. ***Science, Technology & Human Values***, 42(4): 703–740.

HoL (House of Lords). (2018). ***AI in the UK: ready, willing and able?*** Select Committee on Artificial Intelligence: report of Session. House of Lords.

Holstein, J. and Gubrium, J. (1995). ***The active interview***. Thousand Oaks, CA: Sage.

Holt, R., and Johnsen, R. (2019). Time and organization studies. ***Organization Studies,*** 40(10): 1557–1572.

Homburg, C., and Bucerius, M. (2006). Is speed of integration really a success factor of mergers and acquisitions? An analysis of the role of internal and external relatedness. ***Strategic Management Journal***, 27(4): 347–367.

Honoré, C. (2004). ***In praise of slow: How a worldwide movement is challenging the cult of speed.*** London: Orion Books.

Honoré, C. (2013). ***The slow fix: Solve problems, work smarter, and live better in a world addicted to speed***. New York: HarperOne.

Horowitz, M. C., Allen, G.C., Kania, E.B., and Scharre, P. (2018). ***Strategic competition in an era of artificial intelligence***. New York: Centre for New American Security.

Howe, J. (2007). ***Artificial intelligence at Edinburgh University: A perspective***. Retrieved from: http://www.inf.ed.ac.uk/about/AIhistory.html.

Hsu, E.L. (2015). The slow food movement and time shortage: Beyond the dichotomy of fast or slow. ***Journal of Sociolog***y, 51(3): 628–642.

Human Rights Watch (2020). ***Stopping killer robots: Country positions on banning fully autonomous weapons and retaining human control***. Available at: https://www.hrw.org/report/2020/08/10/stopping-killer-robots/country-positions-banning-fully-autonomous-weapons-and.

Huy, Q. N. (2001). Time, temporal capability, and planned change. ***The Academy of Management Review,*** 26: 601– 623.

Ignatow, G. and Robinson, L. (2017). Pierre Bourdieu: Theorizing the digital. ***Information, Communication and Society***, 20(7): 950–966.

Ivanov, S. (2020). ***NeurIPS 2020. Comprehensive analysis of authors, organizations and countries.*** Available at: https://medium.com/criteo-engineering/neurips-2020-comprehensive-analysis-of-authors-organizations-and-countries-a1b55a08132e.

Jack, S. L. and Anderson, A.R. (2002). The effects of embeddedness on the entrepreneurial process. ***Journal of Business Venturing***, 17: 467–487.

Jackson, N. and Carter, P. (1991). 'In defence of paradigm incommensurability'. ***Organization Studies***, 12: 109–27.

James, I. (2009). ***Paul Virilio***: **Routledge critical thinkers.** London: Routledge

Jenkins, R. (1992). ***Pierre Bourdieu***. New York: Routledge.

Jermier, J., Forbes, L., Benn, S., and Orsato, R. (2006). 'The new corporate environmentalism and beyond: Green politics and critical reflective organizational systems', in S.R. Clegg, C. Hardy, T.B. Lawrence, W.R. and Nord (eds.), ***The Sage Handbook of Organization Studies***. London: Sage, 618–650.

Jiang, R.J., Beamish, P.W., and Makino, S. (2014). Time compression diseconomies in foreign expansion. ***Journal of World Business***, 49: 114–121.

Johnsen, C. G., Nelund, M., Olaison, L., and Sørensen, B.M. (2017). Organizing for the post-growth economy. ***Ephemera theory & politics in organization***. 17(1): 1–21.

Johnson, N. (2017). To slow or not? Challenges in subsecond networks. ***Science***, 355(6327): 801–802.

Johnson, N., Zhao, G., Hunsader, E., Qi, H., Johnson, N., Meng, J., and Tivnan, B. (2013). Abrupt rise of new machine ecology beyond human response time. ***Nature***, 3(1): 2627–2627.

Jones, C., Svejenova, S., Pedersen, J.S., and Townley, B. (2016). Misfits, mavericks and mainstreams: Drivers of innovation in the creative industries. ***Organization Studies,*** 37(6): 751–768.

Jones, J.W. (1993). ***High-speed management: Time-based strategies for managers and organizations***. San Francisco: Jossey-Bass.

Judge, W. Q. and Miller, A. (1991). Antecedents and Outcomes of Decision Speed in Different Environmental Context. ***Academy of Management Journal,*** 34(2): 449–463.

Kaplan, S. and Orlikowski, W. J. (2013). Temporal work in strategy making. ***Organization Science***, 24: 965–995.

Katz, Y. (2017). Manufacturing an Artificial Intelligence revolution. ***SRRN***. Available at: http://dx.doi.org/10.2139/ssrn.3078224.

Kellogg, K.C., Valentine, M.A., and Christin, A., (2020). Algorithms at work: The new contested terrain of control. ***Academy of Management Annals***, 14(1): 366–410.

Kern, S. (2003). ***The culture of time and space: 1880-1918***. Cambridge, US: Harvard University Press.

Kerr, R. and Robinson, S. (2012). From symbolic violence to economic violence: The globalizing of the Scottish banking elite. ***Organization Studies***, 33: 247–66.

Kerr, R. and Robinson, S. (2016). Architecture, symbolic capital and elite mobilisations: The case of the Royal Bank of Scotland corporate campus. ***Organization***, 23(5): 699–721.

Kessler, E. and Chakrabarti, A. (1996). Innovation speed: A conceptual model of context, antecedents, and outcomes. ***Academy of Management Review,*** 21(4): 1143–1191.

Kidder, T. (1981). ***The soul of a new machine.*** Boston: Little, Brown and Company.

Kincheloe, J.L. and McLaren, P.L. (1998). 'Rethinking critical theory and qualitative research', in N. Denzin and Y. Lincoln (eds.), ***The landscape of qualitative research: Theories and issues***. Thousand Oaks, CA: Sage Publications.

Kind, C. (2019). We need a moratorium on use of facial recognition technology. ***Financial Times*** (8th September), Available at: https://www.ft.com/content/6ecf7150-cfbd-11e9-b018-ca4456540ea6.

Kiss, A.N. and Barr, P.S. (2017). New product development strategy implementation duration and new venture performance: A contingency-based perspective. ***Journal of Management***, 43(4): 1185–1210.

Kitchin, R. and Fraser, A. (2020). ***Slow computing: Why we need balanced digital lives.*** Bristol, UK: Bristol University Press.

Klarner, P. and Raisch, S. (2013). Move to the beat: Rhythms of change and firm performance. ***Academy of Management Journal***, 56: 160–184.

KMPG. (2018). ***How the UK can win the AI race***. Part of KPMG's 'Industrial Strategy series.' (September 2018), KPMG.

Knight, W. and Hao, K., (2019). Never mind killer robots--here are six real AI dangers to watch out for in 2019. ***MIT Technology Review*** (January 7th). Available at: https://www.technologyreview.com/2019/01/07/137929/never-mind-killer-robotshere-are-six-real-ai-dangers-to-watch-out-for-in-2019/.

Kownatzki, M., Walter, J., Floyd S.W., and Lechner, C. (2013). Corporate control and the speed of strategic business unit decision making. ***Academy of Management Journal,*** 56(5): 1295–1324.

Kunisch, S., Bartunek, J.M., Mueller, J., and Huy, Q.N. (2017). Time in strategic change research. ***Academy of Management Annals,*** 11(2): 1005–1064.

Lamaison, P. (1986). From rules to strategies: An interview with Pierre Bourdieu. ***Cultural Anthropology,*** 1(1):110–120.

Lave, R., Mirowski, P., and Randalls, S. (2010). Introduction: STS and neoliberal science. ***Social Studies of Science,*** 40(5): 659–75.

Lavoipierre, A., Smiley, S., and Mitchell, S. (2021). The rollout of Russia's Sputnik vaccine was roundly criticized, now more than a billion doses have been ordered.

ABC News (February 12th). Available at: https://www.abc.net.au/news/2021-02-13/is-the-russian-vaccine-better-than-oxford-astrazeneca/13144076.

Layder, D. (1998). ***Sociological practice: Linking theory and social research.*** London: SAGE.

Leander, A. (2008) 'The "Realpolitik of Reason"', in A. Klotz and D. Prakash (eds.), ***Qualitative Methods in International Relations***. Basingstoke: Palgrave Macmillan, 11–27.

Lee, C. (2017). ***Jet lag (Object lessons).*** London, UK: Bloomsbury Academic

Lee, K. (2018). ***AI Superpowers***. Boston, US: Houghton Mifflin Harcourt.

Lewin, K. (1951). ***Field theory in social science***. New York, US: Harper.

Lewis, M. (2014). ***Flash boys***. New York, US: W.W. Norton & Company.

Lieberman, M. B. and Montgomery, C.B. (1988). First-mover advantages. ***Strategic Management Journal***, 9: 41–58.

Lincoln Y.S. and Guba, E.G. (1985). ***Naturalistic inquiry.*** Newbury Park, CA: Sage Publications.

Lindebaum, D., Vesa, M., and den Hond, F. (2020). Insights from The Machine Stops to better understand rational assumptions in algorithmic decision-making and its implications for organizations. ***Academy of Management Review***, 45: 247–263.

Linstead, S., Maréchal, G., and Griffin, R. (2014). Theorizing and researching the dark side of organization. ***Organization Studies*****,** 35(2): 165–188.

Machammer, P., Marcello P., and Aristides, B. (2000). ***Scientific controversies: Philosophical and historical perspectives***. New York: Oxford University Press.

MacKenzie, D. (2016). 'Capital's geodesic: Chicago, New Jersey, and the material sociology of speed', in J. Wajcman and N. Dodd (ed.), ***The sociology of speed: Digital, organisational, and social temporalities***. Oxford, UK: Oxford University Press.

MacKenzie, D. (2018). Material signals: A historical sociology of high-frequent trading. ***American Journal of Sociology***, 123(6): 1635–1683.

MacKenzie, D. (2019). Just how fast? ***London Review of Books***, 41(5): 23–24..

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

MacLean, M., Harvey, C., and Kling, G. (2014). Pathways to power: Class, hyper-agency and the French corporate elite. ***Organization studies***, 35(6): 825–855.

Martell, L. (2014). The slow university: Inequality, power and alternatives, ***Qualitative Social Research***, 15(3).

Martínez-Plumed et al., (2018). The facets of artificial intelligence: A framework to track the evolution of AI. ***Proceedings of the Twenty-Seventh International Joint Conference on Artificial Intelligence (IJCAI-18).***

Marx, K. (1973). ***Grundrisse***. Trans by. Martin Nicolaus. London, UK: Penguin Books.

Marx, K. and Engels, F. (1857/2015). ***The communist manifesto***. London, UK: Penguin Classics.

McAfee, A. and Brynjolfsson, E. (2017). ***Machine, platform, crowd: Harnessing our digital future.*** New York: W. W. Norton.

McCarthy, J. (1990). Lessons from the Lighthill flap. ***The Knowledge Engineering Review***, 5(4): 288–290.

McCarthy, J., Minsky, J., Rochester, N., and Shannon, C.E. (1955/2006). A proposal for the Dartmouth summer research project on Artificial Intelligence. ***AI magazine***, 27(4): 12.

McCorduck, P. (2004). ***Machines who think: A personal inquiry into the history and prospects of artificial intelligence***. (2nd Ed). Canada: A.K. Peters.

Meiksins Wood, E. (1995). ***Democracy against capitalism: Renewing historical materialism.*** Cambridge, UK: Cambridge University Press.

Mellino, E. (2020). Google and Microsoft staff set to join the UK's first tech trade union. ***Wired*** (September 22nd). Available at: https://www.wired.co.uk/article/united-tech-and-allied-workers-union.

MGI (McKinsey Global Institute). (2017). ***Artificial intelligence: The next digital frontier?*** June 2017. McKinsey and Company.

MGI (McKinsey Global Institute). (2019). ***Artificial intelligence in the United Kingdom: Prospects and challenges***. June 2019. McKinsey and Company.

Mirowksi, P. (2003). McCorduck's Machines Who Think after twenty-five years: Revisiting the origins of AI. ***AI Magazine***, 24(4): 135.

Mitchell, G. R. (2000). Whose shoe fits best? ***Science, Technology & Human Values,*** 25: 52–86.

MOD (Ministry of Defence) (2019). ***Defense Innovation Priorities***. Available at: https://www.gov.uk/government/publications/defence-innovation-priorities.

Morgan, G. and Spicer, A. (2009). 'Critical approaches to organizational change', in M. Alvesson, R. Bridgman, H. and Willmott (eds.), ***The Oxford handbook of critical management studies***. Oxford, UK: Oxford University Press.

Mosakowski, E. and Earley, P.C. (2000). A selective review of time assumptions in strategy research. ***Academy of Management Review,*** 25(4): 796–812.

Munir, K.A. (2019). Challenging institutional theory's critical credentials. ***Organization Theory***, 1: 1–10.

Murgia, M. (2019). AI academics under pressure to do commercial research. ***Financial Times*** (March 13th). Available at: https://www.ft.com/content/94e86cd0-44b6-11e9-a965-23d669740bfb.

Mutch, A. (2003). Communities of Practice and Habitus: A Critique. ***Organization Studies,*** 24: 383–401.

Nadkarni, S., Chen, T.X., and Chen, J.H. (2016) The clock is ticking! Executive temporal depth, industry velocity, and competitive aggressiveness. ***Strategic Management Journal*** 37(6): 1132–1153.

Neely Jr., B.H., Lovelace, J.B., Cowen, A.P., and Hiller, N.J. (2020). Metacritiques of upper echelon theory: Verdicts and recommendations for future research. ***Journal of Management,*** 46(5): 1029–1062.

NEF (New Economics Foundation). (2019). ***Co-operatives unleashed. Doubling the size of the UK's co-operative sector***. Available at: https://neweconomics.org/uploads/files/co-ops-unleashed.pdf.

NEF (New Economics Foundation). (2020). ***A shorter working week***. Available at: https://neweconomics.org/campaigns/shorter-working-week.

Newell, S. and Marabelli, M. (2015). Strategic opportunities (and challenges) of algorithmic decision-making: A call for action on the long-term societal effects of 'datification.' ***The Journal of Strategic Information Systems***, 24(1): 3–14.

Nilsson, N. J. (2009). ***The quest for artificial intelligence.*** Cambridge, UK: Cambridge University Press.

Noonon, J. (2019). Paul Virilio and the temporal conditions of philosophical thinking. ***Time & Society***, 28(2): 763–782.

Noys, B. (2014). ***Malign velocities: Accelerationism and capitalism.*** Winchester, UK: Zero Books.

O'Neil, C. (2016). ***Weapons of math destruction: How big data increases inequality and threatens democracy.*** New York: Broadway Books.

Oakes, L.S., Townley, B., and Cooper, D.J. (1998). Business planning as pedagogy: Language and control in a changing institutional field. ***Administrative Science Quarterly,*** 43(2): 257–292.

Oakley, B. and Owen, K. (1989). ***Alvey: Britain's Strategic Computing Initiative***. Cambridge, US: MIT Press.

Ogbonna, E. and Harris, L.C. (2004). Work intensification and emotional labour among UK university lecturers: An exploratory study. ***Organization Studies***, 25(7): 1185–1203.

Olazaran M. (1996). A sociological study of the official history of the perceptrons controversy. ***Social Studies of Science,*** 26(3): 611–659.

Oliver, D. and Roos, J. (2005). Decision-making in high-velocity environments: The importance of guiding principles. ***Organization Studies***, 26(6): 889–913.

Orlikowski, W. J. and Yates, J. (2002). It's about time: Temporal structuring in organizations. ***Organization Science***, 13: 684–700.

Osbaldiston, N. (2013). ***Culture of the slow: Social deceleration in an accelerated world***. New York: Palgrave Macmillan.

Oxford Martin School (2016). ***Technology at work V.2.0: The future is not what it used to be***. Available at: http://www.oxfordmartin.ox.ac.uk/downloads/reports/Citi_GPS_Technology_Work_2.pdf.

Özbilgin, M. and Tatli, A. (2005). Understanding Bourdieu's contribution to organization and management studies. ***Academy of Management Review,*** 30(4): 855–877.

Özbilgin, M. and Tatli, A. (2011). Mapping out the field of equality and diversity: Rise of individualism and voluntarism. ***Human Relations,*** 30(4): 855–877.

Pacheco de Almeida, G., Hawk, A., and Yeung, B. (2015). The right speed and its value. ***Strategic Management Journal***, 36: 159–176.

Pacheco-de-Almeida, G. (2010). Erosion, time compression, and self-displacement of leaders in hypercompetitive environments. ***Strategic Management Journal***, 31(13): 1498–1526.

Parker, M. and Jary, D. (1995). The McUniversity: Organization, management and academic subjectivity. ***Organization,*** 2(2): 319–338.

Parker, M., Cheney, G., Fournier, V., and Land, C. (2014). ***The Routledge companion to alternative organization.*** Abingdon: Routledge.

Parkins, W. and Craig, G. (2006). ***Slow living.*** Sydney: University of New South Wales Press.

Patton, M. Q. (1990). ***Qualitative evaluation and research method***s (2nd ed). Newbury Park, CA: Sage.

Pazzanese, C. (2020). Ethical concerns mount as AI takes bigger decision-making role in more industries. ***The Harvard Gazette*** (October 26th). Available at: https://news.harvard.edu/gazette/story/2020/10/ethical-concerns-mount-as-ai-takes-bigger-decision-making-role/.

Perlow, L., Okhuysen, G., and Repenning, N. (2002). The speed trap: Exploring the relationship between decision making and temporal context. ***The Academy of Management Journal,*** 45(5): 931–955.

Perlow, L.A. (1999). The time famine: Toward a sociology of work time. ***Administrative Science Quarterly***, 44: 57–81.

Perrow, C. (1984). ***Normal Accidents: Living with High-Risk Technologies***. New York: Basic Books.

Pesapane, F., Codari, M., and Sardanelli, F. (2018). Artificial intelligence in medical imaging: threat or opportunity? ***European Radiology Experimental,*** 2(1): 1–10.

Phan, P., Wright, M., and Lee, S-H. (2017). From the Editors: Of robots, artificial intelligence and work. ***Academy of Management Perspectives***, 31(4): 253–255.

Phillips, M. and Jeanes, E. (2018). What are the alternatives? Organising for a socially and ecologically sustainable world. ***Ephemera theory & politics in organization***, 18(4): 695–708.

Ponterotto, J. (2006). Brief note on the origins, evolution, and meaning of the qualitative research concept 'thick description.' ***The Qualitative Report,*** 11(3): 538–549.

Popp Berman, E. (2011). ***Creating the market university: How academic science became an economic engine.*** Princeton, NJ: Princeton University Press.

Powell, W.W. (1999). The social construction of an organisational field: the case of biotechnology, ***International Journal of Biotechnology***, 1(1): 42–66.

Power, N. (2015). Decapitalism, left scarcity, and the state. ***Fillip***, 20: 56.

Pratt, M. (2000). The good, the bad, and the ambivalent: Managing identification among Amway distributors. ***Administrative Science Quarterly***, 45(3): 456–493.

PwC. (2017). ***The economic impact of Artificial Intelligence on the UK economy***, Technical report, PwC, London, United Kingdom.

Raisch, S. and Krakowski, S. (2021). Artificial intelligence and management: The automation-augmentation paradox. ***Academy of Management Review***, 46(1): 192–210.

Reid, M. (2013). Social policy, "deservingness", and sociotemporal marginalization: Katrina survivors and FEMA. ***Sociological Forum***, 28(4): 742–763.

Reinecke, J. and Ansari, S. (2015). When times collide: Temporal brokerage at the intersection of markets and developments. ***Academy of Management Journal***, 58(2): 618–648.

Rhodes, C. (2019). ***Disturbing business ethics: Emmanuel Levinas and the politics of organization***. London, Routledge.

Rhodes, C. and Fleming, P. (2020). Forget political social responsibility. ***Organization***, online first: 1–9.

Richardson, H.J. and Howcroft, D. (2006). The contradictions of CRM—a critical lens on call centres. ***Information and Organization***, 16: 143–168.

Rindova V.P. and Kotha, S. (2001). Continuous “morphing”: Competing through dynamic capabilities, form, and function. ***Academy of Management Journal,*** 44(6): 1263–1280.

Romanelli, E. and Tushman, M. (1994). Organizational transformation as punctuated equilibrium: An empirical test. ***Academy of Management Journal***, 37: 1141–1166.

Rorty, R. (1989). ***Contingency, irony and solidarity***. Cambridge: Cambridge University Press.

Rosa, H. (2003). Social acceleration: Ethical and political consequences of a desynchronized high-speed society. ***Constellations***, 10: 3–33.

Rosa, H. (2010). ***Alienation and acceleration: Towards a Critical Theory of late-modern temporality***. Malmö: NSU Press.

Rosa, H. (2015). ***Social acceleration: A new theory of modernity***. Trans. by Jonathan Trejo-Mathys. New York: Columbia University Press.

Rosa, H. (2019). ***Resonance: A sociology of our relationship to the world***. Trans. by James Wagner. New Jersey: Wiley.

Rosa, H. and Scheuerman, W.E. (2009). ***High-speed society: Social acceleration, power and modernity***. Penn State: Pennsylvania State University Press.

Rosa, H., Dörre, K., and Lessenich, S. (2017). Appropriation, activation and acceleration: The escalatory logics of capitalist modernity and the crises of dynamic stabilization. ***Theory, Culture and Society***, 34(1): 53–73.

Rosenblatt, F. (1958). The Perceptron: A probabilistic model for information storage and organization in the brain. ***Psychological Review***, 65(6): 386–408.

Rubin, B.A. (2007). ***Workplace temporalities***. Amsterdam: Elsevier JAI.

Rumelhart, D., Hinton, G.E., and Williams, R.J. (1986). Learning representations by back-propagating errors. ***Nature***, 323: 533–536.

Russell, S. and Norvig, P. (2009). ***Artificial Intelligence: A modern approach.*** (3rd edition). Saddle River, NJ: Prentice Hall.

Ruth D, Wilson S, Alakavuklar O, et al. (2018). Anxious academics: Talking back to the audit culture through collegial, critical, and creative autoethnography. ***Culture and Organization,*** 24(2): 154–170.

Saariluoma, P. (1995). ***Chess players’ thinking: A cognitive psychological approach***. New York: Routledge.

Sandberg, J. and Alvesson, M. (2010). Ways of constructing research questions: gap-spotting or problematization? ***Organization***, 18(1): 23–44.

Sandberg, J. and Alvesson, M. (2020). Meanings of theory: Clarifying theory through typification, ***Journal of Management Studies***. Online first: 1–30.

Savage, M. and Silva, E. (2013). Field analysis in cultural sociology. ***Cultural Sociology***, 7(2): 111–126.

Saward, M. (2017). Agency, design and 'slow democracy.' ***Time & Society***, 26(3): 362–383.

Schacht, R. (1971). ***Alienation***. London: Allen and Unwin.

Schein, E. H. (1992)***. Organizational culture and leadership*** (2nd ed.). San Francisco: Jossey-Bass.

Schneider, N. (2018). ***Everything for everyone***. New York: Nation Books.

Scheuerman, W.E. (2004). ***Liberal democracy and the social acceleration of time***. Maryland, US: John Hopkins University Press.

Schoonhoven C.B., Eisenhardt K.M., and Lyman, K. (1990). Speeding products to market: Waiting time to first product introduction in new firms. ***Administrative Science Quarterly,*** 35: 177–207.

Scott, W. R. (1992). 'The organization of environments', in J. W. Meyer and W. R. Scott (eds.), ***Organizational environments***. London, UK: Sage Publications, 155–175.

Searle, J.R. (1980). Minds, brains, and programs. ***Behavioral and Brain Sciences***, 3(3): 417–457.

Sessions, G. (1987). The deep ecology movement: A review. ***Environmental Review: ER***, 11(2): 105–125.

Shannon, C. and McCarthy, J. (1956). ***Automata studies. Annals of mathematics studies***. Princeton: Princeton University Press.

Shapin, S. (2008). ***The scientific life: A moral history of a late modern vocation.*** London, UK: The University of Chicago Press.

Sharma, G.D., Yadav, A., and Chopra, R. (2020). Artificial intelligence and effective governance: A review, critique and research agenda. ***Sustainable futures***, 2: 100004.

Sharma, S. (2014). ***In the meantime: Temporality and cultural politics***. Durham, US: Duke University Press.

Shi, W. S. and Prescott, J. E. (2012). Rhythm and entrainment of acquisition and alliance initiatives and firm performance: A temporal perspective. ***Organization Studies***, 33: 1281–1310.

Shimoni, B. (2017). What is resistance to change? A habitus-oriented approach. ***Academy of Management Perspectives***, 31(4): 257–270.

Shipp, A.J. and Jansen, K.J. (2021). The "Other" time: A review of the subjective experience of time in organizations. ***Academy of Management Annals***, 15(1), Online First.

Shore, C. and Selwyn, T. (1998). ‘The marketisation of higher education: Management discourse and the politics of performance’, in D. Jary and M. Parker (eds.), ***The new higher education: Issues and directions for the post-Dearing university***. Staffordshire, UK: Staffordshire University Press, 153–172.

Shore, C. and Selwyn, T. (2015). Audit culture revisited: Rankings, ratings, and the reassembling of society. ***Current anthropology***, 56(3): 421–444.

Shore, C. and Wright, S. (2000). Coercive accountability: The rise of audit culture in higher education.’ In: ***Audit Cultures***, edited by M. Strathern, 57–89. London, UK: Routledge.

Shrivastava, P. (1986). Is strategic management ideological? ***Journal of Management***, 12(3): 363–377.

Siggelkow, N. and Rivkin, J.W. (2005). Speed and search: Designing organizations for turbulence and complexity. ***Organization Science***, 16: 101–122.

Siisiainen, M. (2003). Two concepts of social capital: Bourdieu vs. Putnam. ***International Journal of Contemporary Sociology***, 40(2): 183–204.

Silver, D. et al. (2016). Mastering the game of Go with deep neural networks and tree search. ***Nature***, 529: 484–489.

Simmel, G. (1900/1978). ***The philosophy of money***. Trans by Tom Bottomore and David Frisby. London: Routledge.

Simmel, G. (1903/1950). ***The metropolis and mental life.*** Trans by Kurt Wolff. New York: Free Press.

Simon, H. A. and Newell, A. (1958). Heuristic problem solving: The next advance in operations research. ***Operations research***, 6(1): 1–10.

Skade, L., Stanske, S., Wenzel, M., and Koch, J. (2021). Temporary organizing and acceleration: On the plurality of temporal structures in accelerators. ***Research in the Sociology of Organizations***.

Slutskaya, N. and De Cock, C. (2008). The body dances: Carnival dance and organization, ***Organization***, 15(6): 851–68.

Smith, A. (2018). Franken-algorithms: the deadly consequences of unpredictable code. ***The Guardian*** (October 20th) Available at: https://www.theguardian.com/technology/2018/aug/29/coding-algorithms-frankenalgos-program-danger.

Smyth, M. (2004). The process of demilitarization and the reversibility of the peace process in Northern Ireland. ***Terrorism and Political Violence***, 16(3): 544–566.

Sorokin, P. and Merton, R., (1937). Social time: A methodological and functional analysis. ***The American Journal of Sociology***, 42: 615–629.

Spence, C. and Carter, C. (2014). An exploration of the professional habitus in the Big 4 accounting firms. ***Work, Employment, and Society,*** 28(6): 946–962.

Spradley, J. P. (1979). ***The ethnographic interview***. New York: Holt, Rinehart & Winston.

SRC (Science Research Council). (1973). ***Artificial intelligence: a general survey***. Prepared by James Lighthill. London: SRC: 1–21.

Stafford, P. (2019). Future exchanges eye shift to 'Flash Boys' speed bumps. ***Financial Times*** (May 30th), Available at: https://www.ft.com/content/d99eaf40-7dfc-11e9-81d2-f785092ab560.

Stalk, G., Jr. and Hout, T. J. (1990). ***Competing against time: How time-based competition is reshaping global markets.*** New York: Free Press.

Stein, F. (2019). Selling speed: Management consultants, acceleration, and temporal angst. ***Political and legal anthropology review***: 41(1): 103–117.

Stengers, I. (2018/2013). ***Another science is possible: A manifesto for slow science***, trans Stephen Muecke. Cambridge, Polity Press.

Sterne, J. (2003). Bourdieu, technique, and technology. ***Cultural Studies,*** 17(3/4): 367–389.

Sterns, P. (2013). ***Demilitarization in the contemporary world***. Illinois, US: University of Illinois Press.

Stiegler, B. (2016). ***Automatic society: The future of work***. Trans by Daniel Ross. Cambridge, UK: Polity Press.

Stiegler, B. (2019). ***The age of disruption: Technology and madness in computational capitalism***. Trans by Daniel Ross. Cambridge, UK: Polity Press.

Suddaby, R. (2014). Editor's comments: Why theory? ***Academy of Management Review***, 39: 407–411.

Sullivan, O. (1997). Time waits for no (wo)man: An investigation of the gendered experience of domestic time. ***Sociology,*** 31: 221–39.

Sweet, V. (2017). ***Slow medicine: The way to healing***. New York, US: Riverhead Books.

Tan, M. and Mathews, J.A. (2015). Accelerated internationalization and resource leverage strategizing: The case of Chinese wind turbine manufacturers. ***Journal of World Business***, 50: 417–427.

Taylor, F. (1911). ***The principles of scientific management***. New York: Harper and Brothers.

Taylor, S. and Land. C. (2014). Organizational anonymity and the negotiation of research access. ***Qualitative Research in Organizations and Management: An International Journal***, 9(2): 98–109.

Tech Nation (2019). VC investment in UK Artificial Intelligence startups increases almost six-fold in five years. ***Tech Nation***. Available at:

https://technation.io/news/venture-capital-investment-in-uk-artificial-intelligence-startups-increases-almost-six-fold-in-five-years/.

Teece D.J., Pisano, G., and Shuen, A. (1997). Dynamic capabilities and strategic management. ***Strategic Management Journal,*** 18(7): 509–533.

Thompson, E.P. (1967). Work, time-discipline, and industrial capitalism. ***Past and Present***, 38: 56–97.

Thrift, N. (2000). Performing cultures in the new economy. ***Annals of the Association of American Geographers***, 90(4): 674–692.

Thrift, N. (2005). ***Knowing capitalism.*** Thousand Oaks, California: SAGE Publications.

Tomlinson, J. (2007). ***The culture of speed: The coming of immediacy***. Thousand Oaks, CA: Sage.

Turing, A. M. (1950). Computing machinery and intelligence. ***Mind***, 59: 433–460.

Urry, J. (2009). 'Speeding up and slowing down', in H. Rosa and W.E. Scheuerman (eds.), ***High-speed society: Social acceleration, power, and modernity***. Pennsylvania: Pennsylvania State University Press, 179–200.

Vaara, E. and Faÿ, E. (2011). How can a Bourdieusian perspective aid analysis of MBA education. ***Academy of Management Learning and Education***, 10(1): 27–39.

Vaara, E. and Faÿ, E. (2012). Reproduction and change on the global scale: A Bourdieusian perspective on management education. ***Journal of Management Studies,*** 49(6): 1023–1051.

Van Bommel, K. and Spicer, A. (2011). Hail the snail: Hegemonic struggles in the Slow Food movement. ***Organization Studies***, 32(12): 1717–1744.

Vermeulen, F. and Barkema, H. (2002). Pace, rhythm and scope: Process dependence in building a profitable multinational corporation. ***Strategic Management Journal***, 23: 637–653.

Virilio, P. (1986/1977). ***Speed and politics: An essay on dromology,*** trans. Mark Polizzotti. New York: Semiotext(e).

Virilio, P. (1999). ***Polar inertia***. London, UK: Sage Publications.

Virilio, P. (2005). ***Negative horizon: An essay in dromoscopy***, trans. Michael Degener. Continuum.

Virilio, P. and Lotringer, S. (1998). ***Pure war.*** trans. Mark Polizzotti. New York: Semiotext(e).

Voss, C., Tsikriktsis, N. and Frohlich, M. (2002). Case research in operations management. ***International Journal of Operations & Production Management***, 22: 195–219.

Vostal, F. (2014). Thematizing speed: Between critical theory and cultural analysis. ***European Journal of Social Theory*,** 17(1): 95–114.

Vostal, F. (2015). Speed kills, speed thrills: Constraining and enabling accelerations in academic work-life. ***Globalization, Societies and Education***, 13(3): 295–314.

Vostal, F. (2016). ***Accelerating academia: The changing structure of academic time***. Palgrave Macmillan.

Vostal, F. (2019). Acceleration Approximating Science and Technology Studies: On Judy Wajcman's Recent Oeuvre. ***Science, Technology, & Human Values***, 44(4), 686-706.

Wacquant. L. (1989). Towards a reflexive sociology: A workshop with Pierre Bourdieu. ***Sociological Theory***, 7(1): 26-63.

Wacquant, L. (1993). On the tracks of symbolic power: Prefatory notes to Bourdieu's 'State Nobility'. **Theory, Culture and Society**, 10, 1–17.

Wacquant, L. (2002). De l'idéologie à la violence symbolique: culture, classe et conscience chez Marx et Bourdieu. In J. Lojkine (Ed.), Les sociologies critiques du capitalisme (pp. 25‑40). Paris: Presses Universitaires de France.

Wacquant, L. (2004). Following Pierre Bourdieu into the field. ***Ethnography,*** 5(4): 387–414.

Wajcman, J. (2008). Life in the fast lane? Towards a sociology of technology and time. ***The British Journal of Sociology***, 59(1): 59–77.

Wajcman, J. (2015). ***Pressed for time: The acceleration of life in digital capitalism***. Chicago: University of Chicago Press.

Wajcman, J. (2019). How Silicon Valley sets time. ***New Media & Society***, 21(6): 1272–1289.

Wajcman, J. and Dodd, N. (2016). ***The sociology of speed: Digital, organisational, and social temporalities***. Oxford, UK: Oxford University Publishing.

Wakabayashi, D. and Shane, S. (2018). Google Will Not Renew Pentagon Contract That Upset Employees. ***New York Times*** (June 1st), Available at: https://www.nytimes.com/2018/06/01/technology/google-pentagon-project-maven.html.

Wally, S. and Baum, J.R. (1994). Personal and structural determinants of the pace of strategic decision making. ***Academy of Management Journal***, 37(4): 932–956.

Warrell, H. (2021). UK military planners deploy AI to gain edge over adversaries. ***Financial Times*** (March 12th). Available at: https://www.ft.com/content/94d59a36-099a-4add-80d3-475127b231c7.

Watson, T. (2000). Ethnographic fiction science: making sense of managerial work and organizational research processes with Caroline and Terry. ***Organization***, 7(3): 489–510.

Weber, M. (1958). ***The Protestant ethic and the spirit of capitalism.*** Trans. Parsons. Original work published 1904–1905. New York: Charles Schribners.

Weber, M. (1978). ***Economy and society*** (Vol. 1). Berkeley: University of California Press.

Weizenbaum, J. (1976). ***Computer power and human reason***. San Francisco, CA: W.H. Freeman.

Whelen, A. (2019). "Ask for More Time": Big Data Chronopolitics in the Australian Welfare Bureaucracy. ***Critical Sociology***, 1–14.

Wiener, N. (1948). ***Cybernetics: Or control and communication in the animal and the machine***. Boston: MIT Press.

Wiggins, R.R. and Ruefli, T.W. (2005). Schumpeter' s ghost: Is hypercompetition making the best of times shorter? ***Strategic Management Journal***, 26(10): 887–911.

Williams, A. and Srnicek, N. (2014). '#Accelerate: Manifesto of an accelerationist politics', in: ***#Accelerate: The accelerationist reader***. Falmouth: Urbanomic, 347–362.

Williams, O. (2019). Amazon ML chief departs to take up DeepMind professorship at Cambridge. ***New Statesman*** (September 19th) Available at: https://tech.newstatesman.com/business/neil-lawrence-amazon-deepmind-cambridge.

Willmott, H. (1995). Managing the academics: Commodification and control in the development of university education in the U.K. ***Human Relations,*** 48(9): 993–1027.

Wolcott, H. (1990) ***Writing up qualitative research***, Newbury Park, CA: Sage.

Wong, J.C. (2020). More than 1,200 Google workers condemn firing of AI scientist Timnit Gebru, ***The Guardian***, (December 4th). Available at: https://www.theguardian.com/technology/2020/dec/04/timnit-gebru-google-ai-fired-diversity-ethics.

Yin, R. K. (2009). ***Case study research: Design and methods*** (4th Ed.). Thousand Oaks, CA: Sage.

Zald, M. N. (1989). 'History, theory and the sociology of organizations', in J.E. Jackson (ed.), ***Institutions in American society: Essays in market, political and social organizations***. Ann Arbor, MI: University of Michigan Press, 81–108.

Zander, U. and Kogut, B. (1995). Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test. ***Organization Science***, 6(1): 76–92.

Zerubavel, E. (1981). **Hidden rhythms: Schedules and calendars in social life.** Chicago: Chicago University Press.

Zilber, T. B. (2006). 'Mythologies of speed and the shaping of Israeli hi-tech industry', in P. Case, S. Lilley, and T. Owens (eds.), ***The speed of organization***. Copenhagen, Denmark: Copenhagen University Press.

Zuboff, S. (2015). Big other: surveillance capitalism and the prospects of an information civilization. ***Journal of Information Technology***, 30: 75–89.

Zuboff, S. (2019). ***The age of surveillance capitalism: The fight for the future at the new frontier of power.*** London, UK: Profile Books.

APPENDIX 1. THE PROBLEMATISING REVIEW

Level 1: Speed, pace and accelerat* in MOS

Author(s) /year	What conversation does this text contribute to?	What is being probed?	What are the key findings or claims?	What data or methods are being used?	What measures or conceptualisations of speed are employed?	What is taken for granted? What assumptions underly this work?
Eisenhardt (1989)	Strategic decision making speed	Antecedents to, and performance of, fast strategic decision making in high velocity environments (HVE)	In HVEs, organisations with rapid decision-making have superior performance. Fast decision makers: integrate strategic decisions, have experienced counsellors, immerse themselves in real-time information, consider more alternatives, and quickly resolve conflicts.	Empirical-Mixed	HVEs are those in which "...changes in demand, competition, and technology are so rapid and discontinuous that information is often inaccurate, unavailable, or obsolete" (p.816). Decision speed measured by beginning and end times for each decision.	Performance measured by combination of: 1) sales and profitability, 2) CEOs' self-reports of company effectiveness, and 3) a comparison of the self-rating to ratings CEOs gave to competitors. Sample is executives only. Downplays ethical, political and ideological dimensions of speed.
Judge and Miller (1991)	Strategic decision making speed	Deductively testing Eisenhardt's (1989) findings, but adding more varied environments	Fast decision making and performance positively related, but only in HVE. Formalisation slows down strategic decision making.	Empirical-Mixed	Decision speed is: "the time between the first reference to deliberate action, such as scheduling a meeting or seeking information, to the time in which a commitment to act was made" (p.455).	Follows tradition of testing 'financial performance' (p.450). Assumes correct to measure performance through: 1) profitability and 2) sales growth. Interviews are with executives only.
Wally and Baum (1994)	Strategic decision making speed	Antecedents to fast strategic decision making	CEO cognitive ability, use of intuition, tolerance for risk, and propensity to act positively related to fast decision making. Centralised organisations make faster decisions than formalised ones.	Empirical-Quantitative	Decision speed measured by: 1) asking CEOs to record how long they believed their firms would take to reach decisions for six scenario events. 2) asking CEOs three 5-point Likert questions about their firms' decision-making speed.	Treats speed as a general ontological premise from which to theorise. Explores the antecedents to fast decision making. Questionnaires are with executives only.
Perlow et al. (2002)	Strategic decision making speed	Speed of decision making and temporal context	Fast decision-making can lead to a 'speed trap'––a situation where fast decision-making is reinforced to the detriment of decision content and performance.	Empirical-Qualitative	Uses the time spent per strategic decision in meetings as a proxy for measuring decision making speed; compared different periods in the start-up's life cycle.	Performance measured by the organisation's 'growth objectives.' Highlights economic cost of speed, overlooks other negative modalities.
Baum and Wally (2003)	Strategic decision making speed	Antecedents to, and performance of, fast strategic decision making in varied environments	Fast decision making leads to superior performance in heterogenous environments (not just HVEs). Dynamism and munificence are positively related to strategic decision making speed.	Empirical-Quantitative	Decision speed measured by executives' self-reporting the likely number of days required to make various significant organisational decisions.	Performance measured by firm growth and profit. Questionnaires are with executives only.

Siggelkow and Rivkin (2005)	Strategic decision making speed	Antecedents to fast strategic decision making; role of structure and formal design	In turbulent and complex environments, firms must balance both speed and search. Appropriate design is a centralised firm with ample processing power or a lateral communication firm with firm-level incentives and ample coordinative processing power.	Empirical-Quantitative	N/A	Unclear what performance means; simulation-based
Forbes (2005)	Strategic decision making speed	Antecedents to fast strategic decision making in new ventures; individual characteristics	Firms managed by entrepreneurs with prior new venture experience make faster decisions. Decision speed has a curvilinear (inverted U) relationship with performance.	Empirical-Quantitative	Decision speed defined as: "...how quickly organisations execute all aspects of the decision-making process" (p.355).	Speed crucial to performance; ergo, important to understand the determinants to fast decision making. Surveys are with executives/founders only.
Kownatzki et al. (2013)	Strategic decision making speed	Antecedents to fast strategic decision making in SBUs	Decision speed is enhanced by goal setting, extrinsic incentives, and decision process control. Negative incentives and conflict resolution have no effect.	Empirical-Mixed	Follows Eisenhardt's (1989) definition of decision speed.	Assumes importance of decision speed on the basis of firm performance. Speed is treated as a general and basic premise from which to theorise.
Bakker and Shepherd (2017)	Strategic decision making speed	Strategic decision making speed in multi-opportunity contexts	Decision speed is enhanced by experience, standard operating procedures, and confidence. Decision speed varies with the different decisions they make and decision makers often pursue multiple opportunities simultaneously.	Empirical-Mixed	"Decision speed captures the duration of time a mining venture spends in a stage before a decision is made to act on the venture" (p.139).	No measure of performance, but context continues to be for-profit.
Chen and Hambrick (1995)	Competitive dynamics	Competitive response speed and firm performance	Action execution speed and response announcement speed are significantly associated with performance. Small firms are faster implementors of competitive actions. Large firms are quicker to announce their responses.	Empirical-Quantitative	Action execution speed measured by: "the average amount of time that a firm spent to execute an announced action" (p.465). Response announcement speed defined as: "the average amount of time it took a firm-relative to other responding competitors-to announce an intended response to an action" (p.466).	Performance measured through: 1) Net market share change (in share points) and 2) Profit margin.
Suarez and Lanzolla (2007)	Competitive dynamics	Competitive responses and firm performance: first mover advantages	First mover advantages are best acquired in environments where the pace of market and technology evolution is relatively steady.	Conceptual	A "first mover" is defined as: "the first firm-or the first few firms when the market lead time that separates them is insignificant-to enter a new product category (p.381-382).	Aims is understanding when lead times are financially beneficial for firms. Downplays social or ethical problems of first-mover strategies.
Derfus et al. (2008)	Competitive dynamics	Competitive responses and firm performance	Competitive actions can play out as a 'Red Queen' race among rivals: a firm's actions increase performance, but also the number and speed of rivals' actions which in turn negatively impact firm performance.	Empirical-Quantitative	Rival action speed measured by the "average length of time it took rivals to act after a focal firm acted" (p.68).	Performance measured by ROS (Return on Sales) and ROA (Return on Assets).
Pacheco-de-Almeida (2010)	Competitive dynamics	Competitive responses and firm performance	To stay at the top of innovative industries may be sub-optimal because rapid innovations are subject to time-compression diseconomies.	Conceptual	Relative speed	Economistic concerns; implicitly adopts shareholder view of the firm

Hawk et al. (2013)	Competitive dynamics	Competitive responses and firm performance: Speed capabilities	Compared to slow firms, fast firms can afford to delay market entry to wait for information revelation. This gives fast firms stronger entry performance. Speed capabilities allows a firm not to be first, while still reaping the benefits of early entry.	Empirical-Quantitative	"Intrinsic speed capabilities [are] 'firms' ability to execute investment projects faster than competitors at the same cost" (p.1531-32); relative speed	Conceptualises relative speed as predominantly a good thing. Conceals the potentially limiting or destructive implications of speed.
Pacheco-de-Almeida et al. (2015)	Competitive dynamics	Competitive actions and firm value	Firm's intrinsic speed capability, not its speed relative to industry competitors contributes to firm value (i.e. performance). Speed enables a firm to realise the revenue streams from an investment project early.	Empirical-Quantitative	Same as above	Conceptualises relative speed as predominantly a good thing. Performance (firm value) measured by Tobin's Q.
Nadkarni et al. (2015)	Competitive dynamics	Competitive responses and firm performance: aggressiveness	Competitive aggressiveness (acting quickly and often) has a positive effect on firm performance. This effect is stronger in HVEs.	Empirical-Quantitative	"Action speed was the average length of time lag in the focal firm's actions and rivals' immediately preceding actions in a given year…The shorter the time lag, the faster the action speed" (p.1143).	Economistic concerns; implicitly adopts shareholder view of the firm
Homburg and Bucerius (2006)	Mergers and acquisitions; Integration speed	Speed of M&A integration and firm performance.	Fast integration exhibits a strong positive relationship on M&A success when there is low external/high internal relatedness. It is negative in the opposite case.	Empirical-Quantitative	Speed of integration defined as 'the shortness of the time period needed to complete the intended integration' (p.349).	Surveys 'high-level' managers from marketing and sales departments. Performance (i.e. M&A success) defined as 'the merging firms' return on sales after the merger or acquisition compared to the merging firms' situation prior to the merger or acquisition' (p.355).
Shi and Prescott (2012)	Mergers and acquisitions; Integration speed	How, and when, should firms accelerate or decelerate acquisitions?	Organisations that structure the rhythm of repetitive acquisitions in an even-event pace achieve superior performance. An even-event pace is where repetitive initiatives follow an even pace but are responsive to opportunities.	Empirical-Quantitative	Measure rhythm as a variability of acquisition frequency.	Performance measure by Tobin's Q.
Bauer and Matzler (2014)	Mergers and acquisitions; Integration speed	Antecedents of integration speed; speed of integration and performance	A high cultural fit and high degree of strategic complementarity results in fast integration. No strong support for faster integration and M&A success.	Empirical-Quantitative	Measure integration speed on a five-point scale ranging from 1 = longer than 24 months to 5 = shorter than 7 months.	Privileges top executives' perceptions of success/performance. Measure M&A performance from a managerial perspectives.
Schoonhoven et al., (1990)	Innovation speed; New product development (NPD)	Antecedents to fast NPD; Innovation speed and performance	Innovation speed is a crucial factor in the success of innovations. 7 factors lead to accelerated NPD: entrepreneurial experience, industry experience, spending less money, organisational structure, VC ownership, outside investors on the board of directors, presence of more competitors.	Empirical-Quantitative	The time elapsed between the firms founding date and the first product shipment.	Emphasis is on antecedents to innovation speed; implicitly adopts shareholder view of the firm

Kessler and Chakrabarti (1996)	Innovation speed; New product development	Antecedents to, and outcomes of, innovation speed	Innovation speed is driven by: economic competitiveness, technological dynamism, demographic dynamism, and low regulatory restrictiveness. Speed emphasis, goal clarity, project support and external sourcing positively related to innovation speed.	Conceptual-Review	Innovation speed is defined as: 'the time elapsed between (a) initial development, including the conception…an innovation and (b) ultimate commercialisation, which is the introduction of a new product into the marketplace (p.1144). Emphasis on speed as rapidity/quickness.	Emphasis is on antecedents to innovation speed; implicitly adopts shareholder view of the firm
Kiss and Barr (2017)	Innovation speed; New product development	What speed should new ventures adopt when implementing NPD strategies?	Fast NPD strategy implementation translates into higher firm performance when there is a fit between the information processing demands of the environment and the information processing capacity of the TMT.	Empirical-Quantitative	Speed measured by the average number of days taken to implement various NPD process-related action as reflected in public announcements	Economistic concerns; implicitly adopts shareholder view of the firm; builds on upper-echelon theory
Hallen et al. (2020)	Accelerators; Inter-organisational learning	Do accelerators work, and if so, how?	Moderately prominent and experienced accelerator programs are broadly beneficial and worth pursuing for entrepreneurs. Accelerators are associated with faster times to different outcomes. They drive inter-organisational learning via broad, intensive and paced consultation.	Empirical-Mixed	The speed as which ventures reach their entrepreneurial goals.	Success is seen as acceleration as opposed to slow-down or stasis
Zander and Kogut (1995)	Speed of knowledge transfer	How do firms quickly transfer their knowledge of a production capability to new markets?	The degree to which capabilities are codifiable and teachable influences the speed of their transfer. The capacity to speed the internal transfer of a production capability to new markets is of fundamental significance in a competitive environment.	Empirical-Quantitative	N/A	Downplays any loss of meaning or socio-political costs arising from rapid transfer of knowledge
Vermeulen and Barkema (2002)	Speed of internationalisation	Speed, rhythm and scope of internationalisation and firm performance	Growing at a moderate yet steady pace increases profitability more than a short outburst of rapid expansion. Firms that follow a constant, rhythmic pace are better able to benefit from foreign expansion.	Empirical-Quantitative	Internationalisation speed is measured as the number of foreign subsidiaries divided by the number of years since the firm's first foreign expansion Pace and speed are both used and treated as synonyms.	Performance measured by profitability; implicitly adopts shareholder view of the firm
Jiang et al. (2014)	Speed of internationalisation	At what pace should firms internationalise?	Faster internationalisation speeds can hurt a subsidiary's survival probability. However, firms should expand early, but at a moderate pace.	Empirical-Quantitative	Speed is defined as the time it takes a firm to make a subsequent entry.	Highlights economic cost of speed, overlooks other negative modalities. Sample is from managers.
Chetty et al. (2014)	Speed of internationalisation	Internationalisation speed and international performance	The speed of internationalisation and 'international performance' are positively related.	Empirical-Mixed	Speed of internationalisation is defined as 'the firm's average rate of international expansion' (p.2).	International performance measured as: 1) Perceived success of int. activities (avg. last three years), 2) International sales volume (avg. last three years), 3) Perceived international profitability (avg. last three years)

Tan and Mathews (2015)	Speed of internationalisation	What is accelerated internationalisation and what accounts for this phenomenon?	Accelerated internationalisation is driven by an LLL process (linkage, leverage and learning).	Empirical-Archival	Accelerated internationalisation focuses on 'the change of pace or speed of internationalisation of the firm' (p.419)	Economistic concerns; implicitly adopts shareholder view of the firm
Hashai et al. (2018)	Speed of internationalisation	How can firms expand quickly while reducing the disadvantages of rapid expansion?	Organisations that make strategic moves at high but constant speed manage to moderate the negative consequences of rapid expansion.	Empirical-Quantitative	Expansion speed measured by 'the number of new alliances that the firm has established in a given year...divided by the alliance portfolio size in that year' (p.716-717).	Economistic concerns; implicitly adopts shareholder view of the firm
Romanelli and Tushman (1994)	Organisational change	How do fundamental changes in patterns of organisational activity occur?	Organisational transformations are most often accomplished via fast and discontinuous change (i.e. according to the punctuated equilibrium model).	Empirical-Mixed	Blend of subjective and objective measures of change and their frequency	Limited discussion of socio-political costs of high-speed change
Amis et al. (2004)	Organisational change	How should we implement revolutionary change?	Revolutionary change is best introduced slowly (allows trust building); runs contrary to a body of theory suggesting it should be implemented rapidly	Empirical-Mixed	No definition of pace/speed given. Terms used interchangeably. The pace of change was measured by the amounts of change activity that took place.	Limited discussion of socio-political costs of high-speed change
Klarner and Raisch (2013)	Organisational change	How do different rhythms of change relate to firm performance?	Regularly changing companies outperform those that rely on irregular change rhythms, as well as companies that do not change.	Empirical-Mixed	Pace refers to rhythm (i.e. the tempo/frequency of change), not speed as a measure of change over time.	Performance measured by return on equity; implicitly adopts shareholder view of the firm
Rindova and Kotha (2001)	Strategy	How do firms regenerate their transient competitive advantage?	Continuous morphing is the process of profound organisational transformations when competitive or external pressures warrant. Continuous morphing can be used as a strategic tool to support the rapid changes in strategy required to compete in dynamic environments.	Empirical-Qualitative	Profound, continuous change; speed of organisational change	Unclear to what extent the organisations morphed in form and function, but rather solidified existing social structures
Wiggins and Ruefli (2005)	Strategy	Hyper-competition	Over time, competitive advantage has become significantly harder to sustain. A substantial portion of the US economy is characterised increasingly by hyper-competitive behaviour.	Empirical-Quantitative	Hyper-competition defined as "an environment characterised by intense and rapid competitive moves, in which competitors must move quickly to build advantage and erode the advantage of their rival" (p.888).	Speed treated as absolutist; speed is treated as a general and basic premise from which to theorise
D'Aveni, Dagnino and Smith (2010)	Strategy	The antecedents, management, and consequences of temporary advantage	Organisations need to create and maintain 'temporary' competitive advantages as an alternative to models of 'sustainable' competitive advantage. New theory needed to keep up with the 'current disruptive and fast-speed environments of today' (p.1376).	Conceptual-Review	N/A	Claims rest on a changing, increasingly 'temporary' nature of competition; speed is treated as a general and basic premise from which to theorise.

Level 2: Temporality in MOS

Author(s)/year	What conversation does this text contribute to?	What is being probed?	What are the key findings or claims?	What data or methods are being used?	Relevance to speed	What is taken for granted? What assumptions underly this work?
Thompson (1967)	Labour process theory	Temporal structuring at the societal/organisational level	New time-keeping technologies, increased supervision, monetary incentives and changing divisions of labour from the 17th-century resulted in new socio-temporal norms.	Empirical-Archival	Traces origins of the valorisation of speed. Rigorous time-discipline paved the way for an ideology of speed.	Takes the form of a somewhat grand, totalising narrative. Time-structuring practices may be more complex and less deterministic.
Adam (1995)	Sociology of time	Conceptions of time, temporal structuring, the valorisation of speed	Clock-time is the hegemonic conceptualisation of time in industrial/industrialising countries. Explores the hegemony of clock-time and its consequences for other temporal rhythms, e.g. environmental time.	Empirical-Qualitative; Interviews	Connects the veneration of speed with the commodification of time; if time is money, faster is better.	Activism and urgency permeates throughout the work; the pace of development is out of sync with nature's ability to replenish and absorb it.
Mosakowski and Earley (2000)	Time in strategic decision making	Temporal assumptions in strategy research	Strategy researchers generally ignore a subjective view of time. Explore five temporal dimensions: I) Nature of time, 2) Experience of time, 3) Flow of time, 4) Structure of time, and 5) Referent anchor.	Conceptual-Review	Different organisational cultures prioritise speed differently. Organisational members are often unaware of their temporal norms.	N/A
Ancona et al. (2001)	Time and organisational behaviour	What a temporal lens brings to MOS	A temporal lens provides an important framework for explaining and understanding organisational behaviour. The variables of interest include: timing, pace (i.e. speed), cycles, rhythms, flow, temporal orientation, and the cultural meanings of time.	Conceptual-Review	Advances time as a key research lens; helps understand how temporal norms (e.g. the perceived value of speed) may become institutionalised over time.	N/A
Ancona, Okhuysen and Perlow (2001)	Time and organisational behaviour	A review of temporal research in MOS	Authors engineer three overlapping categories for research on time in organisations. 1) Conceptions of time, 2) Mapping activities to time (e.g. speed, frequency), 3) Actors relating to time.	Conceptual-Review	Helps understand subjective and objectified experience(s) of acceleration/deceleration.	N/A
Huy (2001)	Organisational change/time	Temporal capabilities and assumptions	Change agents need to display temporal capability skills to effectively pace, time and sequence different interventions.	Conceptual	Different interventions require different speeds and conceptions of time (e.g. clock time, social time).	N/A
Blount and Janicik (2001)	Temporal organisational research	How people evaluate changes in timing in organisations	Temporal 'responsiveness'—the ability of organisational actors to adapt their speed in response to unanticipated events—is critical for organisational performance.	Conceptual-Review	Socio-temporal norms (e.g. the belief that fast is better than slow) are the result of institutionalised processes.	Assumes a link between faster technology and a more rapid pace of life.

Hassard (2002)	Temporal organisational research	Temporal structuring and phenomenological experience	Paper reflects on three images of temporal structuring and experiences. 1) A modernist, linear-quantitative sense of time in organisations, 2) A symbolic-interpretive sense of time in organisations, 3) A post-modernist sense of time.	Conceptual	Image 1) sees speed logics emerging from the commodification of time; Image 2) is more attuned to temporal agency; Image 3) conceptualises speeds organised beyond the realm of human consciousness.	N/A
Bluedorn and Waller (2006)	Control of time	Temporal structuring and agency	Introduces concept of the 'temporal commons,' i.e. the shared conceptualisation of time and the set of resultant values, beliefs, and behaviours regarding time, as created and applied by members of a culture-carrying collectivity.	Conceptual-Empirical	Beliefs, values, norms, and practices concerning speed are prominent elements of the temporal commons. Actors have unequal resources to shape it.	Assumes that 'time is amenable to human direction (p.388).'
Rubin (2007)	Workplace temporalities	Temporal structuring and agency	Working life is becoming increasingly desynchronised from the temporalities of the body and social life, with deleterious consequences.	Review	Builds from Thompson's (1967) classic study. Workers becoming entrained to the rhythms of a 24/7 economy.	Similar to Thompson, the book is largely epochal, seeing speed imperatives as near-totalising.
Kaplan and Orlikowski (2013)	Temporal work/agency	How actors engage with the past, present and future	Develops a model of 'temporal work,' i.e. how actors negotiate understandings of past, present, and future.	Empirical-Qualitative	The future may be contested in respect to the relationship between speed/acceleration and a receding horizon for action/agency.	Authors privilege agentic power over hegemonic power. Capacity for temporal domination may be suppressed or overlooked.
Reinecke and Ansari (2015)	Temporal work and structuring	How environments adopting different temporal regimes affect one another	Organisations ought to foster ambi-temporality, i.e. the ability to cultivate heterogeneity in the organisational temporal commons.	Empirical-Qualitative	Different processes capable of different speeds; need to try to reconcile these through temporal brokerage,	Same as above.
Granqvist and Gustafsson (2016)	Temporal work	How actors engage in temporal institutional work	Three forms of temporal institutional work are identified: I) entraining, 2) constructing urgency, and 3) enacting momentum.	Empirical-Qualitative	Some institutions may act as a speed/pace giver. Others attempt to synchronise/entrain with it. Actors may try to manipulate others understandings about time/speed.	Same as above.
Kunisch et al., (2017)	Strategic change	Temporal components of strategic change	Time is central to strategy, organisational performance, and survival, especially in dynamic environments. Authors discuss: 1) Conceptions of time in strategic change, 2) Time and strategic change activities, 3) Time and strategic change agents.	Conceptual-Review	The speed of change and how well actions match with others to which they are entrained are crucial for the success of strategic change.	Authors focus on 'empirical studies published in leading strategy and management journals' (p.1008) which may run the risk of 'box thinking.'
Holt and Johnsen (2019)	Time in organisations	How might time escape management/organisation?	A great deal of MOS research on time views it as something for us to manage: a "time-for us." However, time is frequently "without-us," and beyond organisation.	Conceptual-Review	While various processes and actions can be accelerated/decelerated, there are many which we cannot manage or govern, e.g. life's finitude.	N/A

Level 3: Speed and social theory

Author(s)/year	What conversation does this text contribute to?	What is being probed?	What are the key findings or claims?	Relevance to speed	What is taken for granted? What assumptions underly this work?
Marx (1867/1967)	Political economy	Class struggle, capitalist modes of production, labour process	The economic order of capitalism depends upon the control of time. The capitalist logic entails the maximisation of productivity in time, either by 1) elongating the working day or, when this becomes impossible, 2) intensifying available time through speed-up.	Capitalism and reified labour processes are central to explaining speed/acceleration.	Does not explain why non-capitalist regimes of the 20th century were also committed to acceleration.
Marx and Engels (1848/2004)	Political economy	Class struggle, capitalist modes of production	Among other ideas, capitalism leads to constant transformation and totalitarian imperatives for speed.	Highlights the enmeshment of speed and non-stop transformation with capitalist modes of production.	N/A
Weber (1958/2001)	Social theory	Religion as a cause/driver of modern economic conditions	Elaborates links between the Protestant ethic and economic approaches to time. Protestantism instilled an ethic of rigorous temporal discipline which took the waste of time as the deadliest of all sins.	Uncovers Christian origins of speed's valorisation in the West.	Time discipline may have been imposed more through force rather than the pedagogical trainings of Protestantism.
Weber (1978)	Social theory	Relations between individual action, social action, economic action, and economic institutions	Discusses, among other things, the relationship between bureaucracy and speed. Bureaucracies displaced other forms of organisation due to their technical efficiency, including the speed with which they could function.	Recognises the potentially dehumanising effects of attaining optimal speed through bureaucratic administration; dangers of an 'iron cage'	N/A
Simmel (1900/2011)	Social theory	Money, economic relations, speed	Argues that money is a 'dynamic mediator.' Money partially accounts for the unceasing nature of modern life as it contributes to an increasing circulation of people and things.	Money is a key enabler of dynamisation and acceleration dynamics	N/A
Simmel (1903)	Social theory	City life, speed, busyness	The restless and transitory nature of social activity in the city requires individuals to develop defences; to cope, life becomes matter-of-fact, with little consideration given to emotional concerns. This is called the 'blasé outlook.'	Simmel is viewed by some as being 'the first theorist of acceleration society' (e.g. Wajcman and Dodd, 2016, p.6)	N/A
Durkheim (1912/2008)	Social theory	Religion as a social phenomenon	Distinguishes between sacred and profane time. Defines time as the collective expression of the rhythm of social life. Time is social in nature.	Highlights a wide range of socio-temporal norms in various societies; other temporalities are possible	Suppresses or overlooks a time beyond human organisation; time without us.
Taylor (1911)	Scientific management	Speed, efficiency, time management	Time is something to be analysed and optimised. Work tasks should be performed in the least amount of time. Introduced time-and-motion studies. Pursue efficiency through acceleration.	Imposed imperatives for speed upon labourers. Human bodies are viewed as speed machines which must be made maximally efficient in every movement	The rhythms of the machine/factory are prioritised over the rhythms of the individual body and social life more broadly.
Harvey (1989)	Social theory	Postmodernism as a cultural logic of late-capitalism, speed, globalisation, space	The pace of modern life is such that there has been a "time-space compression." Consequently, we live in a world characterised by fragmentation, insecurity, and the ephemeral. The shift from Fordism to post-Fordism can be based on the logic of acceleration.	Deals with how technological speed-up forces us to learn to 'cope with an overwhelming sense of compression of our spatial and temporal worlds' (p.240)	Stresses that speed is a result of the forces of capitalism, rather than war or other cultural drivers.

Bauman (1999)	Social theory	Liquid modernity, precarity	Develops the moniker 'liquid.' Argues that change is occurring more and more rapidly in the liquid modern world. We must constantly modernise, dismantling/shedding identities and creating new ones in other to avoid being consigned to waste.	Highlights the destabilising effects of rapid change; fast, liquid modern societies are precarious, disorienting	Downplays the partiality of an acceleration of social change; the speed of change becomes a kind of meta-narrative.
Virilio (1986/1977)	Dromology	The logic of speed and its impact on socio-technical systems	Introduces 'dromology'—the study of speed, its logics and its impact on human and cultural systems. Virilio develops a a 'political economy of speed:' the multiple temporalities within which people co-exist are unevenly distributed.	Emphasises a critical disposition toward speed. Speed seen as the result of the imperatives of war	Lacking in empirical support; suppresses emancipatory potential of technological acceleration; downplays the forces of capitalism
Virilio (2005/1984)	Dromology	Unifies Virilio's key concerns with the question of speed	Among other ideas, Virilio discusses how speed 1) conditions perception, 2) grants its possessor power, 3) eradicates space, 4) produces accidents and 5) is constructed.	Speed is seen as the decisive factor in human technological evolution	Same as above
Rosa (2010)	Critical theory; Social theory	The temporal underpinnings of modernity from the perspective of critical theory	Develops a critical theory of late-modern temporality. Describes three self-perpetuating accelerations; technological acceleration, acceleration of social change; acceleration of pace of life.	Near totalitarian speed imperatives are leading to crises of temporal desynchronisation and alienation.	Potentially overly negative assessment of speed; downplays positive modalities of social acceleration—e.g. cosmopolitanism.
Rosa (2013)	Critical theory; Social theory	The temporal underpinnings of modernity	Offers a phenomenological account of speed experience in modernity. Life is experienced as a 'slippery slope.' People are in a frenetic standstill.	Need to move faster and faster just to stay in the same place; avoid destabilisation	Same as above; tendency to underestimate temporal agency and speed resistance.
Wajcman and Dodd (2016)	Sociology of speed	The socio-material dynamics of speed	Emphasises, among other things, the materiality of speed, the complex relationship between technology and time, and how speed is produced, paid for, and resisted.	Speed is approached from different and contradictory perspectives	Chapters are written from highly diverse epistemic and political standpoints, making assumptions varied (this may be seen as a key strength of the text)

End