Coders, Creatives and the Commodification of Knowledge in a Digitalizing, Flexibilizing World (of Work)

PhD by

Joshua Moody,

Department of Sociology,

Maynooth University

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Table of Contents

List of Tables & Figures

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ORCID ID

Joshua Moody   https://orcid.org/0000-0002-1483-3914

Summary

This thesis is a comparative case study of knowledge work in software and creative sectors in contemporary capitalism. It investigates how the commodification of knowledge has transformed relations of control, work-life boundaries and worker subjectivities in knowledge work. The thesis links these changes in the organisation of work to commodification through the analysis of four sociomaterial exigencies of knowledge work – indeterminacy, exclusivity, sociomaterial attachments, and objectification (through digitalization).

Studies of work have been burgeoning over the last fifty years, and it is generally agreed by most disciplines and interested parties that the advanced capitalist societies of the world have been experiencing a significant transformation since at least the 1980's. Despite the diverse range of causal explanations for these changes, there is convergence around some core developments, namely the increasing digitalization of society, the flexibilization of work and employment, the intensification of competitiveness, individualism and entrepreneurialism as organizing principles, the financialization of the global economy, and the importance of knowledge, information and creativity in the worlds of work.

The high-technology Software and Cultural and Creative Industries have been the focus of global narratives and hyperbole since the 1990s and in many ways these activities (I use the term 'activities' to denote the industries and the work/labour within them) have been hailed as the archetypes and prototypes of the transformations underway. Therefore, they are ideal cases for a critical study of work at the forefront of capitalist transformations. Through extensive interviews with 44 workers and managers in a variety of firms in both sectors, the thesis provides important insights into how work is changing, what problems and opportunities present themselves, and what might be possible trajectories for the future of work.

These case studies are analysed through a theoretical, conceptual and analytical framework, which I term a *sociomaterialist critical realism*. This framework allows me to unravel the knowledge work of software and creative workers as a necessarily sociomaterial practice. The thesis therefore takes the idea that 'matter matters' seriously, and this becomes the centre point around which the line of argument and chapters are built. By interviewing these workers about the practices of their labour, the organisation of their work and their experiences of it, I 'isolate' and 'locate' the sociomaterial threads that bind them to their labour, organisations, communities of practice, and the subject of their labour itself. In doing so, the analysis

effectively identifies and traces the entanglements of knowledge work and contributes to our understanding of how these are weaved together in contemporary work.

The findings identify core exigencies (central characteristics that generate typical demands) of knowledge work and illustrates how these shape the nature of software and creative work by examining their implications for the contested terrains of control, the work-life boundary, and worker subjectivity. It is in these contested terrains of working life that I find that knowledge work is controlled through *regulated autonomy*, boundaries are necessarily blurred because of the permanent susceptibility to *perennial labour*, and that knowledge workers are sociomaterially required to perform as *agile agents* to effectively conduct their work and maintain their careers.

As Kalleberg (2009:1) stated in his presidential address to the American Sociological Association, "work reveals much about the social order, how it is changing, and the kind of problems and issues people (and their governments) must address". As social scientists, we often approach our studies of the world from a critical juncture of reality where the causal complexities of human societies converge, and social phenomena emerge. Similarly, I use the world of work as the vantage point from which I begin my journey into the analysis of socio-economic organization and its implications for the experiences of workers in contemporary capitalism. Despite the wider complexities of those core transformations taking place, empirical case studies of work and production which build upon global scholarship and account for political economic dynamics can reveal much about these changes, how they are experienced by workers on the ground, and the causal forces shaping work and economic futures.

On a more fundamental level, this research and thesis are all about making connections: firstly, making connections between the different but adjacent fields of the sociology of work (SoW), labour process analysis (LPA), communication and media studies, organisation and management studies, and (socio)materialisms; second, making connections between the microsociological practices of labour, their sociomateriality and the organisational structures and economic processes within which they are embedded; and finally, making connections between new approaches and conceptual tools and existing terrains of struggle within the world of work.

Chapter 1: Introduction

This thesis emerges from what has been widely acknowledged as the post-industrial or post-Fordist era, and its implications for the changing worlds of work and employment. Since at least the 1960s, but certainly picking up pace from the 1980s, there has been intense research and debate about the role of knowledge, information, creativity and digital technology in work, organisations and economic development. Many insights have emerged from different fields of research and policy, although not without their contentions and criticisms, and the role of knowledge, creativity and technology in work and organisations have been interpreted as increasingly integral to the innovation process and work and economic futures.

This interest has its origins in the influential empirical work of Austrian economist Fritz Machlup (1962), followed then by a series of related research projects (Porat and Rubin 1977; Ruben, Huber and Taylor 1986) which identified changes in the US economy from one based primarily on manufacturing to information. These studies led to the popularizing of the concept of the Information Society which seeks to describe a systemic shift in the capitalist economic system whereby information and information technology (IT) fundamentally change the operation and processes of work and economic activity. Subsequently, a whole host of theories began to emerge which attempted to periodise and capture socioeconomic change and the development of capitalism. The 'knowledge-based economy' (OECD 1996) is perhaps the most widely adopted concept that claims to describe the transformations that have taken place across (particularly Western) capitalisms throughout this period. Other frameworks have emerged in tandem which are largely similar in their core features: Post-Industrial Society (Bell 1973); Post-Capitalism (Drucker 1994); Post-Fordism (Amin 1994; Coriat 1992); Network Society and Informational Capitalism (Castells 2010 [1996]); ICT Techno-Economic Paradigm (Freeman and Perez 1988; Perez 2003); Digital Economy (Tapscott 1996) and Creative Economy (Howkins 2001). What all of these frameworks have in common is their attempt to understand the 'changing' role of knowledge, information, creativity and digital technology in work and economic processes and the implications for wider social life.

Collectively, the frameworks outlined above are referred to throughout this thesis as the digital knowledge economy. The digital knowledge economy is understood here to encompass a broad collection of structural trends that have been reshaping contemporary capitalist societies throughout this period. Among the most important of these trends are digitalization through the

global integration and convergence of digital information and communications technologies, flexibilization of work and production, the decline of the predominance of manufacturing and the growth of the services sector, and the growing emphasis in perception, policy and practice of the role of knowledge, information and creativity in the production of value in the contemporary economy. This thesis is first and foremost an analysis of the latter trend within the context of these other transformations, which has generated widespread interest in the worlds of work of what have been popularly coined knowledge workers. This research has therefore been designed as a comparative case study of two archetypical groups of knowledge work: software workers and creative workers employed across the high-tech software sector and Cultural and Creative Industries.

Although this research is situated within what could broadly be defined as the sociology of work, its interest in 'work' as an important site of social interaction and formation originates from the early foundations of sociology as a discipline. Following Polanyi's (2001 [1944]) *The Great Transformation*, I position the scholarship of Marx, Durkheim and Weber within a period of profound sociological change that Polanyi identified as being driven by the process of marketisation, industrialisation, mechanisation and an intensification of the division of labour. Ultimately, work is that social activity that binds these structural processes to the everyday lived experience of individuals, communities and societies, and it is for this reason that it takes centre stage in this thesis.

1.1 Research Contribution

The purpose of this thesis is to analyse the peculiarities of the commodification of knowledge (through both input and output) as a *primary factor* in the work of the two case studies -software and creative workers, and its implications for the shaping of the labour process, organisation of work, and workers' subjects. The thesis is less concerned with crafting an idealised narrative of the contemporary knowledge worker that depicts diverse and complex socioeconomic interactions as homogeneous. Instead, the coordinating core of the argument presented throughout is that the production of knowledge as a primary factor in both the labour and production process exerts causal force that in turn shapes both the labour process and organisation of work. How these forces manifest and are experienced, however, are highly heterogeneous and contingent upon the interpretations and circumstances of individuals and organisations. The pressures exerted on the workers engaged in this type of work and the tactics

they enact to manage those pressures are thus highly contextualised and vary from person to person despite the endogenous force of the commodity form – knowledge.

Early research on the knowledge economy and knowledge workers was characterised by empirically questionable assertions and assumptions based largely on social theorising and statistical proxies (Darr and Warhurst 2008). Although this gap has since been plugged with rich empirical analyses of the working practices of knowledge workers, much of the literature still characterises knowledge work as constituting something novel and, in many ways, immaterial. By bringing new perspectives and tools to the table, this thesis contributes to a *sociology of knowledge work* by demonstrating how the extraction, development, production and exchange of knowledge in work shapes the labour process through the emerging social, technological and material effects of knowledge commodification. To conceptually outline these emergent effects, the concept of *sociomaterial exigencies[1]* is developed and four such effects (or exigencies) are identified in the work of software and creative workers (see table below).

Indeterminacy	Human knowledge of reality is inherently fallible and tentative. The production/commodification of knowledge is therefore characterised by uncertainty, unpredictability and a fundamental indeterminacy.
Exclusivity	Actors (individual and collective) relate to knowledge based on their *access* to it and its *intelligibility* to them. Therefore, a fundamental feature of knowledge production in society, and thus of knowledge work is the condition of exclusivity.
Sociomaterial Attachments	The production of knowledge is a *sociomaterial* practice that produces attachments that embed the producers (i.e workers) within webs of sociomaterial ties through the interactions and relations implicated in the labour process.
Objectification (Through digitalization)	Knowledge is understood here as a *necessarily material entity* that resides and is objectified in physical bearers (Zukerfeld 2017). Digital technology is the primary bearer of the respective knowledges of coders and creatives (alongside the workers themselves).

Table 1: Four sociomaterial exigencies of knowledge production/commodification.

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[1] I use the term 'exigency' instead of property, dimension or feature etc. to emphasise their active and agentic nature. Far from being a static characteristic of work, exigencies instantiate a vitality and unfolding nature to sociomaterial processes, centring notions of emergence and an always already becoming and happening.

These four exigencies of knowledge production in software and creative work shape the labour processes of these knowledge workers, the organisation of their work, and the workers' subject. The development of the concept of sociomaterial exigencies is informed by the thesis' meta-theoretical framework – *sociomaterialist critical realism*. This framework (developed in chapter 4) supports me in identifying the mechanisms implicated in the knowledge production process, and in analysing how those mechanisms become activated and experienced in the world of work. I apply this conceptual and analytical framework to three contested terrains of working life: (i) the domain of production and the organisational imperative for *control* over the organisation of work and the labour process, (ii) the contested and shifting *boundary* between work and non-work or private life, and (iii) personal attachment to work and its implications for the actions and *subjects* of workers. In particular, the thesis demonstrates (i) how the indeterminacy and exclusivity of knowledge shapes both the organisation of work and managerial forms of control; (ii) it identifies the effort, spatial and time pressures exerted on these workers through the sociomaterial attachments of their labour by advancing the concept of *perennial labour*, and finally (iii) it counters previous claims of the productivity pursuing 'entreployee' that supposedly pervades the subjectivities of knowledge workers by demonstrating how actions such as self-control, self-commercialisation and self-rationalisation are emergent effects of commodifying knowledge for work that are primarily driven by the sociomaterial attachments of work and the accelerating effects of digitalization, rather than a calculated subjective entrepreneurial drive.

1.2 Research Design

Research Questions

The thesis is driven by a core set of research questions that explore how the commodification of knowledge, as a sociomaterial practice, shapes the worlds of work for software and creative workers. It begins this by focusing on the emergent exigencies, or sociomaterial becomings of knowledge commodification/production/work in the software and creative sectors, demonstrating how this shapes both the organisation and conduct of work. Following this empirical and analytical grounding, the investigation then turns to the pressures generated by this work, and the tactics workers enact in response to those pressures, before finally considering the conditions that are unfolding in relation to the intra-action of these forces. As this research has come to life in response to global transformations in the world of work which have been collectively termed here as the digital knowledge economy, the structure of the thesis

is therefore built upon a series of empirical puzzles in response to a wider empirical observation from the political economy of what we might call knowledge capitalism, depicted in the table overleaf:

Empirical Observation
Knowledge and creativity have assumed a 'new' importance in economic life where nation states and organisations have directed their developmental strategies towards leveraging these 'resources' with the aim of enhancing innovation, productivity and growth; and their more explicit centrality in the world of work is expressed by the nomenclature of the 'knowledge worker', of whom software and creative workers are said to be archetypes.
Empirical Puzzle 1
EP1.   What are the emerging consequences of commodifying knowledge (as both input and output) for both the organisation of work and the labour process?

Empirical Puzzle 2	Empirical Puzzle 3
EP2. What are the primary pressures experienced by software and creative workers?	EP3. What emerging conditions unfold through these pressures, and what tactics do workers adopt in relation to them?

Table 2: Empirical puzzle framework.

These empirical puzzles provide the foundation for the research and focus for the empirical chapters of the thesis where they are mapped onto and refined based on the topic each chapter tackles. As the first research question is concerned with examining the sociomaterial implications of knowledge production as both an input and output in the production and work process, chapter 5 explicitly focuses on providing an answer to this question based on the experiences of the software and creative workers in the study. The analysis in chapter 5, which is oriented around what I have termed the *sociomaterial exigencies* of knowledge production, provides an analytical and empirical foundation for the three substantive chapters that follow which turn their focus to *three contested terrains in the world of work: control, boundaries and subjectivity.* Each of these contested terrains of working life have two specific research questions that map onto the above empirical puzzle framework: the first research question for

each of these chapters corresponds to the second empirical puzzle on the pressures experienced by these workers, and the second research question maps on to the third empirical puzzle concerned with the conditions generated by these pressures and the tactics workers adopt to manage them.

Chapter 6 Control

RQ1. How is organisational control achieved over the work of coders and creatives?

RQ2. How is control experienced by these workers, and what are the emerging conditions unfolding from these experiences?

Chapter 7 Boundaries

RQ1. What are the pressures leading to work-life boundary blurring in digital knowledge work?

RQ2. How do those pressures intra-act to shape the labour process, and what tactics do workers adopt in relation to those pressures?

Chapter 8 Subjectivity

RQ1. What generates personal attachment to work for software and creative workers?

RQ2. How does this process shape the workers' subject, and what tactics do they adopt in relation to it?

This cascading research design tackles each of the empirical puzzles as the thesis and analysis progresses, and the culmination of the theoretical, conceptual and empirical contributions throughout the thesis in the end provide an answer to the core puzzle concerned with the implications of commodifying knowledge for both the organisation of work and the labour process.

Theoretical and Conceptual Framework

This thesis is a critical sociological examination of the capitalist commodification of knowledge and human labour, and its implications for the organisation and experiences of workers. The process of commodification is the starting point of the research, and it is taken to be the *engine of change* in capitalist production and labour (Huws 2007; 2014). This change emerges as the accumulation of profit and capital takes place through the process of

commodification, and the pursuit of new sources of value both re-invents and extends the commodification process to subsume existing and new domains of the natural and social world (Polanyi 1944; Huws 2014). This interpretation which centres the engine of commodification is in line with Diane Elson's value theory of labour (Elson 1979; Harvey 2017) where the imperative of commodification drives the transformation of labour, production and consumption. In order to identify and comprehend how the commodification process, in particular the commodification of knowledge, shapes the experiences of workers, I draw on an eclectic mix of theoretical and conceptual frameworks, beginning with what could be broadly conceived of as the materialisms of Mariano Zukerfeld (2017), Karen Barad (2007) and Wanda J. Orlikowski (2005a; 2007; 2008), before moving firmly into the fields of labour process analysis (Thompson and Smith 2010) and the sociology of work more widely (Edgell et al. 2016). The aim is to take these theoretical and conceptual tools drawn from the prior group and to apply them to the respected fields of the later to build new 'conceptual tissue' and dialogues for the advancement of our understanding of the world of work.

The scholarship of Zukerfeld (2017), Barad (2007) and Orlikowski (2005a

; 2007; 2008) is used to develop an understanding of knowledge as a *necessarily sociomaterial thing and practice*. This allows me to position my work, partly in response but firmly in contrast to the immaterial labour and cognitive capitalism theses with their emphasis on the weightlessness and immateriality of contemporary work and economic activity and their claims to an ensuing 'crisis of measurability' in capitalism. In this I follow others who have questioned the sweeping claims of these grand narratives (Thompson and Briken 2017; Pitts 2018). The fields of labour process analysis and the sociology of work are used to frame the three contested terrains (Edwards 1979) of control, boundaries and subjectivity. It is here that I draw on past research into these topics and enter into a dialogue where I seek to contribute to our knowledge in these areas through a sociomaterial analysis of the chosen case studies of software and creative work.

The thesis takes knowledge to be the primary factor and commodity form in software and creative work, what Marx (1867/2015: 127) would have called "*the subject of that work*". By commodity form, I mean the substantive content and form which both labour and commodity goods and service take, and in these cases, the primary form being exchanged, applied and produced in both the labour and production process is knowledge. I develop and apply the bridging concept of sociomaterial exigencies, which as a conceptual tool allows me to 'isolate',

'see', 'locate' and 'unpack' knowledge as a sociomaterial entity in its own right. I articulate these exigencies as the emergent effects of producing knowledge in the commodification process. The production of knowledge is approached as a sociomaterial practice (Orlikowski and Scott 2008) that constitutively entangles individuals, collectives and their interactions and relations, with technologies, social contexts and structures. The sociomaterial exigencies arising in the commodification of knowledge are potentially non-exhaustive, however for the purposes of analytical priority, four *core* exigencies are identified and their implications for shaping work are demonstrated in the empirical findings of the study: indeterminacy (of knowledge); exclusivity; sociomaterial attachments; and objectification (through digitalization).

Introducing the bridging concept of sociomaterial exigencies links the political economic process of commodification, and its emergent implications, to the experiences of workers and the organisation of work. This effectively takes the transformations occurring in the wider political economy or macro-sociological domain of reality and grounds them in the meso (organisational) and micro (labour) sociological realities of everyday life.

1.3   Chapter Overview

Following this introduction, *chapter 2* converges the literature and contextualises the thesis before *chapter 3* problematises the literature and shapes the thesis. The literature review is divided into two chapters with four main sections, each section narrowing in its focus to the case studies at hand. Firstly, the review explores the role of knowledge, information and creativity in an increasingly digitalizing, flexibilizing world of work where the dominant political economic narratives which have been circulating since at least the 1980s are reframed under the term digital knowledge economy. Through this I argue that these political economic imaginaries are driven by what Ursula Huws (2014) has called the *engine of commodification*. Secondly, I move to locate and position software and creative workers within the milieu of 'new' work in contemporary capitalisms. It is here that these case studies are articulated as a new core of an old cohort, and as 'organisational professionals' (Scarbrough 1999). The next section (and the first of chapter 3) brings sociomateriality to bear on the world of work of software and creative workers as an approach which can provide some reorientations and clarification in our understandings of knowledge work. Finally, the review narrows further to the three contested terrains of control, boundaries and subjectivity. This final section begins by

delving into the terrains through the rich empirical scholarship in labour process analysis and the sociology of work before focusing in on the specificities of each of the case studies.

Chapter 4 describes the methodological and meta-theoretical foundations of the study, before detailing the research strategy, methods and data that comprise the thesis. As a social scientific endeavour, the research is guided by a *sociomaterialist critical realism* that builds on a combination of the work of Bhasker (1975), Sayer (2000), Elder-Vass (2010), Zukerfeld (2017), Barad (2007) and Orlikowski (2005b). These foundations provide a useful frame through which the commodification of knowledge can be approached as the necessarily sociomaterial practice that it is. Following this, the research strategy based on comparative case studies of knowledge work is outlined, before detailing the method of semi-structured interviewing and the rich qualitative data of the forces shaping the experiences of these workers that it provided and finishing with a discussion of the data analysis process.

This thesis is first and foremost an examination of how the commodification of knowledge in work shapes both the organisation of work and the labour process. It achieves this by analysing the production (and application) of knowledge as a sociomaterial practice (Barad 2007; Orlikowski 2005a; Zukerfeld 2017) which is characterised by the process of emergence, that is, things emerge from this practice that are constitutive of it but irreducible to it. Advancing such an approach leads us to ask what are some of the key emergent properties, or as I put it – exigencies that unfold through the sociomaterial practice of knowledge work? In *chapter 5* I identify indeterminacy, exclusivity, sociomaterial attachments, and objectification (of which digitalization is the current predominant form) as four of these exigencies, and I examine how these shape the organisation and conduct of software and creative work through the experiences of the workers themselves. Most importantly, the chapter illustrates how these are *sociomaterial exigencies* with real social and material consequences for the structures, practices and agencies of knowledge work(ers). Following the establishment of this analytical and empirical foundation of sorts, the thesis then explores how these play out within three contested terrains of working life.

Chapter 6 examines the organisational control of coders and creatives as organisations and management attempt to extend control over both the organisation and conduct of work, while navigating the ambiguity of knowledge work and production. Knowledge work is ambiguous because its practice and organisation is shaped by the exigencies of indeterminacy and exclusivity, and the organisations employing these workers to produce value not only need to

deal with the indeterminacy of labour problem, but also the ambiguity problem. Through an analysis of the control of work, which I position as occurring within increasingly agile production environments (Moore 2019), I demonstrate how control is achieved over software and creative work through the establishment of a *regulated autonomy*. I argue that by merging types of direct, technical, bureaucratic, market and normative controls through the use of *regulative devices*, these organisations simultaneously extend control while partially managing the ambiguities of knowledge work.

Chapter 7 examines the phenomenon of work-life boundary blurring which is said to be a common characteristic of knowledge work specifically, but also work more widely in contemporary digitalizing capitalism. As most of the literature on the domain of work-life boundaries focuses on either boundary work (i.e how people enact boundaries) or the pressures technology, organisations and management exert on workers' boundaries, the analyses are oriented around how people achieve a balance between the integration and segmentation of work and life. Although I follow this route of examining work-life boundary blurring, I demonstrate first the sequence of pressures that lead to this phenomenon. In doing so I argue that the sociomaterial attachments that exist as an exigency of knowledge work are the *driving pressure* of work-life boundary blurring, while the digitalization of work is an *accelerating pressure*, while specific organisational and market demands are *contingent pressures*. Following this clarification, I advance the concept of *perennial labour* to describe the permanent susceptibility of these workers to labour that is not bound by intent nor organisational space and time. Finally, I argue that because perennial labour is a sociomaterial fact of their work, these workers cannot in practice achieve a segmentation of work and life and that what these workers are actually doing through their boundary work tactics is engaging in a process of boundary (re)shaping where they enact *habitats of labour* throughout their lives.

Chapter 8 enters the domain of the subject where questions of work attachment, identity and agency are examined through an analysis of the embeddedness and performativity of software and creative work. The analysis begins by arguing that the sociomaterial attachments of software and creative work, which are intensified by digitalization and organisational and market pressures, constitute a form of *sociomaterial embeddedness* for workers. With its origins in the materiality of the practice of work, the sociomaterial embeddedness of workers is the basis for personal attachment to work and it exists with, through and beyond subjective bases for work attachment which have their origins primarily in discourse and ideology.

Following this I demonstrate how the sociomaterial practice of software and creative work, where knowledge is both possessed in the head and practiced in the world (Norman 1988, Amin Cohendet 2004), and its employment within agile production processes requires that workers perform the role of an *agile agent*. I then finally argue that in performing this role, software and creative workers need to manage their degrees of embeddedness to navigate the organisational and labour market risks and rewards that follow its differential enactment.

Finally, in *chapter 9* I synthesise the contributions made by the research and demonstrated through the thesis. I begin by summarising the primary contributions of each of the empirical chapters 5 through to 8, I then elaborate how these contributions add to our knowledge in the literature and on these topics both empirically and conceptually, before finally considering the contributions made to the areas of policy and practice. In doing so, this chapter aims to remind the reader of the fruitfulness of analysing knowledge work through the prism of sociomateriality by outlining the many proverbial spanners that such an analysis can throw into the fields of labour process analysis and the sociology of work, and the terrains of control, boundaries and subjectivity in the worlds of work.

This thesis structure is illustrated in the diagram overleaf:
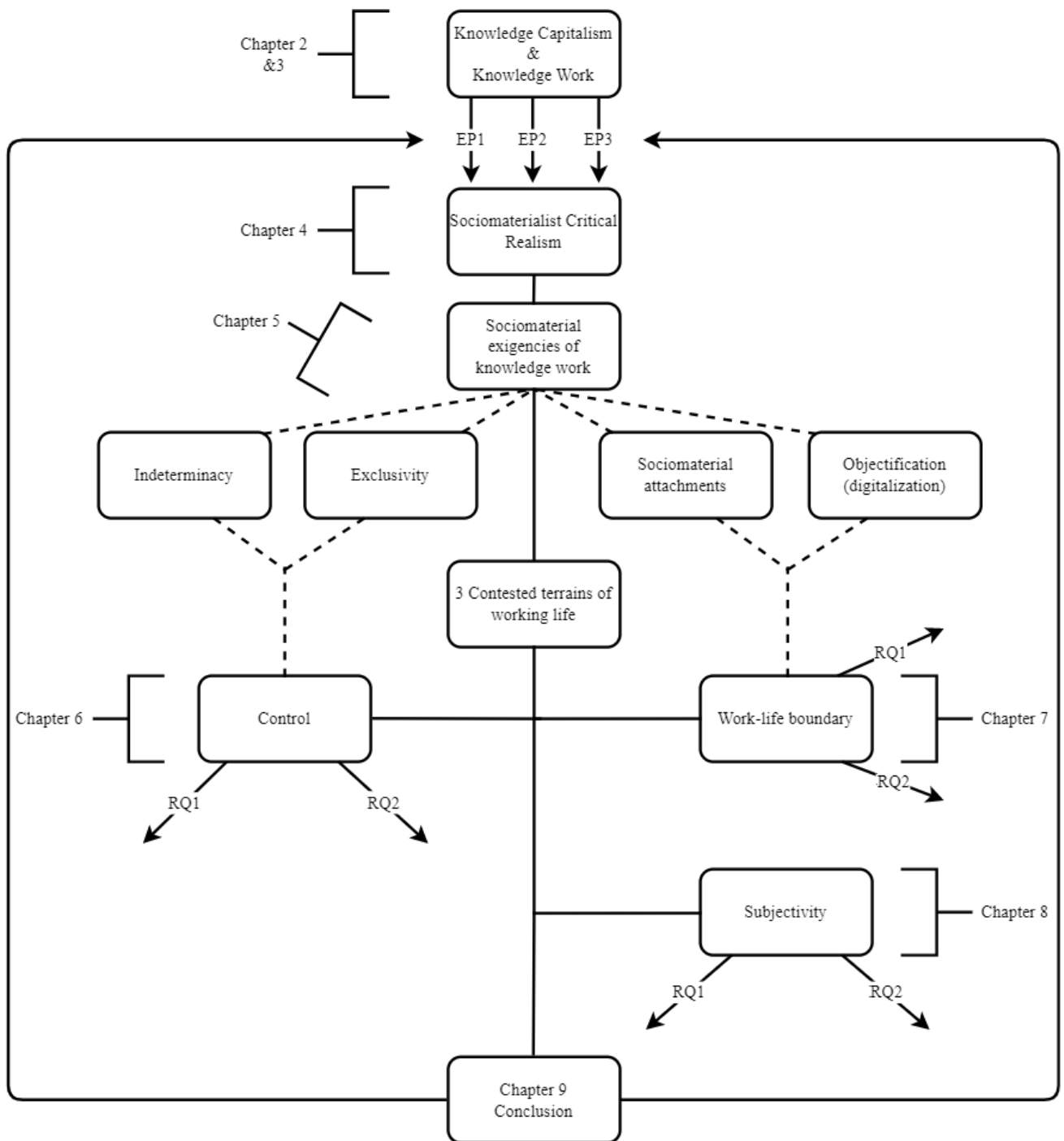
Figure 1: Thesis Structure

Chapter 2: Converging the Literature and Contextualising the Thesis

This chapter presents a synthesis of the social scientific research on knowledge, information and creativity in a digitalizing, flexibilizing world of work. To achieve this, I converge literature from political economy, the sociology of work and labour process analysis to shape the field of inquiry within which this thesis is situated. The complimentary convergence of these literatures provides three main benefits for the study at hand: first, research from the changing political economy of capitalism sets the stage by providing the wider socioeconomic context of the period in question; second, drawing on research in the sociology of work and labour process analysis provides deeper insight into the experiences of workers on the ground amid these changes and the significance of the chosen case studies; finally, merging the three literatures begins the process of finding the "connective tissue" (Thompson and Vincent 2010) that binds the political economy to the world of work, an objective chapter 3 continues and the remaining empirical chapters of thesis aim to achieve.

The chapter is divided into two main sections, each section narrowing in its focus to the case studies at hand. The first section explores the role of knowledge, information and creativity in an increasingly digitalizing, flexibilizing world of work where the dominant political economic narratives which have been circulating since at least the 1980s are reframed under the term digital knowledge economy. Through this I argue that these political economic imaginaries are driven by what Ursula Huws (2014) has called the engine of commodification. In the final section, I move to locate and position software and creative workers within the milieu of 'new' work in contemporary capitalisms. It is here that these case studies are articulated as a new core of an old cohort, and as 'organisational professionals' (Scarbrough 1999).

2.1   Knowledge, Information and Creativity in a Digitalizing, Flexibilizing World of Work

Towards an Informational Capitalism?

In his book *Reshaping Communications: Technology, Information and Social Change*, Paschal Preston (2001) conducts what he calls an 'archaeology of the information sector' by taking the division of labour, a cornerstone of the social sciences, as a lens into the changing social world. This review is inspired by Preston's archaeological endeavour, however, rather than focusing on the trajectory of social change more widely, the concern here is on the changing world of

work and technology as key factors within those wider debates of social transformation. The period under examination dates from the 1950's to our present day and it is primarily defined by developments information and communication technologies and the internet, their diffusion across the world of work, new and extended opportunities for commodification and capital accumulation, and the emergent implications for the organisation of work and the nature of labour processes in contemporary capitalism. Following Castells (1996), Zukerfeld (2017) and Fuchs (2020), this section uses the term *informational capitalism* to orient the debates around the main developments of this period of change in work and technology.

The starting point for our analysis of the literature on informational capitalism is C. Wright Mills' (1951) *White Collar: The American Middle Classes*. Mills demonstrated a change in the occupational structure of the American workforce across the later 19th century up to the first half of the 20th century, where the fastest growing segment of the workforce was in what he called white collar work, or the 'new middle class'. From the year 1870[2] to 1940, this group of workers which consisted of managers, salaried professionals, salespeople and office workers grew from 6% to 25% of the American workforce. The context within which this changing occupational structure was embedded was that of the spread of bureaucratic organisation. Bureaucratization is a central focus of *white collar*, as are many of Weber's other concepts in his former student Mills' work. The 'bureaucratic context' as Mills calls it, is an important factor for the changing division of labour because it produces and legitimises the need for the production, organisation, storage, and application of information across organisations, whether public or private. Indeed, we can even find mentions in the book of white-collar work as part of an "information industry" providing "information services" (p. 150 & 169) and these were increasingly important to manage production and people and to accelerate consumption (e.g., through the communication of marketing and sales information).

Over a decade later, Austrian American economist Fritz Machlup (1962) produced what is now recognised as one of the first studies of the role of information and knowledge in the economy. Machlup's analysis built on Mills' (1951) work by demonstrating how the American workforce was transitioning from one based predominately on production in manufacturing industries to one based on the production of information in what he termed the "knowledge industries". This

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[2] It is interesting to note that the dates Mills' observations are based on are only three years after the publication of Marx' capital in 1867. The ideal worker of early industrial capitalism in Marx's analysis is the industrial factory worker based on their numbers and significance for the organisation of work and labour processes. Mills' (1951) contribution highlights the growing seeds of occupational change in the division of labour, a change driven in large part by the increasing informationalisation of socio-economic activity.

is a landmark study which provided the impetus for the emerging focus on information societies, knowledge economies and service economies in later decades. For Machlup, knowledge industries consisted of education, research and development, 'communication-media', and 'information machines and services' and these activities accounted for 29% of America's Gross National Product and perhaps most importantly, these industries were comprised of "knowledge-producing occupations" which accounted for over 32% of the workforce (Kerr and Ó'Riain 2010).

It is important to note at this stage that the two main drivers of this growing 'knowledge-producing' and 'information service' work were ongoing changes in both the world of work *and* technology. Throughout this period of rapid expansion across industrial societies, a growing number of organisations and corporations grew to employ hundreds of thousands in what became increasingly complex, information-laden bureaucracies. Maintaining effective control over the expanding industrial and services workforce and communication between organisational branches required the production of new information systems, procedures, and technologies, what Beniger (1986) called the 'crisis of control'. Furthermore, the period immediately preceding when Machlup (1962), Porat and Rubin (1977) and Rubin, Huber and Taylor (1986) were conducting their analyses into the changing division of labour - the golden age of Atlantic capitalism (Vidal 2016), was also a time of major technological advancement in micro-electronics, computation and telecommunications, a field which would later become known as information and communications technology (or ICT). With the invention of the semiconductor in 1947, the integrated circuit in 1957, and Intel's first microprocessor in 1971 the production of computing technology and power experienced exponential growth, a phenomenon we now refer to as 'Moore's Law'[3], named after the then chairman of the largest micro-electronics corporation at the time – Intel (Castells 1996). Although most of the research and development that drove these technological innovations were publicly funded for military operations (Mazzucato 2011), their applications were quickly realised in private industry as the production and use of personal computers accelerated in the 1980s.

The mutually entangled development of production, work organisation and technology tend to therefore move in tandem. Changes in the organisation of work produce emergent needs for new technologies (of control and communication) and the integration of new technologies in

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[3] Beynon (2016: 318-319) uses the production of the Sony PlayStation 3 gaming console, effectively as mini-computer, as an example of Moore's law, as he states "*launched in 2006 it had the computing power of the powerful ASCI Red computer that had cost the US government 55 million dollars to develop in 1996 and occupied 100 cabinets over 1,600 square feet of floor space.*".

the world of work shape both labour processes and their organisation within the workplace in an emergent, dialectical process.

The 'Post-' Wave Theories and the Rush to Predict what the Future Is and Is Not

It is within this context of a growing informationalisation throughout (mainly advanced) capitalisms that a series of theories and narratives have emerged that profess systemic socioeconomic change, fundamental 'breaks' with the structures and logics of industrial capitalism, and for those more hesitant to prophesising – claims of continuity, deepening and adaptation where past characteristics are merging with new contexts. The most notable of these are Bell's (1973) 'Post-Industrial Society', Drucker's theory of 'Post-Capitalism' (1989; 1994) and the theories of 'Post-Fordism' that animated the debates around socio-economic change throughout this period (Amin 1994; Coriat 1992; Jessop 1992). These can be divided into two camps: the first consists of Bell (1973), Drucker (1989; 1994) and what others have called 'third wave' theories (Preston 2001) which put forth a position of optimism and rational progress; the second encapsulates those multiple intersecting theories that fall broadly under the Post-Fordist debates from the 1980s–2000s which tended to be more hesitant in their prescriptions on future states in favour of arguing what the present period was not. Despite the interest in the changing division of labour within western capitalisms since the publication of Mills (1951) and Machlup's (1962) studies, it was not until the early 1970's that this interest spread rapidly throughout academia and popular media and culture. The publication of Alvin Toffler's Future Shock (1970) and Daniel Bell's The Coming of Post-Industrial Society: An Exercise in Social Forecasting (1973) have arguably been the turning points and springboards in both the academic and popular media debates about the 'new' future of capitalism and these constitute the starting point of the first camp of 'post-' wave theories.

Toffler (1970; 1981) began what Preston (2001) refers to as the 'third wave narratives' of societal transformation, where scholars and free-market techno-utopianists were concerned with identifying a transition within the capitalist modes of production from agrarian, to industrial to post-industrial. The advantage of hindsight is a powerful thing in grounding debates of change, and a review of the literature on these theories of change throughout this period helps reveal the different orientations and networks that these authors were embedded within. From this we can see that there is a group of authors who have deep ties to corporate networks. Alvin Toffler was perhaps one of the first techno-utopian business 'gurus' with his

connections to IBM and other large US corporations at the time, followed then by management academic and consultant to firms such as IBM and General Electric – Peter Drucker. The links between these third wave theorists and the corporate centres of work organisation and technological adoption and evangelism extends to the work of Nicholas Negroponte[4] (1996) and Kevin Kelly (2000; 2016) who founded Wired magazine, which is arguably the centre of popular media on technology and society in western culture. This link between the private sector, theorists and their fascination with the 'technological engine' and the notion of 'knowledge as fuel' that will drive innovation and profits has and continues to be integral to the development of information and communications industries. Not only were these authors deeply connected with the private sector (technology companies and venture capital), their publications and theories all bear the stamp of technological determinism, a propensity for claims to fundamental change and a free-market fundamentalism that guides their thinking.

Beginning with Peter Drucker's claim that society has experienced an 'age of discontinuity' (1969) and a transformation to what he called a 'post-capitalist society' (1993). In his publication of the same name, Drucker predicted that this transformation would "not be completed until 2010 or 2020" (1993: 2). The transformation that he claimed was occurring was a fundamental shift in capitalism where the primary source of value was no longer capital, natural resources or labour but knowledge and its application towards productivity and innovation in the world of work. He called this changing role of knowledge in society the 'productivity revolution' where knowledge was applied to tools, processes and products to revolutionise the production process and indeed the world of work. Drucker too took advances in the field of information and communication technology and the division of labour[5] to claim that the new epicentre of the world of work is the 'knowledge worker' or the 'knowledge professionals' - those who design and market the goods and services of the economy. The foundations of this transformation lied in the application of knowledge to the production process in the first half of the 20th century, which helped accelerate the link between technological innovation and work organisation. Although technology was central to Drucker's claims, he positioned the new knowledge workforce as the ultimate harbingers of new technologies "whom the machine serves" (p.66). However, this assurance in the directionality

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[4] Negroponte was also deeply embedded, through his founding of the Media Lab at the Massachusetts Institute of Technology, within what would become the academic centre of the close links to the US technology industry and the elite academies.

[5] In his book, Drucker (1993) proclaims that Frederick Winslow Taylor (1856-1915) "first applied knowledge to the study of work, the analysis of work and the engineering of work" (p.30) in what we now recognise as scientific management or Taylorism.

of control between workers and technology is at odds with current empirical research that demonstrates the technological structuring of work from the personal computer to new tracking devices (Moore 2019) and the algorithmic platforms of the gig economy (Wood et al. 2019; Vallas and Schor 2020).

Drucker's (1969; 1993) claims of systemic breaks in the logics and structures of capitalism and the third wave optimism of Toffler (1970; 1981) could have perhaps been dismissed by the social scientific literature as arguments in thrall to market fundamentalism. However, the coinciding introduction of Daniel Bell's (1973) post-industrial society thesis occupied more of a centre ground in the emerging debate and drew more interest, support and scrutiny from the field of sociology. Despite Bell's affinity for market fundamentalism, his Keynesian undertones deeply influenced his post-industrial society thesis where he argued that the new age would be characterised by closer ties between professional, scientific and technical workers and state governance of capitalist market societies (Ampuja and Koivisto 2014). The overall vision put forth in Bell's (1973) work was of a society in transition where the 'old machinery' of industrialism was and would continue to give way to a post-industrial mode of production where professional, scientific and technical workers (what he called 'research and technical men') led the planning and organisation of national economies. He argued that this transition constituted a fundamental shift in the locus of power in society away from the property owning and political classes who accessed power through inheritance and membership, towards the individual who would accumulate power in the post-industrial society through education, knowledge and skill or 'human capital'. An argument which would later become central to the 'knowledge economy' debate and policy agenda.

Underpinning those claims of systemic transformation in Bell's work was, he argued, the changing role of information and knowledge in society and work, for in his own words - "My basic premise has been that knowledge and information are becoming **the** strategic resource and transforming agent of the post-industrial society" (Bell 1973: 531). Central to Bell's post-industrial society thesis was the claim that "theoretical knowledge" would become the core "axial principle" and driving force of the changes to the social structure (centrality of knowledge, knowledge workers and information technologies) that would subsequently usher in this new age. This archaeological trail that we have traced thus far follows the growing emphasis in scholarship and popular media on the expanding informationalisation of (re)production in western capitalisms. At this point I think it is timely to link the scholarship of Manuel Castells (1989; 2010 [1996]) to this debate. Although not necessarily ascribed to the

'post-' wave narratives of societal change, Castells' (2010 [1996]) trilogy *The Information Age: Economy, Society and Culture* and in particular volume I *The Rise of the Network Society* is deeply influenced by Bell's (1973) post-industrial society thesis and in many ways holds the same optimistic forecasts. The locus of Castells' argument is the transition from industrialism to informationalism, a new mode of development and production afforded by the shift towards "knowledge generation, information processing and symbol communication" (2010 [1996]:17) which is driven in large part by the new information and communication technologies. Informational capitalism, he argues, is oriented towards the accumulation of knowledge towards technological development.

However, as with previous authors the core to Castells' thesis remains the mutually shaping developments in both the division of labour and technology. Apart from the continuation of the arguments mainly originating in Bell's (1973) work on post-industrialism and maintaining a veneer of optimism akin to the third wave theorists, The Rise of the Network Society adds a new emphasis on organisational transformation. The 'network' for Castells supersedes and replaces the hierarchy so central to the bureaucratic organisations of the industrial era:

> *"...historically, power was embedded in organisations and institutions, organised around a hierarchy of centres…networks dissolve centres, they disorganise hierarchy, and make materially impossible the exercise of hierarchical power without processing instructions in the network…"* (Castells 2000)

This ushers in a new era of 'network enterprises', the decentralisation of control and apparently - the subsequent increases in autonomy within the world of work. As Ampuja and Koivisto (2014) pointed out, Castells' neoliberal undertones emphasised the shifting locus of power from centralised states and hierarchies towards horizontal networks, from traditional modes of organisation and planning towards more entrepreneurial, innovative forms of production in the 'New Economy'. The thrust of Castells' argument, the authors note, is aligned with the emerging managerial discourses of the time which emphasised the new spirit of capitalism and the need for organisations to cultivate (and manage) creativity and entrepreneurship (and later– 'intrapreneurship'). Despite Castells' interest in this period of social change dating back to his work on *The Information City* (1989), his later trilogy became and continues to be firmly cemented within the sociological debate on the contemporary changes in capitalism, and his concept of informational capitalism (although not accurate as a universal signifier of the totality

of the contemporary political economy) is arguably the most accurate descriptor for capturing this pocket[6] of transformations.

However, another network of debate was emerging at the same time and these contributions have become known as the theories of 'Post-Fordism'. In what is the most consolidated edited collection on this debate to date, in *Post-Fordism: A Reader* Ash Amin (1994) describes these coinciding theories as:

> "...a confrontation of diverse viewpoints, a heterogeneity of positions which draw on different concepts to say different things about past, present and future. These positions offer different explanations and conjure up different fantasies and phantoms…" (p.5)

The viewpoints that Amin is referring to are those of the regulation school, the proponents of the flexible-specialisation thesis and the neo-Schumpeterian's – the three theoretical dialogues of post-Fordism. Throughout the period from the late 1980s to the 2000s, these theoretical traditions emerged in dialogue with one another through their coinciding and at times competing arguments as to the forces shaping the world of work at the time and the trajectory of such developments.

The regulation school is the most critical of the three post-Fordism's and the least prescriptive in its concern for developing a theoretical framework of regimes of accumulation in capitalism. Originating in France, this approach has developed along various lines as its influence spread internationally (Jessop 1992). The primary concern for the regulationist's is to identify the dominant structures, principles and mechanisms of passing and potential future regimes of accumulation (Amin 1994). At the centre of the conceptualisation of accumulation regimes are a dominant grouping of sectors and a set of national and international regulatory measures designed to foster and develop these sectors (Castree et al. 2013), often referred to as a mode of regulation. This approach has driven the scholarship on the 'crisis of Fordism' which followed the golden age of Atlantic capitalism in the post-war period. According to regulation scholars, the crisis was characterised by the dissolution of the Fordist social contract from interacting factors such as the emerging stagnation of productivity levels, pressures of the globalisation of economic activity, inflationary pressures in the economy, and a gradual shift in consumption patterns from standardised to specialised products (Amin 1994). These

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[6] I use the term 'pocket' here to emphasise the fact that the developments and trends being identified by these theorists, despite their claims, only ever captured parts of the material realities within particular sectors (mainly technology industries and their associated sectors) and particular societies (at the time, mainly the US, UK, EU). Webster (2014) highlights some of the issues with such homogenising definitions of theories of social change.

analytical factors were grounded in the division of labour and technology in a similar way to the previously discussed theorists, although the scope of analysis was broadened significantly to include the institutional structures within which they were embedded.

Many of the factors identified within the regulation approach were also central mechanisms of change within both the neo-Schumpeterian approaches of Freeman and Perez (Freeman and Perez 1988; Perez 2003) and the flexible specialisation thesis (Piore and Sabel 1984; Lester and Piore 2004). For Freeman and Perez, the focus too was on long-wave paradigms of socioeconomic change, although the primary mechanism initiating and driving these processes of change was technology hence the use of the term 'techno-economic paradigm'. The authors correspond the period in which Fordism was dominant as a social contract and regime of accumulation to the 'fourth Kondratiev wave', a techno-economic paradigm driven by electrical and mechanical technologies and their diffusion throughout the mass production industries. In the later work of this neo-Schumpeterian line, Carlota Perez (2003) develops a framework for a fifth Kondratiev wave which she argues corresponds to an ICT techno-economic paradigm where information and communication technologies initiate a transition from the previous growth paradigm and sustain a new wave of development based on information technology industries. In this view, technology is the primary force driving changes in the organisation of production and the world of work towards increasing informationalisation:

> "The contemporary change of paradigm may be seen as a shift from a technology based primarily on cheap inputs of energy to one predominantly based on cheap inputs of information derived from advances in microelectronics and telecommunications technology." (Freeman 1988: 10)

The final approach within the post-Fordist debate narrows the scale of its focus to the domain of production. The flexible specialisation thesis is concerned with theorising modes of production based on either a model of mass production or flexible specialisation, two modes of organisation which the authors claim co-exist historically yet become individually dominant at different historical periods or 'industrial divides' (Amin 1994). The core of the argument is that Fordism was characterised by the periodic dominance of a mass production mode of organisation which has given way, following the crisis of Fordism, to a second industrial divide characterised by the emerging dominance of a mode of production based on flexible specialisation where skilled, craft-based workers produce customised goods and services (Piore

and Sabel 1984). As a mode of production, flexible specialisation is said to involve organisational restructuring to cultivate flexible production and working practices, a decentralisation of control to enhance worker autonomy, skills and knowledge and a general trend towards improved working conditions based on new relations of skill, collaboration and trust (Amin 1994). This new mode of production thus increased the importance of what Lester and Piore (2004) termed "*the missing dimension*" – innovation by knowledge workers.

The merits of the post-Fordist approaches have been scrutinised from multiple angles, with concerns over technological determinism and dualistic logics. As Beynon (2016) has reminded us, the emerging empirical research on the changing world of work has demonstrated, against the optimisms of many theorists, the persisting tendencies of exploitation, commodification, intensification and degradation. He contends that "*if viewed from the standpoint of worker autonomy and the salience of work based upon pressured and repetitive job tasks*" (p.322) it is clear that we have moved "*not very far*" beyond Fordism. Despite the differences in their forecasts and optimism for the future, at the heart of the post-Fordist theories there was general agreement on a number of important trends in the division of labour and technology (see table 3 below).

	Regulation School	**Flexible Specialization**	**Neo-Schumpeterian**
Main Trends	-ICT-based production/work. -Flexible production/work.	-ICT revolution & networking. -Flexible production/work. - Centrality of innovation, knowledge and skills in production. - Decentralisation of workplace control.	-ICT revolution & networking. - Flexible production/work. - Centrality of innovation & knowledge in production.

Table 3: Post-Fordisms.

First, technological advancements in ICTs and their application to the world of work had wide ranging implications for work organisation. Second, there was throughout this period an increasing emphasis on product differentiation and an intensification of consumer communications and marketing, and these trends were leading to the introduction of more flexible, decentralised and networked forms of work organisation. Finally, this ultimately deepened the trend in the division of labour towards services and informationalisation, a small

pocket of which is primarily involved in knowledge-intensive, innovation-based work. The 'crisis of control' (Beniger 1986) that followed the expansion of the social machinery of industrial capitalism (e.g., mass production, mass transit and technology and energy advancements), and the coinciding bureaucratization of private and public organisations not only lead to changes in the division of labour towards more services-based activities, but also innovations in the technological tools that would allow for the effective control of the expanding system. What the early work of Mills and Machlup, and the following 'post-' wave theories of social change agree upon is that both changes in the division of labour and technology, which emerged throughout a period of huge growth in economic production and consumption in western capitalisms, increased both the quantity of information and the need for new forms of work and technologies to control, communicate and put the information 'to work'. Unfortunately, these developments subsequently led to a renewed interest in grand-narratives and the widespread use within business and policy networks of the concept of the 'Knowledge Economy' (OECD 1999).

The Knowledge Economy and Cognitive Capitalism Imaginaries: Two-Sides of the Same Coin?

The obsession with periodising the stages of capitalism and predicting the future of the world of work have continued throughout the transition of the century and have spread on one side to business and state networks and the other to more radical, progressive critiques. This section focuses on the two main theories which originate from and represent the interests of both sides of this coin – the knowledge economy debate which emerged from the utopian visions of the 'post-' wave theorists and has become the orthodox go-to agenda of national and transnational economies; and the theory of Cognitive Capitalism which is influenced by autonomist Marxism and scholars of the Italian post-operaismo tradition (Hard and Negri 2000; 2009; Lazzarato 1996; Vercellone 2007; Moulier-Boutang 2012). Although the proponents of both theories occupy polar sides of the social, economic and political spectrum, both the knowledge economy and cognitive capitalism theorists are united in their claim that knowledge has become the *primary* source of value in capitalism, and that knowledge workers or 'immaterial labourers' are the new vanguard of the world of work with revolutionary implications, albeit in diverging political directions. Together, these theses represent the contemporary manifestations of the interest in the changing world of work and technology, and their implications for the political economy of capitalism in the 21st century.

Thompson and Harley (2012) trace the discursive development of the knowledge economy agenda, identifying its origins in 1970s post-industrialism and its heyday in policy and (some) academic circles throughout the 1990s. As perhaps one of the world's largest and most politically influential research-based think tanks, the OECD (1986; 1995; 1996; 1999; 2001) has done more to disseminate and (quasi) legitimise the knowledge economy agenda than any other institution. In a series of publications dating from the 1980s to the 2000s, the OECD drove attempts at the statistical measurement of the knowledge economy and the wider discourse and policy framing of the 'information economy' and 'knowledge-based economy'. These studies were indeed born out of the research and publications focused on the growing informationalisation of the workforce, production and investment in knowledge products such as intellectual property and the many (contested) claims of the progressive effects technology and knowledge will have on employment growth, productivity and innovation in commodity markets. Knowledge economies are defined as those which *"are directly based on the production, distribution and use of knowledge and information"* (OECD 1996:3), and its associated claims have become cornerstones of national and international policy:

> *"The shift to a digital, knowledge-based economy, prompted by new goods and services, will be a powerful engine for growth, competitiveness and jobs." (Lisbon European Council, 2000:1)*

One of the scholars of the regulation school – Bob Jessop (2004:168) has argued that the concept of the knowledge economy has the capacity to be adapted to multiple scales and purposes and as a 'vision and strategy' has contributed to the growing interest in ideas such as the creative industries, information economy and lifelong learning. Other authors have made similar points, positioning the knowledge economy discourse within policy circles and its academic proponents as attempting to make virtuous links between economic transformation, knowledge-based work, entrepreneurial subjectivity and risk taking with the intention of diffusing 'enterprise ideology' throughout the different spheres of society (state, education, science etc.) in what Armstrong (2001) describes as an 'ideological distortion'. For *"the [knowledge economy] policy is an act of faith, based neither on research nor on experience. Its reliance on enterprise is less a solution than a hope that one will spontaneously appear."* (Armstrong 2001: 524). As an umbrella concept (Godin 2006), the realities it is purported to describe have come under sustained empirical critique since its inception.

Warhurst and Thompson (2006) identify three assumptions that characterise the knowledge economy imaginary and which are largely unsupported by empirical data, if not by proxies. First, the economy (and work) is said to be characterised by increasing knowledge-intensity, secondly, organisations must therefore re-design management strategies and the organisation of work to create, capture and capitalize on this knowledge; and finally, public policy needs to be re-directed to foster this process through for example mass higher education and investment in R&D. The data underpinning these assumptions is based largely on the use of proxies such as ICT use, R&D, qualifications, and occupational categorizations, all of which have their limitations (Godin 2006). Furthermore, the growing proportion of the workforce across advanced capitalist societies labelled as professional, managerial and technical work, the statistical category most used to support claims of a knowledge economy, are developing along polarized lines with a knowledge 'core' of managers, designers, engineers etc. and a growing periphery of more routine work involving information processing more akin to traditional administrative occupations as opposed to those focused on creativity, invention and innovation (Warhurst 2013).

In their assessment of the debate, Powell and Snellman (2004) provide insight into an important yet often overlooked assumption in relation to the connection between technological development and organisational practices. The authors point to research by economists who claim that the value of ICT's will emerge as organisations begin to conform to the new technological systems, and later argue the same:

> *"the long-expected gains in productivity from information technology may not be realized until older, centralized organizational arrangements are abandoned and alternative ways of organizing are developed."* (Powell and Snellman 2004:209)

The rationale underpinning such claims originate from the accepted assumption that people (i.e workers, organisations and institutions) must change, adapt and conform to the affordances of new technologies. Therefore, rather than technology being developed and used to assist the needs of peoples, technology is often adopted with the aim of transforming or 'disrupting' the structures, logics and practices enacted across society in the pursuit of growth (i.e through more: productivity, control[7], extraction, 'efficiencies' or cost savings and so on). It is important to highlight this assumption because it is present in both implicit and explicit forms throughout

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[7] How this assumption and the associated changes to organisational logics and structures plays out is discussed further in section 2.4 of this review which focuses on the contested terrain of control in work and is examined within the context of software and creative work throughout chapter 5 on the control of software and creative work through *regulated autonomy*.

socio-economic thinking, from the policy agendas of global institutions and nation states to the decisions and structures of organisations all the way down to the practices of workers and peoples in their everyday lives.

The empirical claims of the knowledge economy discourse which has directed the strategies of private capital and the policies of governmental bodies have largely failed to come to fruition. Contrary to the forecasts of its proponents, the world of work has not transformed into a world comprising of knowledge workers, where the relations of the workplace are democratised because workers now possess ownership of the 'new' means of production (i.e knowledge), securing their creative freedom and autonomy from managerial control. Indeed, such claims were central to those earlier 'post-' wave theories where the traditional industrial modes of production, work organisation and thus control have and will continue to fundamentally shift. This shift, which is driven in large part by the proclaimed centrality of knowledge (or immaterial labour) and ICT's, will result in organisational upheaval where bureaucratic control gives way to more devolved, horizontal networked modes of organisation, or what Toffler (1970) called 'the collapse of hierarchy'. Moreover, the share of employment in knowledge-intensive services, despite experiencing growth, still comprises a comparatively small portion of employment within most OECD nations. Many advanced capitalisms have indeed experienced a transition from manufacturing based activities to one based on services, with employment across manufacturing declining by over 20% in the past two decades and employment in services increasing by 27% in the same period (OECD 2019), however, the composition of this growth in services work has followed an increasingly polarized trajectory (Oesch 2013), with the majority of new jobs located in 'low-skilled' interactive service work in the retail and hospitality sectors with a smaller portion of employment growth taking place in 'high-skill' professional and technical services activities.

Emerging in response to the pervasive knowledge economy agenda and off the back of the 'blockbuster' success (Passavant and Dean 2003) of the autonomist Marxist tradition which is founded on its conceptualisation of immaterial labour and its proposed radical implications (Lazzarato 1996; Hardt and Negri 2000), the cognitive capitalism thesis (Vercellone 2007; Moulier-Boutang 2012) represents the other side of same coin. The theory of cognitive capitalism claims to depict a new, third stage of capitalism which follows mercantile and industrial capitalism. This new paradigm breaking formation is as Thompson and Briken (2017) point out, based on identifying an archetype of the division of labour and attributing it transformational qualities for both the political economy and class composition of capitalism.

It is here that the autonomist Marxist emblem of the immaterial labourer comes into play. As a concept, immaterial labour appears to include an ever-expanding range of qualities in the literature, but it is originally defined as that labour which contributes to the informational or cultural content of a commodity (Lazzarato 1996). Immaterial labourers are therefore the vanguard of the new stage of capitalism which is premised on knowledge as the primary source of value, a claim which has now become commonplace among theorists of grand socio-economic change. As a theoretical corpus, the cognitive capitalism and immaterial labour theses have much in common with previous grand-narratives such as the knowledge economy and taken together they help frame the actually existing empirical position of their acclaimed archetype – the knowledge worker or immaterial labourer.

As Hemondhalgh (2008) noted, one of the weaknesses of the autonomist Marxist tradition is its failure to engage with the empirical cases and contexts it purports to explain. Empirically grounded analyses are also lacking in its latest iteration in the cognitive capitalism thesis. This is partly due to the style of theorising often adopted by grand narrative where a niche, ideal type segment of the workforce is taken as the harbinger and seed of systemic social transformation (Thompson and Briken 2017). Moreover, these traditions are also characterised by some conceptual fuzziness in the shifting boundaries of their concepts. For example, immaterial labour refers to the cultural and informational content of work, but also encompasses the affective labour of human interaction (care etc.), and the free labour (Terranova 2004) extracted though systems of data capitalism. On top of these problematic conceptual boundaries, the concentration and reification of immateriality in this work is at pains with the material realities upon which it is founded. Gill and Pratt (2008:9) compare this issue with previous narratives of the 'death of distance' (Cairncross 2001) that sparked critical scholarship on the centrality of place in economic activities (Pratt 2002; Saxenian 2006) and call for "*a response that highlights the persistence of all-too-material forms of labour*".

Both traditions have emerged within wider social contexts of an increasingly informationalised, digitalized and services-based economy where a growing proportion of the workforce is involved in information processing activities and emerging centres of economic power are oriented around high-technology industries where research, science and innovation are prioritised. It is under these circumstances and following in the footsteps of the now age-old tradition of eulogising a particular type of work or sector of the economy as the harbinger of social transformation that these theories have continued the work of the previous authors in propelling the knowledge worker (usually software and creative workers) to the forefront of

the changing, and radically improving I might add, world of work. These workers not only produce the *primary* sources of value in contemporary capitalism, but the exclusive possession of the means of production awards them increasing power in the workplace which defies managerial control (Drucker 1993; Hardt and Negri 2000; Moulier-Boutang 2012). Furthermore, the centrality of these workers to the brave new world of work is such that organisational structures must be recomposed anew to allow for the flourishing of creativity and collaboration and the death of hierarchy and bureaucracy in this post-industrial, post-Fordist, knowledge-based, cognitive and so on…era.

It is through the realisation that both theories tend to extrapolate paradigm breaking change in the political economy of capitalism from comparatively niche developments in a small pocket of industry (high-tech and cultural and creative industries) and an even smaller cohort of the workforce (knowledge workers or immaterial labourers), that they are best understood as imagined futures (Beckert 2016). As imagined futures, the knowledge economy agenda and cognitive capitalism thesis are driven by what Beckert (2013; 2016) defined as fictional expectations (of employment and productivity growth, democratisation of control, a crisis of measurability, a radical new class composition etc.). These expectations are of imagined future states which are extrapolated from the asserted and assumed empirical significance of developments in the world of work and technology for transforming the totality of global capitalism. These imaginaries are powerful drivers of macro-socioeconomic change because they emerge from western liberal ideologies that are founded on market fundamentalism, and which believe the 'self-regulating market' to be the most efficient means of organising and most importantly – progressing society. Indeed, others have argued that such concepts as information society and knowledge economy preserve enlightenment beliefs in rationality and progress. Alternatively, the cognitive capitalism thesis and its influence by the proponents of immaterial labour contain the same weaknesses of other grand-narratives (Thompson and Briken 2017) and are based upon the very premises they purport to negate (Pitts 2017; 2018), highlighting the need for scholars to centre actually existing capitalisms in their analyses of the structures and dynamics of the present day.

Grounding the Debate in Actually Existing Capitalisms

Although the previous waves of scholarship discussed throughout this section have as their basis real empirical change in both the division of labour and technological characteristics of advanced capitalisms, their indulgence of futurology and determinism leads them to

overestimate novelty and the implications for the future of work, verging towards discontinuity at the expense of the continuing convergence and adaptations of capital logics and structures. This amounts to a macro-sociological exercise in the construction of imagined futures through attempts to identify, establish and legitimise fictional expectations of a future world of work, production and economic prosperity (Beckert 2013; 2016). Ultimately, what emerges from the ashes of these imagined futures is the persisting empirical materialities of 'actually existing capitalisms' (Thompson and Briken 2017). As Fuchs (2020) is at pains to highlight, capitalism is a dynamic emergent system of social, political, economic, cultural and ecological organisation and rather than it following an exclusive path of change, contemporary capitalism is simultaneously an informational capitalism, financial capitalism, digital capitalism, network capitalism, surveillance and data capitalism and so on. It is through the recognition of the mutually entangled nature of these developments and of the co-presence of change and continuity that debates on the world of work under contemporary capitalism can be grounded in their empirical reality, which invariably requires acknowledging its multifaceted, complex and at times contradictory nature.

The claims and prescriptions of the many authors and theories discussed above have been subject to critique from multiple angles. In terms of the contention that knowledge production has become the primary source of value in many advanced capitalisms, researchers have indeed shown that there has been a marked growth in the production and commodification of intellectual property (Powell and Snellman 2004; Zukerfeld 2017) and knowledge commodities (Rotta 2018; Rotta and Teixeira 2019). However, the degree to which knowledge work has become dominant, and the accompanying changes to organisational control and structures based on this assumption and the advents of new ICTs have failed to materialise (Thompson et al. 2001; Warhurst and Thompson 2006). Furthermore, the links between technological (specifically ICT) development and productivity, long purported by the knowledge economy prescribers, are rife with measurement, data and classificatory limitations (Godin 2006). The knowledge economy appears to have experienced a dissolution as a hegemonic concept, for as some authors have argued - the discourse actually only related to "*the interests of a fraction of capital in the knowledge-intensive industries*" (Thompson and Harley 2012: 1371). However, it is more useful to perceive this change in popularity through a different lens. The knowledge economy, and many of its theoretical claims to material transformations in the world of work has become what we could call a sedimented concept, one whose assumptions and assertions (Darr and Warhurst 2008) have disseminated throughout the 'common-sense' vocabulary and

understandings of private and public spheres, irrespective of their empirical reality. Despite its relative[8] decline in its explicit centring within policy and academic discourse, in its dissolution and eventual sedimentation as a framework of knowing it has become the underline foundation for the new waves of hegemonic agendas and economic 'buzzwords' such as the New Economy (Godin 2006), Creative Economy (Florida 2002; Dubina et al. 2012; OECD 2014), Digital Economy and Digital Transformation (Rothstein 2021), the new wave of interest in artificial intelligence (Kerr et al. 2020), and emerging systems of capital accumulation based on datafication and surveillance (Van Dijck 2014; Zuboff 2019; Couldry and Mejias 2019; Sadowski 2020).

What recent empirical analyses on the changing world of work *have found* are a number of processes of what we could call hybridisation, where old principles, logics, tools and structures are evolving to meet new contexts and in turn have extended and re-made the organisation, control and stability of work. The digitalization of production, through for example new platform structures, and of work, through emerging forms of digital labour are one example. Moreover, the distinctions between industrial work and services work amid the western transition to a predominantly services-based economy has become increasingly blurred. The degree to which production (and work) in industrial manufacturing differs from 'post-industrial' services is questionable when what has actually taken place is a hybridisation of the division, organisation and practice of labour. Powell and Snellman (2004) point to this process with their examples of the increasing informationalisation and computerization of automobile production, and this is further evident in recent analyses of services work that identify a new form of digital Taylorism (Cole et al. 2021).

In their critique of the immaterial labour thesis, de Angelis and Harvie (2009) identify a myriad of processes and tools of measurement within the control of academic labour. Most importantly, this persistent presence of measurement is also identified by Pitts (2016; 2017) in his case study of creative workers, mounting strong critique for the proclaimed 'crisis of measurability' that the era of knowledge work and immaterial labour is claimed to have ushered in. In our present day, the overwhelming reality of contemporary capitalisms obsession and success in controlling labour through quantification is evident in the pervasiveness of the logics of dataism, and the structures and mechanisms of datafication (Van Dijck 2014),

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[8] This decline is indeed to its heyday throughout the 90s but the concept of the knowledge economy remains an important piece in the overall socio-economic frameworks that the OECD construct. This is evident in the current use of the concept within publications directed at the development of particular nations (2016; 2021) and also through its diffusion throughout the organisation's publications on the future of work (2019).

platformisation (Duffy et al. 2019) and surveillance capitalism (Zuboff 2019). Capitalism is always already informational, neoliberal, digital, financial etc. because these social processes are mutually entangled, each trend contributing to the intensification, adaptation and overall transformation of the others (Fuchs 2020). In grounding debates on the world of work in actually existing capitalisms, analyses of the labour process, organisation of work and technology need to resist the temptation to claim the presence of novelty and instead put the continuing presence and hybridisation of old practices, structures and logics into new empirical contests.

This chapter has analysed the role of knowledge, information and creativity in a digitalizing, flexibilizing world (of work) through the historical waves of scholarship that have shaped the frames through which we have come to understand them. Beginning from the early studies that sparked interest in a shift towards an informational capitalism. Mills' (1951) seminal research on white-collar work and Machlup's (1962) quantitative analysis of the shift in US employment away from manufacturing towards informational service work paved the way for the successive waves of interest on the assumed changing role of knowledge in society. Next, Daniel Bell's (1973) influential *The Coming of a Post-Industrial Society* spurred a wave of 'post-' narratives where scholars, critics and proponents alike attempted to describe the changing worlds of work, production and consumption through various descriptions of what the contemporary era was *not*. The Knowledge Economy and Cognitive Capitalism imaginaries emerged from these two waves as perhaps the most influential of such theories and has subsequently become embedded within the social, cultural and institutional lexicon of society and governmental policy. Finally, the New Economy, Digital Economy and Creative Economy orthodoxies extended the reach and focus of these debates by examining their representation through the emerging economic activities, work and sectors that appear as archetypes of such changes, namely the high-tech, new media and creative sectors.

Despite the varying claims to the causes, directionality and outcomes of the changes that have been taking place over the past 60 years or so, what these waves all share is their general agreement on the growing significance of knowledge and digital technologies in contemporary capitalism. Knowledge, information and creativity have been increasingly revered as the drivers of economic growth and prosperity, and knowledge workers are acclaimed as the future of work. What has become evident to date is that knowledge, creativity and cultural intensity have become *more explicitly* important for capital accumulation in a digitalizing, flexibilizing global capitalism through for example technological and services innovation, consumer

product differentiation and digital advertising etc. Digitalization positions software workers at the vanguard of this emerging socioeconomic system and simultaneously renews and extends the significance of creative labour's 'work of combustion' (Pitts 2016) by providing new virtual space for creative commodities and consumer marketing.

However, the workers that cater to these developments, although they have been the focus of much debate in the knowledge work literature, constitute a small section of the workforce. As opposed to the future of work, they represent the latest cohort of creative knowledge workers needed to drive the current model of capitalist innovation (Huws 2010; Wohl 2022) which is based on digitalization, datafication, product differentiation and consumer marketing and persuasion. Taken collectively, these trends when positioned in the wider context of an ICT-technoeconomic paradigm (Perez 2003) and the capitalistic marketisation of knowledge as a fictitious commodity form (Polanyi 1944) part of the global pursuit of imagined futures based on what we could call a digital knowledge economy. As Warhurst and Thompson (2006) note in their critical examination of the knowledge economy agenda, "*knowledge and skills are formed through broader institutional processes, ranging from labour markets to the variety of capitalism within which the workplace is embedded*"(p.797). Indeed, the purpose of reorienting the knowledge economy debate in this section is to show how the political economic pursuit of the digital knowledge economy imaginary materializes in the changing nature of (and emphases placed upon) specific sections of work and economic activity such as those at the epicentre of the high-tech and the cultural and creative industries.

2.2   Locating Software and Creative Workers in the Milieu of 'New' Work

This section examines the worlds of work of the chosen case studies – software workers and creative workers and seeks to locate them within the unfolding political economic transformations detailed in the previous section. I begin by tracing the origins of this work and discussing their role within capitalist political economy before illustrating how these cases are considered vanguards of the changing world of work and archetypes of the digital knowledge economy in contemporary capitalism. Following this, the remaining parts of the section draw on some insights from Harry Scarbrough (1999), Ursula Huws (2003; 2006a; 2014), Alan Freeman (2008; 2012) and Frederick Harry Pitts (2015a; 2015b) to reposition the role of software and creative workers as organisational professionals and a new core of an old cohort of intellectual (or knowledge) workers driving the process of accumulation through innovation and consumption-based activities. On conclusion of the section, the level of focus will have

narrowed from the wider political economy down to the case studies of work and the workers with which this thesis is directly concerned.

Early research on the role of knowledge *in* work fell prey to some problematic assumptions and assertions which provided a basis for a somewhat skewed direction of scholarly attention (Darr and Warhurst 2008). The most common problem being the assumption that knowledge, information and creativity are somehow new and novel to contemporary capitalism and work. This error serves to obscure the ubiquity and interdependence of knowledges and creativity as deeply relational and critical aspects of all work both historically and contemporarily. The question then arises – if knowledge, information and creativity are imagined to be *increasingly* important to economic production, what forms of knowledge and creativity are becoming more important and why? Any discussion of 'importance' in the realm of economic production has at its core the profit imperative and thus the logic of capital accumulation. Therefore, a re-phrasing of the question is required – what forms of knowledge and creativity are becoming more important for the pursuit of profit and thus capital accumulation? The argument advanced here suggests that an answer to this question can be found in the cases of software work and creative work through the commodification of particular types of knowledges and creativities.

Despite decades of overgeneralised assumptions and assertions on the role of knowledge workers in the world of work, a lack of qualitative analyses of their working practices (Kleinman and Vallas 2001; Darr and Warhurst 2008; Issahaka and Rune 2019), and prolific debates across sociology, management and organisational scholarship, recent research has gone some way to rectifying this. Darr and Warhurst identified this early failing as "*evidence-based analysis displaced by assertion cum assumption*" (2008: 26) and other research has highlighted how the knowledge work literature has largely been driven by occupational and statistical categorisations based on proxies (Warhurst and Thompson 2006). We have rightly corrected the misplaced narratives on the scope and extent of knowledge work in contemporary capitalism by establishing what is *not* knowledge work (e.g., interactive service work) and by acknowledging how all workers are *knowledgeable* in the enactment of their labour, however manual or intellectual that labour may be (Thompson et al. 2001). Knowledge work has been variously defined as that which involves complex tasks, high levels of uncertainty, creativity, cooperation, autonomy and the decentralisation of hierarchy and control (Frenkel et al 1995; Blackler 1995; Thompson 2004; Huws 2006a; Flecker et al. 2006; Warhurst 2013; Holtgrewe 2014). In the process of defining the boundaries of the two case studies examined in this thesis, a practice Carter and Sealey (2009) term 'casing', I refer to software and creative workers

collectively as *digital knowledge workers* which I define as - workers who are hired for their *possessed*[9] knowledge in order to *practice* knowledge for the *production/commodification* of knowledge through both *digitally mediated* inputs (i.e labour) and outputs (i.e commodities). My attention now turns to 'locating' software and creative workers in the milieu of the 'new' world of work so often invoked by business and policy stakeholders.

Software Work, Creative Work and the Origins of Coders and Creatives

The development of software work and creative work, and the types of work and outputs they produce (e.g. computer programming, design, software applications, graphics, videos etc.), are both a means of and product of the pursuit of profit and power in contemporary society. For the practice of computer programming this has always been the case, and for the age-old practices of cultural and creative production this has increasingly become the case since the development of capitalist political economies based on mass consumption. Tracing the origins of software work and creative work as we have come to classify them ironically begins at the same point, before diverging along two (apparently) contrasting paths and ultimately arriving back at the same point in which they began. As alluded to already, these types of work under capitalism[10] both have their origins in the pursuit of profit and the means by which they achieve this is through the application and production of domains of knowledge which are both possessed and practiced by these workers to *primarily* produce efficiency gains and consumer attachments. Now to trace the origins of these cases and in doing so highlight their central role in the process of capital accumulation.

> "*We may say most aptly, that the Analytical Engine weaves algebraical patterns just as the Jacquard-loom weaves flowers and leaves.*" (Lovelace 1842, quoted in Carlucci Aiello (2016:60)

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[9] I use the term 'possessed' knowledge here to denote the diverse knowledges that workers bring to the labour processes. These include those knowledges that are embodied, embrained and embedded in the worker in both tacit and explicit forms. The term 'practiced' knowledge is used to describe those knowledges that are not necessarily possessed by the worker but are instead accessed, cultivated and adopted from their many distributed sources in the practice of labour.

[10] I specify 'under capitalism' to indicate that my discussion departs in its analysis of both forms of work based on their location within capitalist political economies. The intention is not to imply that creative work is in any way new, or for that matter exclusive to capitalist societies because indeed it is not. Instead, I simply want to stress the fact that my discussion begins from their location in capitalism rather than the creative and cultural practices that predate settled societies as we know them.

Ada Lovelace is widely credited as the first computer programmer for her work with Charles Babbage on the development of the Analytical Engine and a computational algorithm to compute Bernoulli Numbers[11] (Carlucci Aiello 2016). As mathematicians and logicians, both Lovelace and Babbage are key characters in the history of computer programming and what we have come to know as software work. Most importantly, this history has its origins in the two processes used to orient our discussion so far – the division of labour and the development of technology. The first programming languages developed out of the *manufactured* production of mathematical tables in late 18th century France by mathematicians and logicians (Campbell-Kelly et al. 2016), and then through the application of binary logic, akin to that applied to the Jacquard Loom, to machine computation by Babbage and Lovelace some fifty years later (Carlucci-Aiello 2016).

At the heart of these inventions lay Adam Smith's (1723-1790) pioneering research on the division of labour and its influence on Gaspard de Prony's (1735-1839) production of the worlds largest table-making project[12] and later Charles Babbage's (1791-1871) work on the first computation machine. De Prony's project was organised based on the principles of the division of labour where the workforce was divided based on mental complexity and manual intensity into three 'sections', the final and largest of which were the 'human computers' tasked with the labour of calculation for the development of the technology which would ultimately lead to the substitution of their labour. This principle was then adopted by Babbage to construct the Analytical Engine, a computational machine designed to make tables in a deepening of the division of labour and technological automation (Babbage 2010[1832]; Campbell-Kelly et al. 2016). Indeed, Babbage had also become one of the most knowledgeable scholars on the organisation of production during this period, evident in the use of term the 'Babbage principle' (Braverman 1974), bridging the work of Smith (1776) and Frederick Winslow Taylor's scientific management (1911) in his treatise on the subject *'On the Economy of Machinery and Manufacturers'* published in 1832. The 'godfather' of computing (Stemwedel 2011) may also be acknowledged as the godfather of the scientific management of work. This lineage is apt considering the pivotal role played by software in the organisation and automation of present economic activities (Shestakofsky 2017; Briken 2020; Moore et al. 2020) and the continued elevation of 'technical men' (Bell 1973) in the world of work which would have certainly

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[11] Despite the Analytical Engine being widely credited as the first computer, it was never actually developed into an operational product. Instead, Babbage had designed the logical system and proved it worked through the use of a prototype (Campbell-Kelly 2016).

[12] The *tables du cadastre* project commenced in 1790 by order of the French government and was aimed at constructing new ordinance surveys and decimal tables under the newly introduced rational metric system (Campbell-Kelly 2016: 5).

satisfied Taylor (1856-1915), his contemporary disciples and their intent on the rationalisation of work.

It was not until the mid-20th century, and the heyday of industrial capitalism that computer programming became a recognised and growing occupation and computers an economically scalable commodity primarily used for information processing. Computer programming, or coding languages proliferated throughout the 1950's with autocoding languages, Fortran, and COBAL some of the key innovations. Pivotal to the development of new programming languages and the push for more accessible syntax was the economic imperative of accelerating *and* simplifying the process of computer programming so that the industry was not as reliant on a small pocket of expensive expert coders (Campbell-Kelly et al. 2016), an attempt at deskilling that would prove only partially successful. Nonetheless, Campbell-Kelly et al. (2016: 175) argue that the cost of computer programming (development and debugging) was the primary reason the emerging software sector followed a consulting or business-to-business (B2B) model where software firms primarily produced applications for other sectors (e.g., banking, insurance, manufacturing, retail), catering to both large corporations (enterprise software) and SMEs.

As a growing and increasingly important occupation, computer programming experienced a period of professionalisation throughout the 1960s, a process which remains ongoing. The first cultural depictions (which are still present) of computer programmers (or coders) tended to characterise these workers as the 'socially awkward computer nerd' (Campbell-Kelly et al. 2013:183) and certainly contributed to the gendered division of software work (Adam et al. 2006) which is in stark contrast to the key role played by women as both mathematicians and 'computers' in its early development (Little 2021). Perhaps the most enduring and significant feat of the strategic process of professionalisation by the sector is the re-framing of computer programming and coding as 'engineering' (Bogost 2015; Campbell-Kelly 2016). Brian Randell (2018) describes this act of re-presentation as "*being provocative, describing a requirement rather than a reality*". The intention was to professionalise the status of computer programming by deepening the theoretical and methodological foundations of the discipline along similar lines to those of established engineering, in turn dissolving some of the circulating stereotypes which besmirched the occupation. This term software engineer has now become the go-to title employed throughout the industry and recent years have seen the design and integration of development methodologies such as Waterfall and Agile to structure and formalise the software production process.

Despite some notable exemptions primarily from the sociology of work and labour process analysis (Ó'Riain 2001; Barret 2001; 2004a; 2004b; Marks and Scholarios 2007; O'Carroll 2008), studies of software work and the software industry more generally lack the diversity, depth and sustained critical engagement of those seen on the Cultural and Creative Industries. Nonetheless, as a form of digital knowledge work that is critical to the maintenance and operation of contemporary digitalizing capitalism, software work is an important site of investigation into the nature of the labour process and the organisation of work in contemporary capitalism. The world of work of these coders is explored in more detail through three contested terrains in chapter 3 but for now, the porous category of creative work is brought into view.

There has been a growing focus on the notion of creative work and on the concept of the Cultural and Creative Industries in recent years (Warhurst and Thompson 2006; Hesmondhalgh 2008; Banks et al. 2013). Over the past three decades, industry interests, policy analysts and academics have shifted their gaze to these areas as potentially important activities for the future of work, economic development and socio-cultural change. This growing attention has converged in what can be considered two broad strands: the first is driven by industry and state policy directions such as the UK's 'Cool Britannia', the US's 'New Economy', and Australia's 'Creative Nation' (Ross 2009); the second comes as a direct response to the hyperbolic tendencies of the above and originates from the rich body of academic scholarship seeking to theoretically and empirically analyse creative work and the specificities of the newly coined cultural and creative industries (CCIs). During this period, Ireland followed similar growth models as other advanced western nations where policy makers and industry interests embraced the popular rhetoric of the 'knowledge-based economy', with its emphasis on knowledge, creativity and high-tech innovation (GOI 2016; Ó'Riain 2000; 2004). The 'creative', 'digital' and 'knowledge' industries are increasingly acclaimed as areas of economic growth, value and future employment, and have been subsequently elevated to keystones of national and international industrial policy (Kerr 2007; DCMS 1998; Ross 2009; EU 2010; OECD 2014). What underpins the industry and policy strand of this research and indeed some more 'critical' accounts is the assumption that creative work is somehow new and novel, echoing much of the preceding narratives of the New Knowledge Economy.

The positioning of creative workers as an important cohort driving the developmental trends of the new economy intensified within this strand of policy particularly across the US and UK as notions of entrepreneurialism and creativity became linked with economic growth, urban regeneration and regional development (DCMS 1998; Leadbeater and Oakley 1999; Florida

2002). Throughout this decade, policy and academic discourse moved from discussions of the cultural industries towards depictions of creative industries that were claimed to provide a more accurate account of modern cultural and creative production activities (Hartley and Cunningham 2001). This growing interest gained a great deal more traction following the references to creative work (or immaterial labour) in the autonomist Marxist tradition. Popularised by the publication of Hardt and Negri's *Empire* (2000), this continued the framing of creative workers as potentates of a new societal formation or 'spontaneous communism'. However, these strands tended to indulge too much in imagined futures (Beckert 2016) and lacked sustained focus on the qualitative nature of the labour process and organisation of production in these sectors. These issues have been highlighted elsewhere by key proponents of cultural industries analysis, a community of scholars primarily concerned with examining the working practices of cultural and creative production, and have tended to take a more critical approach to 'creative industries' (and other such) narratives (Garnham 2005; Hesmondhalgh 2008; Hesmondhalgh and Baker 2011).

David Hesmondhalgh has played a central role in analyses of cultural industries and cultural work, bridging this field and wider approaches from media studies, the political economy of communication and sociology. As Hesmondhalgh (2010) has noted, research on creative work has at times lost track of the domain of production and the labour process as a key site of analysis. This issue has amplified with the newfound attention autonomists have drawn to the extraction of value through what Terranova (2004) called 'free labour' across the internet. Despite the extraction of value through new platform and data structures, the focus on the 'social factory' and 'immaterial labour' across much of the creative work literature has contributed to a downplaying of the workplace and the labour process of creatives as the key site of contestation. However, a number of critical scholars of creative work have successfully centred the labour process and organisation of work in their analyses. These authors have examined exploitation and self-commodification (Ursell 2000), instrumental 'network sociality' (Wittel 2001), gender inequalities (Gill 2002; Hesmondhalgh and Baker 2015), the role of passion as the proverbial carrot on a stick (McRobbie 2002; Kerr et al. 2006), contradictory experiences of doing creative work within organisational structures and constrains (Huws 2010; Hesmondhalgh and Baker 2011). Such analyses grounded in the working practices of creatives have mitigated some of the hyperbole of novelty surrounding the cultural and creative industries.

Moreover, as Alan Freeman (2012) has noted:

"...neither the cultural nor the creative industries are new. Actually, they predate manufacture, agriculture and 'services', to which statisticians usually confine themselves. People have always been paying money for culture since antiquity. Creation is as old as, well, creation. Culture and creation should be recognised as an industry not because they have just arrived, but because they have always been."
(Freeman 2012: 5)

As a practice of labour involving the conception, design and circulation of cultural and creative artefacts, the concept of creative work in fact has its origins, as Freeman alluded to in his above extract, in the origins of human communication and sociality itself. Indeed, Freeman (2012:8) argues that there is "*a case for treating culture as the quintessential outcome, and creativity as the quintessential activity, of what makes production and consumption distinctively human social, political and economic activity*". Any such acknowledgement of this inherent aspect of human activity dissolves the popular depictions of creative work in the economy as 'new'. Alan Freeman's (2008; 2012; 2014) analyses on creative work do however provide some insight to the specificities of this type of work in our contemporary period. Perhaps most central to the work of creatives is the production of 'culturally-differentiated' goods and services that are constructed upon and contribute to the communities of taste (Freeman 2008) that have become pivotal to the act of consumption and thus the process of production and commodity circulation (i.e marketing, advertising, sales) in contemporary capitalism. Moreover, the role of creative work within the present period that has been characterised by informationalisation, digitalization and flexibilization (Piore and Sabel 1984; Castells 1996; Lester and Piore 2004) has become more pronounced. In this Freeman (2008: 22) identifies (i) producing things defined by the *effect required* rather than the method of making, (ii) producing *distinctive and differentiated* things and (iii) producing to an *abstract or imperfect specification* as three core features of contemporary creative work.

The importance of creative work therefore lies in its renewed, expanded and more pronounced role in contemporary capitalism rather than its historical novelty. However, tracing the origins and present-day specificities of creative work reveals what Frederick Harry Pitts (2015) has called "*a hidden history*". A history that highlights an ever-present activity in creative labour that has taken on a new veneer through its institutionalisation, rationalisation and specialisation as a 'new' collective 'industry' – the cultural and creative industries. The embedding of cultural meaning, signs and symbols within the products of human labour have, in the words of Pitts ever been thus, but these practices have gained increased significance within a global political

economy premised on the perpetual expansion of mass consumption of goods and services. Following this 'creative turn', many researchers have drawn attention to the work and labour processes behind the highly economistic rhetoric underpinning the CCIs and 'Creative Economy', and an extensive body of theoretical and empirical work has emerged in response. Knowledge, creativity and culture are seen as the 'new' driving sources of the economy, and the passionate, intuitive and flexible workers behind these activities are revered as archetypes of the future of work. However, a more measured and less exotic examination of creative work reveals the "*hidden-history*" of the cultural and creative industries (Pitts 2015) and highlights their central role in the construction of the cultural value, circulation and exchange of commodities.

Coders and Creatives as the New 'Core' of an Old Cohort

Tracing the origins of software work and creative work has thus far led us away from depictions of novelty and towards an account of the knowledge work that they are engaged in as an integral feature of human labour throughout history. Societies have always been 'knowledge' societies in the widest sense that all societal formations are premised upon and produce their own knowledge forms. From pre-settled communities coordinated by knowledge of the land and nature to agricultural societies oriented around knowledges of natural cycles and early farming tools and techniques, to feudal societies oriented around religious and fiefdom knowledge structures to industrial societies structured around the tools, machines and techniques of mass production, knowledge is and has been pivotal to all systems of social reproduction. What differentiates and unifies these systems beyond the fact that they are oriented and constructed through knowledge? - the productive directionality of the modes of production. In pre-settler communities' knowledge was used for survival, in agricultural societies knowledge is directed towards maximising food production which would allow for settled communities and population growth. In feudal societies knowledge was directed towards establishing and competing for political, economic, cultural and territorial power. In industrial capitalist societies, knowledge is primarily directed towards accelerating the private accumulation of capital and power. Contemporary digitalizing capitalism maintains this directionality, although it accelerates the scale and scope through which knowledge can be produced and applied through technological innovation. Considering this, who and what are 'knowledge workers' then? Following Huws (2006a; 2006b) and Pitts (2016), I argue here that knowledge workers

are a small portion of the workforce whose labour is tasked with and directed towards driving the process of innovation in society, where old knowledges are revised, added to, replaced and ultimately transformed to produce new ways of accelerating and maintaining production, commodity markets and consumption. In this, we can view *coders and creatives as the new core of an old cohort*. These workers are the core knowledge workers of digitalizing, informational capitalism who are tasked with the design and production of the digital virtual environment and its products, the content that flows through it/them and the architecture that structures our engagement, interaction and participation in digital capitalism (e.g., as individuals, citizens, audiences, consumers, users and so on…).

As a segment of the workforce that has always been key to the cycles of production and consumption in societies, creative knowledge workers represent a specificity rather than a novelty in the world of work. What building on Ursula Huws' (2006b:28) insights reveals is that although this cohort is not new, the grouping of occupations that represent its 'core' do indeed change throughout different periods in history for "*the commodification process drives a continuous process of restructuring which always has a double edge. Each innovation simultaneously requires a new cohort of creative knowledge workers*". Through this lens we can position coders and creatives as being part of this contemporary core of knowledge workers akin to the mechanical, electrical and chemical engineers that drove the innovations of the industrial revolution. Although coders and creatives may well be the cohort driving the construction, content and operation of digitalizing capitalism, that is not to mistake or overgeneralise their role as the primary sources of value in the productive levers of capital accumulation. Far from being the case, the activities of these workers are always embedded within, intra-acting with and dependent on the wider 'sections' of the division of labour in society. Following this understanding it is useful to conceptualise software and creative workers as 'organisational professionals' (Scarbrough 1999).

Gorman and Sandefur (2011) review the state of the art in the study of professions and knowledge work, and they identify four key attributes characterising these forms of work: (i) expert knowledge, (ii) technical autonomy, (c) service orientation and community and (d) high rewards such as income and status. Despite the drop in research specifically focussing on the sociology of professions, research on professional and knowledge work has continued to grow around these four themes amid widespread changes to the organisation of work in the 21st century. This body of scholarship has come to recognise both the traditional professions (law, medicine etc.) and emerging knowledge occupations (consultants, information architects,

market analysts etc.) as constituting a characteristically heterogenous yet causally cohesive group whose work is based on the possession and practice of expert knowledge, with the growing proportion of occupations in front line and interactive service work making up another broad group who are increasingly locked out of the rewards and benefits which are believed to come with knowledge work (high-income, status, autonomy etc.). Connell and Crawford (2007) define intellectual labour, the primary factor of professional work and knowledge work, as the application of symbolic techniques as tools to the objects of cultural materials to transform them, and state that they "*are the bearers and operators of an immensely important social asset- shared, organized knowledge and technique.*" (p.203). The labour processes of both professional workers and knowledge workers are thus characterised by the use of domains of knowledge, technology, work autonomy, and involvement with/in organisations.

Coders and creatives exhibit many of the same characteristics of professions such as intellectual, mental or cognitive labour; expertise in a domain of knowledge, (higher) autonomy and socioeconomic status yet they work within shifting individualised labour markets that remove others such as occupational closure or 'market shelters', high ethical and normative values through strong professional and institutionalised associations and accreditations, and secure stable career ladders. Are these organisational professions expected to engage in professional labour without the occupational power and protections traditionally awarded to professions? (Ó'Riain 2002). In contrast to the coordinated, formal associations that institutionalise (and shelter) traditional professions such as law, medicine and accountancy, coders and creatives operate in increasingly individualised labour markets where strong networked sociality has not yet resulted in the development of professional systems of enclosure (Abbott 1988; Adam and Demaiter 2008). Nonetheless, we can fruitfully position software workers and creative workers as 'organisational professionals' (Scarbrough 1999), similar to Raymond Williams' (1981) depiction of the 'corporate professional' creative worker, who are firmly embedded within business and organisational structures and needs rather than professional codes (Rasmussen and Johansen 2004). These workers possess and practice a specialist body of knowledge through the three 'modalities' of diagnosis, inference and treatment identified by Abbott (1988:39-40) as constituting the bases of professional work (See table 4).

	Diagnosis	**Inference**	**Treatment**
Software Workers	What problems do they diagnose? (Problems of business costs; 'inefficiencies'; computation; business 'opportunities'; bugs)	What inferences do they make? What are they based on? (New features, architecture and systems; new products and markets; refactoring code; accelerating processes)	What treatments do they provide? What are they based on? (System architecture & design; programming; algorithm design; troubleshooting & debugging; system maintenance)
Creative Workers	What problems do they diagnose? (Problems of consumer attachment; website traffic; online engagement; business 'opportunities')	What inferences do they make? What are they based on? (Design choices; consumer sentiments; cultural targeting; content strategies; new products and markets)	What treatments do they provide? What are they based on? (Branded designs; copy and audio-visual content; creative ideation; digital content; websites; user interfaces; brand identities; advertising & marketing campaigns; SEO)

Table 4: The 'subjective' bases of software and creative work as 'organisational professional' work, drawing on Scarbrough's (1999) concept and Abbott's (1988) 'three modalities'.

The concept of the knowledge worker is best understood *not* as emblematic of some sweeping rift in the world of work, nor as some futurist imaginary, but as pointing to developments within occupational roles that involve a *more explicit* concern with the production, codification, communication and commodification of knowledge (Scarbrough 1999). Scarbrough highlights the central role played by information technology in this process of increased knowledge-intensity, where IT extends the commodification of knowledge through (i) encoding tacit and embodied knowledge, (ii) providing the means to manipulate coded knowledges in easier and more diverse ways and (iii) by increasing the types of organisational forms that are capable of

managing and commodifying knowledge, such as the shift from hierarchies to networks. Some have even argued that 'the knowledge worker is dead' (Švarc 2016). Švarc (2016) rightly identifies the convergence of the 'knowledge economy' with the service economy following the 'creative turn' in the 1990s (Ross 2007). He argues that the 'technical-rational' model of professionalism that characterised the knowledge economy and which consisted of research-intensive industries (electrical, chemical, biotechnological) has shifted towards a 'creatocractic' model based on cultural and creative services (management and consultancy, entertainment, software design etc.). Whether any 'paradigm' shift has occurred or not, the prevalence of such cultural and creative services has been expanding particularly across the digital economy where software and creative content provide both the virtual architecture and audiovisuality of digital capitalism.

This thesis positions the expansion of software and creative work within the wider shift in the global political economy towards a digital knowledge economy based on the accumulation[13] and commodification of knowledges through digitalization. In this re-articulation, similarities can be drawn with others who have recently theorised knowledge workers as 'medium and outcome' of the development and pursuit of an informational capitalism (Allmer 2019). Coders and creatives, as contemporary knowledge workers, have been positioned with a renewed significance in the production process not because they represent a fundamental break or paradigm shift in the world of work but on the contrary because coders and creatives represent the new cohort of creative knowledge workers that are required to drive the cycles of innovation and consumption (Huws 2006b; 2007; 2016) in the digital knowledge economy. Creative workers such as the designers, audiovisual content creators, copywriters and web developers and software workers such as the developers, engineers, product designers and managers interviewed in this study are categorised here as *digital knowledge workers*. As digital knowledge workers, these occupations represent this new core of knowledge workers and are best understood in the contemporary period as organisational professionals[14], professional workers employed within organisations to possess and practice their respective domains of knowledge but lack the traditional institutional structures that shield professions such as law, medicine and accountancy from open labour market competition and encroachment on their

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[13] I include the term 'accumulation' here to denote two different but intra-dependent processes. The accumulation of knowledge as capital (Sadowski 2019) and the commodification of knowledge as a driver of profit and change in work, production and consumption.

[14] Of course, these sectors are also characterised by alternative working arrangements such as freelancing and contracting, however, these remain comparatively niche compared to the majority who are employed within organisations.

expertise (Abbott 1988). Beverly Silver (2003) in her impressive account of the history of labour struggles, describes how the textiles industry and auto-industry were the ideal workers of early and industrial capitalism, in light of this and the views laid out thus far, it is hardly surprising that software and creative workers have been revered as the emblematic workers of our time.

Chapter 3: Problematising the Literature and Shaping the Thesis

Following the contextualisation provided in the previous chapter of the literature on knowledge, information and creativity in the world of work and the significance of software and creative work as case studies for these developments, this chapter begins the work of problematising the literature on these forms of knowledge work and shaping the thesis. The chapter furthers the objective of finding the "connective tissue" (Thompson and Vincent 2010) that binds the political economy to the world of work. Incidentally, following the thread from macro to meso and down to the micro level of the labour process practice, and all of its focus on transforming social structures and working practices, provides a useful frame through which I can articulate a sociomaterial labour process analysis as a fruitful approach in the study of work. By converging literature on political economy, the sociology of work and labour process analysis, and sociomateriality (Orlikowski and Scott 2008), chapter 2 and this chapter identify both some shortages in past research and the potential for new constructive pathways for future research.

The chapter is divided into two main sections, each section problematising our understanding of knowledge work and laying the groundworks for the empirical analyses that follow in the thesis. The first section seeks to bring sociomateriality to bear on analyses of work. The primary thing lacking from both the political economy and work literature is an explicit focus on the materialities of knowledge production/commodification *in* and *through* working practices. The knowledge economy literature has tended to focus on proxies for quantitative measurement, while the work literature has (rightly) examined some of the characteristics of knowledge work(ers), albeit without considering knowledge as necessarily a material entity. This opens up a new pathway of inquiry to approach knowledge work as a sociomaterial practice where the learning, application, exploitation and production of knowledge generates emergent exigencies that shape the world of work. The final section moves the discussion to a narrower frame by demonstrating how the three contested terrains of control, boundaries and subjectivity need some rejuvenation, critique and redirection. Firstly, more qualitative, comparative analyses on how control is achieved over organisational knowledge workers in the digital knowledge economy in needed (Thompson and Van Den Broek 2010). Secondly, the work-life boundaries literature tends to centre technological and organisational factors in analyses while largely omitting explicit examination of the sources leading to boundary blurring. Finally, the proliferating research on the contemporary working subject, which often draws on some form

of knowledge work, tends to focus on how ideological and discursive constructs produce subjectivities while ignoring the sociomateriality of the labour process itself.

3.1   Bringing Sociomateriality to Bear on the Sociology of (Knowledge) Work

Emerging from a lineage of research on the mutual shaping of technology and social processes[15], the concept of sociomateriality has come to form the basis of a field in itself, a sociomateriality studies (Orlikowski 2007; Orlikowski and Scott 2008; Feldman and Orlikowski 2011; Leonardi 2013; Hultin 2019). Originally proposed by information systems scholar Wanda J. Orlikowski (2007) and later developed through Orlikowski's collaboration with Susan Scott (Orlikowski and Scott 2008; Scott and Orlikowski 2013; Orlikowski and Scott 2016), sociomateriality as a concept and approach "*posits the constitutive entanglement of the social and the material in everyday life*" (2007: 1435). It emerged in response to the growing need for new tools to conceptualise the convergence of technology, work and organisation beyond those of sociotechnical systems (Hallin et al. 2017) and the social shaping of technology (Mackenzie and Wajcman 1985), conceptual tools which would be capable of moving beyond the dichotomy of the subject – object interaction. It is through the integration of Karen Barad's posthumanist performativity (2003) and research on the 'entanglement of matter and meaning' (2007) that Orlikowski and Scott build sociomateriality as an approach and toolkit capable of examining how technology, work and organisation are constitutively entangled through practices in everyday life (Orlikowski and Scott 2008). In bringing sociomateriality to bear on the sociology of knowledge work, this section demonstrates how analysing the work of software and creative workers as a sociomaterial practice can provide a new perspective on the connective tissue binding the political economy and labour process by linking the commodification of knowledge to the organisation of work and the labour process by accounting for the sociomaterialities of the exchange and production of knowledge.

The field of sociomateriality studies, as we could call it, is grounded upon the 're-turn to practice' (Suchman 2007; Nicolini 2013; Gherardhi 2011; 2015; 2017) which has emerged from a special issue of the journal *Organization* published in 2000 titled *Practice-Based Theorising on Learning and Knowing in Organisations*. This turn seeks to examine social phenomena as they emerge through practices which entangle socialities and materialities. The

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[15] It is important to note that sociomateriality studies have emerged through and in relation to research originating in science and technology studies such as socio—technical systems (Trist 1981) and actor-network theory (Law 1992).

concept has been widely applied in a diversity of cases such as waste management and IT systems in various contexts (Hallin et al. 2017; McLoughlin and Dawson 2017), although the focus here is on how sociomateriality has been applied to the study of work (Orlikowski 2007; Gherardhi 2015; Styhre et al 2012; Mazmanian et al. 2013; Panourgias et al. 2013). A number of key concepts have entered the lexicon of this field which seek to describe this practice-based relationality. Borrowed from Barad (2003; 2007), the concept of intra-action is introduced to describe the constitutive entanglement of the social and material, and between subject and object. However, the ontological bases upon which these concepts are understood and applied diverge along two lines in sociomateriality studies, the agential realism (AR) of Barad, Orlikowski and co. based on the premise of 'ontological inseparability', and critical realist applications which maintain the analytical distinction between entities (Leonardi 2013). A thorough discussion of such matters takes place in chapter 4 where the methodological foundations of this study are formulated, however, for the purpose of the present task it suffices to say that the approach adopted here is the latter[16].

As with any newly emerging field of inquiry, descriptions and applications of sociomateriality can be ad-hoc and somewhat overcomplicated at times. However, the core premise of applying such an approach is the following: taking matter seriously through a *balanced* examination of the emergent nature of social and material intra-actions. This has most often occurred through the analysis of work (i.e social) and technology (i.e material). For example, in her original paper on the subject Orlikowski (2007) demonstrates how the introduction of BlackBerry devices in an organisation simultaneously increased spatial and temporal flexibility of work and the obligation to be constantly connected. The conditions emerged through "*the contingent way in which the [technology] is designed, configured, and engaged in practice*" (p.1444, emphasis included). Wajcman and Rose (2011) directly extend this work in their study of the fragmentation of the working day by what they coin 'constant connectivity' and the interruptions it entails in the digitalized practices of work as contemporary workers navigate increasingly digitalized, mediatised environments. Examining sociomaterial practices also highlight how complex, multicomponent technologies (such as IT systems) are constituted

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[16] There are two reasons why this study is grounded in its development of a sociomaterialist critical realism rather than an agential realist foundation: (i) although recognising the fruitfulness and reasons for adopting a sociomaterial approach based on an *ontological inseparability* in typically complex organisational systems where the focus of the researcher is distributed, applying this premise to the analysis of the labour process can inadvertently lead to the depoliticization of the working relations by removing the labour process, and its human implications, as the prioritised site of inquiry; and (ii) when the social and material entities under examination are taken as ontologically inseparable from the outset, the importance of temporality in considering the relations through which those entities become mutually constituted is downgraded or ignored.

through the intra-action of distributed knowledges (across departments, occupations, individuals) and technologies towards collective imaginaries as Styhre et al. (2012) demonstrate in their case study of electrical engineering. Furthermore, scholars have even highlighted how the practice of creativity as an 'on-going flow' emerges in relation to and is situated within wider sociomaterial entanglements of technological capabilities and development techniques (Panourgias et al. 2013). The concept has also been applied most recently to mobile knowledge workers (MKW): Jarrahi and Nelson (2018) introduce the term 'configuration work', akin to Gray et al.'s (2020) 'corollary work', to describe the work that MKW need to engage in beyond their organisationally prescribed work just to make technology function (e.g., updating software, finding WiFi connection, setting up accounts etc.).

In bringing sociomateriality to bear on the analysis of knowledge work in this thesis, I build upon this emerging field and extend sociomateriality studies to labour process analysis to provide a new perspective on the connective tissues binding political economy, work, organisation and technology (Thompson and Vincent 2010). By integrating Zukerfeld's (2017) cognitive materialist[17] understanding of knowledge as a necessarily material entity that resides in physical (human and non-human) bearers, I conduct a sociology and labour process analysis of knowledge work as practiced through the continuous intra-action of social and material entities which are distributed across space and time, individual cognitions, interpersonal and organisational structures, and digital and non-digital technologies. I therefore advance an understanding of the digital knowledge work of software and creative workers as that which involves the application of possessed knowledge and the practice of knowledge 'out there' in the world (Norman 1988; Amin and Cohendat 2004) through entanglements of tools, machines and infrastructures (both digital and non-digital). In doing this, the thesis builds on previous work into the sociomateriality of knowledge work (Wajcman and Rose 2011; Panourgias et al. 2013; Gray et al. 2020) by not only considering the sociomaterialities and intra-actions of technology and work, but also of knowledge as a material entity itself entangled throughout those practices of digital knowledge work.

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[17] It is also important to note that Mariano Zukerfeld's (2017) *Knowledge in the Age of Digital Capitalism: An Introduction to Cognitive Materialism* was published in the *Critical, Digital and Social Media Studies* series edited by Christian Fuchs. As a key scholar in the fields of communication and media studies, Fuchs (2014; 2020) himself critiques the philosophical idealism that characterises much of the literature on knowledge/informational capitalism (exemplified in the concept of immaterial labour) that assumes a duality between mind and matter. In his own words, "*A thought is not tangible, but is based on and emerges from the networked activities of the components of the brain, that is, a physical system. That the mind is material means that cognition emerges from the brain's dynamic, networked activities of production*" (2020:36).

In applying a sociomaterial labour process analysis it is important not to lose sight of the ultimate aim of a sociology of work – to improve the experiences and conditions of work and organisation for people. As Abildgaard and Nickelsen (2013:80) have noted, applying a "*sociomaterial analysis runs the risk of shifting attention away from the key issue at hand*" by muddling the communication and clarity of explanations. However, the application of a sociomaterial lens to the labour process analysis conducted here provides alternative understandings of the organisation and labour process of knowledge work by identifying new explanations and re-orienting our assumptions of how the three contested terrains of control, work-life boundaries and subjectivity unfold. The value that this approach contributes to this analysis is through its identification of the primary emergent *dimensions of* and *practices through which* the knowledge work of software and creative workers takes place, what I collectively refer to as the *sociomaterial exigencies*[18] of knowledge commodification[19].

Sociomaterial exigencies are the emergent effects of applying, practicing and producing knowledge in the production process. The term 'exigency' is defined in English dictionaries as '*the need, demand or requirement intrinsic to a circumstance or condition*' and '*a case or situation that demands prompt action*' (Dictionary.com); '*an urgent need or demand that you must deal with*' (Oxford English Dictionary 2015); and '*the exigencies of a situation or a job are the demands or difficulties that you have to deal with as part of it*' (Collinsdictionary.com). The core meanings attributed to the term can therefore be summarised as demand, urgency/time, and action. The reason for adopting the term *sociomaterial exigencies* is that these dimensions (of indeterminacy and exclusivity) and practices (of attachments and objectification) are (pre)requisites for knowledge production to exist. Furthermore, rather than describe these as characteristics or features, which invokes a sense of them being somehow static, the term exigency effectively captures their liveliness and emergent nature which necessitates action (by workers, organisations and so on).

As a sociomaterial practice, knowledge work takes place through the constitutive entanglement of individuals, collectives, technologies, social contexts, antecedent social structures and future

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[18] 'Exigencies' is used here to describe the "need, **demand** or requirement intrinsic to a circumstance or condition" (Dictionary.com 2020). I highlight 'demand' here to emphasise that sociomaterial exigencies is a concept that seeks to explain the demands that *can* arise following the commodification of specific commodity forms and in doing so shift the language away from one that could be interpreted as suggesting that these exigencies are somehow deterministic. The exigencies arising from the commodification of knowledge exist within the pre-existing context of the logics of capitalist production (i.e imperatives of value creation, competitiveness, speed, control etc.).

[19] The concept of commodification is understood here to comprise the intra-acting processes of extraction, appropriation, regulation, exploitation and exchange.

imaginaries, and it generates emergent phenomena (exigencies) which shape both the organisation of work and the labour process. Introducing this bridging concept links the systemic political economic process of commodification to its sociomaterial manifestations in the world of work. In what follows, I identify four of these exigencies that are central to knowledge work.

Indeterminacy

The paradigm of critical realism (CR) (Bhasker 1975; Sayer 2000) proposes an understanding of reality that challenges and extends those adopted by positivism and social constructivism, with implications for how social scientists come to comprehend and thus operationalise our approach to ontology (reality) and epistemology (our knowledge of reality). Its application here to the operationalisation of a sociomaterial labour process analysis is therefore important for understanding the emrgent dimensions of such practices. A central tenet of critical realism is that reality in all of its complexity is mind-independent (Fletcher et al. 2017), meaning that in its attempts to 'know' reality our knowledge is always tentative and fallible by necessity. Indeed, as one of the intellectual progenitors of sociomaterial studies, Barad (2003; 2007) goes one step further by considering reality as ontologically indeterminate, itself contingently constructed in the everyday doing of sociomaterial practices that 'perform the world' (Olikowski and Soctt 2016). Pivotal to this is not only the notion that natural and social phenomena exist above and beyond our experience and knowledge of them, but also that the world is fundamentally constitututed by emergence as an inherent dynamic. Because the natural and social phenomena which constitute the world arise through the intra-actions of generative mechanisms comprising multiple entities, the collective, emergent characteristics of such cannot be reduced to those constituent parts (Sayer 2000) because "*emergent properties are defined as properties or powers of a whole that are not possessed by its parts*" (Elder-Vass 2011:16). These conditions mean that the natural and social world is relational, processual and always necessarily becoming and ceasing to be.

It is from these meta-theoretical premises that we can identify *indeterminacy* as an inherent, default dimension of the production of knowledge. If the nature of knowledge itself is characterised by indeterminacy, the sociomaterialisations of labour processes which involve knowledge as a primary factor in both their inputs and outputs, and the organisation of those labour processes within a wider production process will be shaped by the emergent implications

of indeterminacy. Indeed, the growing complexity of organisations through digitalizing, flexibilizing markets and workforces mean that the operation of organisations as sociomaterial assemblages are themselves increasingly indeterminate (Feldman and Orlikowski 2011). In relation to the practice of creative work itself, Pitts' (2015a; 2015b) connection of creative work to the sphere of circulation and 'work of combustion' as articulated by Marx (YEAR) highlights its central role in value production through social validation, a process which itself exhibits an inherent uncertainty, similar to what Thompson et al. (2009: 67) call an "*indeterminacy of outcome*". Furthermore, knowledge-intensive work processes such as that engaged in by professions is characterised by an unpredictability (Abbott 1988). The presence of a permeating and unavoidable uncertainty and ambiguity within the knowledge work of software and creative workers is likely therefore to contradict the overwhelming drive for control and the rationalisation of the production process within organisations. How those contradictions play out in the labour process and organisation of work will therefore have important implications for the experiences of workers and the conditions in which they are embedded.

Exclusivity

As past research from the labour process tradition has demonstrated, the extraction and regulation of knowledge is a key power resource for management and employers over workers in the production process (Braverman 1978; Thompson and Van Den Broek 2010). It was on this premise that Braverman (1978) interpreted the separation of manual and mental labour as constituting a deskilling of the workforce, where management organised the production process and coordinated work to extract and codify and at times automate elements of the labour process. Indeed, the extraction and codification of worker knowledge is the foundational principle and aim of scientific management (Taylor 1911) and the now well established field of knowledge management (KM) across business, management and organisation studies (Earl 2001; Hellström and Raman 2001; Swan and Scarbrough 2001; McKinlay 2002). Subsequent critical research on the empirical consequences of the implementation of knowledge management systems for workers has demonstrated how they have resulted in the deskilling and degradation of work for employees (Taskin and Van Bunnen 2015), and how their adoption by employers is resisted by those workers whose knowledge is subject to extraction and codification (Waring and Currie 2009). Indeed, in a recent study Tali Kristal (2020:467) argues

that an occupation's position on the 'information flow' "*reveals a rising wage premium for occupations with greater access to and control of information*" in the production process. Adopting an understanding of knowledge as a material entity foregrounds the notion that all knowledge domains are characterised by what Zukerfeld describes as the 'regulation of access':

> "*All entities are related to capitalism through the regulation of access to them, or more generically, their inscription in the property register, both in their physical and knowledge aspects…Beyond this static image, capitalism also implies a permanent movement towards propertisation (exclusive access to those entities or derived products) and/or growing commodification (adoption on the part of these entities or their derived products of the commodity form)."* (2017:79)

In his book *Knowledge in the Age of Digital Capitalism,* Zukerfeld (2017) provides a typology of access under capitalism (see table 5 overleaf) whereby physical and knowledge matter are regulated along a continuum of exclusivity which ranges from exclusive (i.e private) to non-exclusive (i.e public). Applying such a perspective, which is based on capitalist relations of ownership more widely, to the organisation of work reveals the tendency towards two diverging outcomes under capitalist relations of production. On the one hand, the strategies of organisations and employers verge towards the enclosure of knowledges to secure their monopoly and privatise their profitability. On the other hand, the tendency within the organisation of work and labour process is for the knowledges of workers to become increasingly non-exclusive and shared in order to allow for its extraction, codification and automation within and indeed across the production process. In this we can see that there is a pull of knowledge by organisations towards a condition of exclusivity and a push by organisations for the knowledge of labour towards a condition of non-exclusivity.

			Physical Matter	**Knowledge Matter**
Degree of exclusion — High ——— Low		Exclusive ('private')	Physical private property	Intellectual property
		Common	State property Cooperative property Communitary property (common pool)	GPL licences Creative Commons licences Compulsory state licences
	Non-exclusive ('public')	Open	Open Access	Public Domain

Table 5: Mariano Zukerfeld's (2017:81) typology of access under capitalism.

By integrating Zukerfeld's (2017) materialist understanding of knowledge to an analysis of knowledge work as a sociomaterial practice, we can therefore identify *exclusivity* as an exigency that emerges from the relations that mediate the production of knowledge in practice. People, teams, departments and organisations relate to knowledge domains (such as computer programming and design) through their access, understanding, recognition and legitimation (or lack thereof) of those domains. Within the world of work of software workers and creative workers, the dimension of exclusivity shapes the comparable and contrasting degrees of occupational power which each cohort enjoys within the workplace and across the labour market more widely.

Sociomaterial Attachments

The adoption of a sociomaterial approach to the analysis of work involves a recognition that work and labour processes take place through practices (Nicolini 2013). Feldman and Orlikowski (2011) in their 'stocktake' of the dispersed yet budding field of practice theory identify some core principles that unite applications of the concept. First and most importantly, everyday situated actions are consequential in producing the social world, and second, relations exist in mutual constitution for "*phenomena always exist in relation to each other*" (p.1242). The articulation of practices as consisting of situated actions and mutually constitutive relations compliments the materialist approach to knowledge (Zukerfeld 2017) adopted here, where knowledge is depicted as existing within and translating across physical bearers (from humans

to sewing pins to books and word processors). Such an understanding requires that the researcher takes those embeddings and translations as important sites of inquiry. This turn to practice through the lens of sociomateriality can contribute to the analysis of knowledge work by prioritising the identification and examination of the links that thread the interactions of workers, tools, technologies, organisations, communities and networks, the relations that emerge from those mutual entanglements, and the implications of such for both the organisation of and experience of work.

These threaded links which together constitute the emergent practice of knowledge work are in fact an exigency of the practice of knowledge work itself for they form the *sociomaterial attachments* that bind the worker to those multiple entities implicated in the practice. Silvia Gherardhi (2015:20) points to this when she says that "*practice, in fact, should be considered not only as an assemblage of activities but also as a social relationship between the practice and those who create and sustain it.*". It follows then that the identification and analysis of these *sociomaterial attachments* within software and creative work can contribute to the explanation of the characteristics, experiences and pressures of such work. It is through grounding the analysis of knowledge work as a sociomaterial practice that we can begin to locate and examine the situated actions and emergent relations which constitute the conception, application, development and exchange of knowledge in the labour process. To do this, the labour process and organisation of work for these cases must be observed by 'zooming in' and 'zooming out' (Nicolini 2013) to identify and untangle those threads of attachment to reveal their implications for how the work gets done. Identifying sociomaterial attachments as an emergent exigency in knowledge work provides us with a tool to undertake such a task.

Objectification (through Digitalization)

The final exigency that is central to the practice of digital knowledge work can be traced to Zukerfeld (2017:55) and his conceptualisation of 'objectified knowledges' as those knowledges which "*are crystallised outside of living beings, materialised in the most varied goods*". Putting knowledge to work in the production of commodities by applying and developing it through working practices implies the objectification of those knowledges within a multitude of physical bearers. For contemporary software and creative workers, these often take the form of digital information and communication technologies - media that store, process, reproduce, transmit and/or convert information (Zukerfeld 2017). These primarily

computational technologies are used in the practice of software work and creative work, and the commodities produced through this work take the form of digital goods and services, making these truly a type of digital knowledge work. Orlikowski and Scott (2016) in outlining a 'digital work agenda' highlight how an ever-expanding portion of occupations can be categorised as engaging in digital work due to their reliance in some way or another on digital information and communication technologies for the completion of their work. Thompson and Briken (2017:7), although agreeing on the pervasiveness of digital information and communication technologies across the world of work, prefer to distinguish between the categories of occupations involved in digital work by opting to adopt the term 'core digital labour' which they define *"in terms of creating and maintaining digital commodities"*.

Digital knowledge workers are articulated here along the same lines as 'core digital labour' (Thompson and Briken 2017), although through the added lens of sociomateriality. What unifies these workers is that the practice of their work is characterised by the *objectification* of knowledge primarily through digitalization as a sociomaterial exigency implicated in the work itself. Here the fundamental function of technology, from its most primitive (spear, wheel etc.) to simple (paper, glass) to complex forms (engines, digital technologies) is understood to be the bearing of knowledge. It follows that the digitalization of society through the global integration of digital information and communications technologies has extensive implications for the commodification of knowledge, its extent, form and effects. Furthermore, the digital mediation of the labour process, through both its inputs in the production process with the use of digital tools and technologies and its outputs in the form of digital commodities, is consequential for how those labour processes are experienced for digital technologies exhibit their own affordances (Treem and Leonardi 2012; Nelson et al. 2017). Indeed, a particularly pertinent consequence of objectifying knowledge and human labour through digitalization is that it necessarily involves the process of digitization, or as Zuboff (1988) called it 'informating', the production of (digital) information from qualitative human inputs. Not only are digital information and communication technologies fundamentally important for the practice of objectifying knowledge within and beyond the work process, Panourgias et al. (2013:12) note that these digital technologies "*are not being developed independently from the affective and cultural concerns associated with creative and cultural production"*. Indeed, the same connection is highlighted in discussions of how creative desires for patterned designs and colour deeply shaped innovations in machine technology (i.e jacquard loom) and chemical engineering (i.e colour dyes) (Freeman 2012). It is through the adoption of a sociomaterial

approach to knowledge work that we can understand that these connections arise from the mutual constitution of creativities, knowledges and technological artefacts.

Towards a Sociomaterial Analysis of Knowledge Work

The field of labour process analysis, or more broadly speaking the sociology of work, has developed over the past 50 years or so based on clusters of conceptual innovations that are tied to empirical analyses of different cases (sectors, types etc.) of work. For example, studies on the work of flight attendants, retail assistants, interns and call centre workers have taken place over this period where researchers have conducted case studies and where some conceptual innovations have emerged (i.e aesthetic labour, emotional labour, provisional labour, hope labour etc.). These concepts have then formed the basis through which subsequent studies have attempted to identify these characteristics in other forms of work (McGovern 2020), extending our knowledge of contemporary worlds of work and providing further impetus to the sociology of work as an important field of inquiry. This cycle tends to repeat as new forms of work become the focus of attention across those disciplines mostly involved in the analysis of work, employment and labour markets, evident in the currently proliferating interest in work within the platform and gig economy. What a sociomaterial labour process analysis can provide is an added step, or additional tool upon which the fields of LPA and the SoW can examine the world of work and employment.

Recognising that the act of labour is a necessarily sociomaterial practice pushes us to begin with a consideration and examination of the sociomaterial exigencies that are generated in particular forms of work and employment. This section has integrated the emerging field of sociomateriality studies and a materialist understanding of knowledge in order to formulate the grounds upon which a sociomaterialist labour process analysis of knowledge work can be conducted. In doing so, four emergent sociomaterial exigencies of knowledge work are advanced (table 6 overleaf), two of which are present as dimensions and two as practices: indeterminacy, exclusivity, sociomaterial attachments, and objectification (through digitalization).

Dimensions	Practices
Indeterminacy Indeterminacy is the default state of human knowledge which is inherently characterised by fallibility, uncertainty and ambiguity.	*Sociomaterial Attachments* Sociomaterial attachments emerge through the practices of the knowledge labour process in the conception, development, application, maintenance and exchange of knowledges.
Exclusivity Exclusivity emerges from the relations that mediate the production of knowledge. All knowledge domains vary depending on people's access, understanding, recognition and legitimation (or lack thereof).	*Objectification (through digitalization)* Knowledges reside in technological bearers through the practice of objectification. In the digitally mediated labour of software and creative workers, knowledges are primarily objectified through the process of digitalization.

Table 6: Four sociomaterial exigencies in the commodification of knowledge.

Through making connections and building bridges between debates on the changing political economy, organisation of work and labour processes, and mutual entanglements of technologies in work, our understanding of each can be advanced. In tackling this task, we are responding to the call by scholars to thread new dialogues between sites of analysis and disciplines in order to enrich the fields of research we seek to contribute to (Thompson and Vincent 2010; Holtgrewe 2014). Identifying the inherent sociomaterial dimensions of and practices through which knowledge work happens, in other words its exigencies, can help rejuvenate, critique and redirect some assertions and assumptions that have come to characterise our understanding of the nature of knowledge work.

3.2 Control, Boundaries and Subjectivity: Three Contested Terrains in the Worlds of Work

This section shifts the discussion firmly to the fields of labour process analysis and the wider sociology of work as practiced throughout varied disciplines. I apply Richard Edwards' (1979) concept of contested terrain to the worlds of work for software and creative workers. In doing

so, I identify three primary terrains within and through which work is experienced by people within the capitalist production process and its constituent labour processes. The first terrain unfolds in the production process, where an organisational imperative exists to control the indeterminacy of the labour process in order to maximise and ensure profitability through the extraction of value (Thompson and Smith 2010). The second terrain shifts from the point of production to the domain of the labour process itself where the contested boundaries between work and private life are under threat and in need of management (Nippert-Eng 1996). The third terrain sees the focus shift again, this time further outwards from production and inwards to the subject where the implications of working life for the actions, identities and subjectivities of workers are explored. Finally, labour process analysis as a systematic field of study has built upon the foundations of the 'core labour process theory' originally outlined by Paul Thompson (1990) and subsequently established within the labour process tradition (Thompson and Smith 2010). Core labour process theory is based on the following principles: (i) the centrality of labour power as a commodity, (ii) the indeterminacy of labour, (iii) the transformation of the labour process, organisation of work and labour power as central to capital accumulation, (iv) the existence of a control imperative to reduce the indeterminacy of labour., (v) the above dynamics generate conditions for resistance, compliance and consent. These principles provide a framework to guide analyses of the labour process and changing world of work under capitalism, and they guide this chapter and thesis.

The Contested Terrain of Control

The analysis of the 'contested terrain' (Edwards 1979) of control between organisational management and workers is firmly embedded in the 'core' of labour process theory (Thompson and Smith 2010). A central tenet of labour process theory and analysis is that the labour process and organisation of work at the point of production is fundamentally characterised by a 'control imperative', where the indeterminacy of labour must be overcome by employers through the effective control of work. Human labour is fundamentally indeterminate because it exists as a potentiality that must be effectively realised in the act of work through its organisation into a labour process. The publication of *Labor and Monopoly Capital* by Harry Braverman in 1974 successfully initiated a labour process control debate across the study of work and organisations in the social sciences, firstly within the field of labour process analysis (Friedman 1977;

Edwards 1979; Burawoy 1979; 1985; Storey 1985), followed then by human relations, management and organisation studies (Sewell 1992; Wilmott 1993; Frenkel et al. 1999; Thompson and Van Den Broek 2010). Most recently, Phoebe Moore (2019), building on Barley and Kunda's (1992) historicization of managerial ideological strategies, has provided a useful integrative review of the periodic strategies of managerial control up until our most recent period which she characterises as being dominated by *agility management systems* (see table 7 overleaf). This review draws on Moore's periodisation as a useful framework around which the control debate can be oriented.

Historical Blocks of Managerial Strategies	
Ideology/Strategy	Period
Industrial Betterment	1870-1900
Scientific Management (Taylor 1998 [1911])	1900-1923
Human Relations (Mayo − Hawthorne Studies; Follet − Org psychology)	1925-1955
Systems Rationalism (Critical Path Method, Project Management)	1955-1980
Organisational Culture and Quality (Barley and Kunda 1992)	1980-
Agility Management Systems (Moore 2019)	2001-

Table 7: Moore's (2019) historical blocks of managerial control.

Early contributions to the control debate were largely based on manufacturing work, and they focused on how control was achieved over the labour process, and its effects on both the experience of work and the relations of production. Braverman (1974) demonstrated how techniques of scientific management and human relations were used to control the work process and deskill workers through the standardisation and routinization of tasks, laying the foundations for what became known as the 'deskilling thesis'. Post-Braverman labour process theory developed a conceptual concern with the mechanisms through which management controlled labour through the organisation of production and design of the labour process. Friedman's (1977) early contribution positioned managerial strategies as a dichotomy between direct forms of control and what he termed responsible autonomy, later re-articulating the relationship of both forms as a continuum of control strategies (1990) in response to criticism

(Storey 1985; 1989; Pawlicki 2013). Similarly, Edwards (1979) in his seminal work provided the first conceptual framework of the 'contested terrain' of organisational control. By illustrating the mechanisms of direction, evaluation and discipline in the achievement of organisational control, and by demonstrating the evolution of simple, technical and bureaucratic types of control through different industrial eras, Edwards (1979) provided what remains one of the foundational studies in the labour process. At the same time, Michael Burawoy (1979; 1985) advanced an analysis of 'regimes' of control in the factory between coercion (despotic) and consent (hegemonic). Key to both Edwards and Burawoy's theorising of control was the influence of social institutions such as national labour markets and government policy, centring the labour process and the control debate within its wider political economy.

In a series of articles that were based on a constructive critique of the control debate, John Storey (1985; 1989) and Richard Hyman (1987) highlighted some important nuances that questioned the appearance of stability in the reliance on dichotomies and regimes in previous work. Firstly, Storey introduced the concepts of 'layers' and 'circuits' of control to the labour process debate which at the time he argued was experiencing a crisis between "*structurally-deterministic positions…and positions which stress the indeterminacy of control systems*" (p.207). The central argument that Storey advances is that control over the labour process emerges from the dialectical relations between management strategies and the tactics of workers which produce conditions where "*multiple control devices oscillate, are activated, deactivated, merge and are constituted anew*" (p.207). Hyman (1987) complimented this in his contribution to the first issue of the Work, Employment and Society journal where he emphasised the persistence of contradiction in capitalist production, and that managerial strategies of control are best understood as "*the programmatic choice among alternatives, none of which can prove satisfactory*" because "*there is no 'one best way' of managing these contradictions, only different routes to partial failure*" (p.30). In other words, both Storey and Hyman affirmed how control over the labour process is dynamic, tentative, contingent and in need of perpetual renewal to remain effective. It is through this notion of dynamism and convergence that Barley and Kunda's (1992) periodisation and Moore's (2019) addition should be understood, where each successive managerial ideology and strategy merges and rearticulates previous waves in a process of hybridisation.

The period following this (1990's) was characterised by a lull in the control debate among labour process theorists (Thompson and Van Den Broek 2010), but saw it shift to the fields of

human relations, management and organisation studies where the interest was in normative types of control. This shift was in part a natural movement in these fields which had been influenced by what Moore described as the organisational culture and quality wave which emerged throughout the 1980s. As Barley and Kunda (1992) argued, "*by heeding the symbolics of leadership and by attending to employees' values, managers could enhance their firm's competitiveness*" (p.381) by extending control over the hearts and minds of workers. This period was also characterised by a broad subjective turn across the social sciences, highly influenced by Foucauldian concepts of subjectification, governmentality and biopolitics. Much of this research sought to analyse the engineering of identity, subjectivity and culture through corporate managerial discourse and ideologies of a 'new spirit of capitalism' (Boltanski and Chiapello 2005) within a post-industrial, knowledge-based economy. Still, Thompson and Van Den Broek (2010) questioned the need to conceptualise normative control as a distinct type, emphasising that normative effects often emerge from all types of control. Later work on normative control has however effectively illustrated how such normative control devices can be embedded within and merged with other forms of control, such as branding (Cushen 2009) and financialised logics (Cushen and Thompson 2012).

The transformations that were taking place within the wider political economies of particularly western capitalisms at the time are key for providing context to the evolution of the control debate. Among the flurry of the post-wave and knowledge-based economy narratives, questions arose as to the absence of empirical analyses of the working practices and operation of control within knowledge work (Darr and Warhurst 2008; Thompson and Van Den Broek 2010). The need for research into the control of professional and knowledge work was further compounded by emerging evidence of declining levels of workplace discretion among professionals (Grugulis et al. 2003; Felstead 2004). Within this shifting political economic context driven by rapidly increasing levels of digitalization, globalization and informatization, the relations between management, professionals and knowledge workers more widely was one fraught with ambiguity and conflicts over the control of work and knowledge. As Waring and Currie (2009) have effectively argued, the process of professionalisation is a technique for workers to manage knowledge for the benefit of the occupation, while the proliferation of 'knowledge management' systems that emerged since the 90s is an attempt by organisations to control knowledge for the benefit of management.

Central to the issue of control over knowledge work is the commodification of knowledge, where organisations seek to extract and utilise the knowledge of workers to produce value. The

dominant narratives depicted knowledge workers, the new organisational professionals (Scarbrough 1999), as carriers of high-value expert knowledge that were self-managing and in need of autonomy in the workplace (Drucker 1994; 1999). Autonomy, as a concept within the sociology of work, refers to a worker's ability and opportunity to control their work (Choi et al. 2008; Barrett 2004). This period of transformation in the world of work was spearheaded by the global growth of the high-tech software and cultural and creative industries, which are characterised by project-based production, knowledge-intensive work and the production of knowledge assets and creative content (Grabher 2002; Smith and McKinlay 2009). In terms of the dominant managerial ideologies and strategies circulating, the 21st century saw a convergence of previous techniques within emerging agility management systems (Moore 2019).

Agility management systems merge principles of scientific management and systems rationalism with their focus on the elevation of technical experts and the rational design of work and production through project planning, with normative practices centred on adaptability, customer-value and quality (Highsmith 2002; Moore 2019). Lean thinking, which originated in the management of manufacturing work (Womack et al. 1990), has been gradually implemented in services work and knowledge work contexts and is tightly integrated within agile management systems (Kämpf 2018), which are seen as an evolution of the method. The attraction of applying lean production principles to knowledge work for management lie in their ability to "*make tacit knowledge work more concrete*" (Kropsu-Vehkapera and Isoherranen 2018: 440) through processes of standardization, value-stream mapping and visualization. This is achieved through the use of a suite of new workflow management systems, organisational units, roles and procedures, and the (partial) adherence to the foundational principles of the Agile Manifesto (2001), as outlined in the table below.

Agile Manifesto Principles	
1	Customer-value first.
2	Constant change.
3	Frequent delivery.
4	Alignment with business.
5	Build and trust "motivated individuals".

6	Interaction over documentation.
7	Working software over perfect software.
8	Set and maintain a "constant pace indefinitely".
9	Technical excellence and good design.
10	Simplicity.
11	Self (team-based) organisation.
12	Self (performance) management.

Table 8: Agile Manifesto principles.

Zukerfeld (2017b) points to the pivotal role that the regulation of access to knowledge plays within capitalist societies, however, the power relations mediating access to knowledges also play out in important ways at the point of production - within both the organisation of work and the labour process. It is here that we can observe how exclusivity as an emergent dimension of knowledge production becomes an important site of power and struggle in the workplace, and where the ambiguities arising from the indeterminacy of knowledge work inflect the relations of work and control. This struggle over the autonomy and regulation of work does indeed constitute a contested terrain of control for those involved, and the following section analyses how this unfolds within the world of software and creative work.

Control in Software Work

The conception of agile methods in fact originates from the field of software development, articulated by a group of software developers and published in 2001 as the Agile Manifesto:

'We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions over processes and tools,

Working software over comprehensive documentation,

Customer collaboration over contract negotiation,

Responding to change over following a plan

That is, while there is value in the items on the right, we value the items of the left more.'

(agilemanifesto.org 2021)

The methodology was conceived with the aim of streamlining the development process in a similar way to lean production, while taking account of the emergent nature of software as an 'evolving object' (Adler 2005) which defies linear production methods because of its need for continuous refinement, fixing and maintenance – hence the emphasis on responding to change by being 'agile'. As Phoebe Moore (2019) has highlighted and as chapter 6 on the control of software and creative work demonstrates, the terminology of agility management systems provides important clues onto the implications for workers of adopting and implementing its principles and structures. Most importantly, the adoption of the term agile implies the accepted assumption of perpetual change and uncertainty in the production process where the onus to respond to changes (in functionality, requests, timelines etc.) shifts to the worker in what Moore (2019) describes as a reversal of the role of humans and technology. Software workers, in the same way as their creative counterparts, have been positioned as the vanguard of the New Economy and world of work (Kraft and Dubnoff 1986; Ackroyd et al. 2000; Barrett 2001; Baldry 2004) and are increasingly subject to knowledge management (KM) (Braga de Vasconcelos et al. 2017; Colomo-Palacios et al. 2018), yet empirical sociological research on their working practices has been sparse.

Despite this, what little empirical literature exists on software work provides rich detail on the characteristics of control and autonomy for this work. In a relatively early intervention, Kraft and Dubnoff (1986: 194) proclaimed that "*the making of computer programs has been subject to a process of intellectual industrial engineering, a scientific management of mind work*". The authors identified the continuity of industrial modes of work organisation in software work through out the 1970s and 80s, a period which the previous chapter has noted was characterised by a concerted professionalisation of the occupation by its re-branding as software 'engineering' (Kraft and Dubnoff 1986; Bogost 2015). It is important to recognise that software development itself consists of a deepening division of labour and the fragmentation of tasks along a mental – manual continuum similar to that identified by Braverman (1974; Beirne et al. 1998). This is evident in today's workforce which contains roles such as Systems Architects which design abstract models of applications, core Software Engineering roles (which are also divided based on language specialities) where the code is written to construct those models, and Test Analysts where the final application is tested for any errors. As Kraft and Dubnoff (1986) proposed software work had become wholly subject to deskilling, Beirne et al.'s more measured account (1998) argued that the rationalisation of work was indeed present but that the qualitative complexity of the labour process remained a barrier for managerial control.

These early accounts paint a picture which encapsulates a nuance in the labour process analysis of control that was only emerging in literature at the time – that control was dynamic, tentative, contingent and subject to limits and contradictions (Storey 1985; 1989; Hyman 1987).

This nuance was central to Kunda's (1992) ethnography of the 'engineering of culture' in a software development department where the construction and dissemination of corporate cultures represented a form of normative control over the 'hearts and minds' of workers. Following this, Rowena Barrett (2001; 2004; 2005) provides an important articulation of how control operates in software work in a series of comparative case studies of software development companies in Australia. Overall, the emphasis in this work is that *"continuity is as important as change"* (Barret 2001:31). Barrett identified the presence of both direct forms of control and managerial strategies based on responsible autonomy (Friedman 1977; 1984). Specifications were employed by management and evaluated through weekly meetings, and deadlines were used as an incentive for increased efficiency. The software development departments under analysis in Barrett's case studies were organised according to what was then the predominant development model – the Waterfall model. Waterfall production followed a linear development cycle based on meeting the objectives and functionality of final specifications document, the abstract articulation of what would be the end product. During this period though, the Agile Manifesto (2001) was published, and its influence would soon spread throughout the software development community and into the purview of management. At the same time, other research pointed to the 'ever-present market' as another factor of control which software workers were increasingly subject to (Ó'Riain 2010). By introducing emerging debates on the service triangle of customer – manager – worker, Ó'Riain (2010) emphasised the role of the customer in exposing software workers to the pressures of the market (e.g., user problems, requests etc.) despite their position within the cubicle sheltering them from direct contact.

From these rich contributions we can construct an account of software work as being subject to a diversity of control mechanisms ranging from normative cultures to production models and marketisation. In most recent analyses, authors have attempted to build on Barrett's case studies. Pawlicki's (2013) analysis of the electrical engineering labour process in global production networks followed Barrett (2001; 2004) in applying Storey's concept of 'layers of control' by focusing on the engineers' ability to negotiate the technical and organisational aspects of work. Pawlicki (2013) articulates 'negotiability' as a technique used by management that simultaneously allows for the exploitation of tacit, contextual engineering knowledges

from workers while mitigating the possibility of worker resistance and resentment by including them in a communicative process on the organisation of work. Within the dominant control structure, Pawlicki identifies the use of 'milestones' as the key control mechanism:

> "*Milestones are used in project management as the fundamental structuring element to define specific points in time where deliverables have to be met by the respective responsible engineer…The focus of control shifts from the work process towards the results of work, a process that can leave more space for autonomy. However, the granularity of milestones and deadlines in project work organisation affects possible degrees of autonomy…a dialogical definition of milestones based on the experience of engineers tilts this practice more into the direction of responsible autonomy. Within the system of milestones, engineers can act relatively autonomously and manage their time and tasks on their own.*" (Pawlicki 2013: 44)

The implementation of key development procedures such as milestones derived from the 'engineering push' of software development in the attempt to rationalise the production of software to increase productivity and remove the nuanced complexity which characterised the 'software crisis' of the 60s and 70s (Beirne et al. 1998; Campbell-Kelly et al. 2014; De Vasconcelos 2016). The work of rejuvenating the lull of labour process analyses of control by expanding its view to knowledge workers (Thompson and Van Den Broek 2010) has begun with contributions such as Pawlicki's (2013) and more recently Boes and Kämpf (2014) and Kämpf's (2018) claim of an 'industrialisation of white-collar work'. In an important contribution to the implications of agile methodologies for software work, Boes and Kämpf (2014) note how Agile has spread from its 'pioneer stage' through its 'grassroot stage' to become a widespread new production model within software development and beyond[20]. In his later analysis of the engineering department of a large European IT company, Kämpf (2014:909) demonstrates how management effectively dissolved what he describes as the "*grassroots, 'anti-management' movements*" present in the Agile community by integrating the method with Lean principles. Although I would question the position that the original premises of Agile were 'anti-management' in their implications, these case studies of software work represent the beginning of an important dialogue on the role of Agility Management Systems (Moore 2019) in the sociology of software work.

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[20] The authors identify the spread of agile methodologies to research and development and public administration in what appears to be becoming a new managerial orthodoxy.

Control in Creative Work

In a similar way to software workers and other occupations labelled knowledge work, creative workers in the Cultural and Creative Industries have been a focus for those concerned with the new modes of management required to harness creativity and to put knowledge to work (Townlet et al. 2009) through the decentralisation of management in the network society (Castells 1996). The rise in prominence, albeit not quantitatively, of creative workers such as the new media workers in this study is tightly linked with the dot.com boom and the continued growth of internet-based companies which in early stages of rapid growth (and dissolution I might add) exhibited loose and informal organisational structures in what were high-risk markets (Neff 2004; 2012). However, there is evidence that these ad-hoc organisations have now followed more traditional paths towards work organisation and management amid concerns for maintaining stability and profitability in what is now a cornerstone of the global political economy in the internet industry (McKinlay and Smith 2009). Research on the management of creative workers tends to follow two directions. The first (and less followed) is concerned with the organisation of creative workers primarily at the point of production where project-based work structures the rhythms of creative production. The second, and by far the most travelled, focuses on the subjective orientations and rationalisations of creative workers in pursuit of desirable, fulfilling work and how these can produce commitment through self-exploitation.

Work in the cultural industries has traditionally been organised through projects which are based on the formation of project teams formed around particular production or client contracts, and this mode of organisation remains the template across the Cultural and Creative Industries which reify the romantic ideal of free-flowing, ephemeral artistic work (Lesage 2018). Project-based working is thought to provide organisational flexibility, collaboration which is key to foster creative ideation, and a decentralisation of control through more networked forms of production. However, empirical research has demonstrated the persistence of hierarchical and centralised forms of control (Huws 2006a). In their study of IT and digital media companies in Germany, Mayer-Ahuja and Wolf (2007) argued that despite the widespread cultural depictions and expectations of these sectors as exemplifying the new spirit of (project-based) capitalism (Boltanski and Chiapello 1999), formal hierarchical controls persist for the workers in these sectors. In the same special issue, Manning and Sydow (2007) demonstrated how project-based

working in TV production can serve as a form of 'network-based control' founded on relationality and a merging of forms of market-based and hierarchical pressures. In their synthesis of the scholarship on creative work, Hesmondhalgh and Baker (2011) emphasise the centrality of struggles over creative autonomy as key to understanding the varied conditions, tensions and experiences of creative workers. Making a distinction between 'aesthetic/artistic autonomy' and 'professional autonomy', the authors demonstrate how the idealised pursuit of artistic freedom by creative workers jars with the organisational imperative for control, a point further highlighted by Huws (2010) in her 'dialectics of autonomy and control' which emphasised the inherent contradictions of control and creative labour.

The control of creative work through the 'engineering' of subjectivity and culture (Kunda 1992) has also been an important focus of the literature. In their study of discursive ideals in the game development sector by analysing a prominent magazine – *Game Developer*, Cote and Harris (2020; 2021) highlighted the presence of three themes which served to legitimise the prevalence of crunch time. By connecting extreme periods of long hours and work commitment to subjective notions of passion in game workers, popular industry media help provide a normative rationalisation for work intensification and exploitation. Angela McRobbie (2002; 2004; 2016) introduced the term 'pleasure-pain' axis to describe the ways in which connections to work such as passion are employed to legitimise the pain of poor employment conditions. Indeed, so pervasive has the study of passion and work become that De Palma (2021) claims it constitutes a new cultural paradigm of work – the 'passion-paradigm'. The passion-paradigm represent both a coping mechanism for workers, and an individualising mechanism for organisations to achieve work commitment. What tends to be missing from the literature on the control of creative workers is an account that considers the merging of multiple mechanisms (organisational structures and subjectivity) to deepen the monitoring of and commitment to work.

Hodgson and Briand's (2013) analysis of the implementation of Agile management in a game development studio makes important steps towards achieving this. Their study involved the analysis of a development team consisting of both programming roles and more artistic-based roles such as artists, designers and animators. They find that those within software development roles embraced the principles and procedures of the Agile methodology while the creatives actively resisted it because it contradicted the qualitative, unpredictable nature of their work process. Based on these challenges to the adoption and efficacy of Agile management systems, they claim *"there is a pressing need for more extensive, cross-sectoral and critical research*

into its implementation and the consequences for control" (Hodgson and Brian 2013:322). The analysis here of software workers and creative workers throughout both the high-tech software sector and the Cultural and Creative Industries provides insight into how such new management strategies are implemented in different organisational contexts with different workers.

The mode of organisation which predominates in the software and creative sectors is project-based production. Work, which is based around either the use or development of digital technologies, is planned, parcelled out and monitored through the prism of the project which is often coordinated by project managers and project management methodologies. Phoebe Moore (2019) identifies Agility Management Systems as the emerging managerial strategy of control and the implications of this systems for the contested terrain of control in the labour process need to be examined. The aim of chapter 6 is to continue this work by igniting a spark in the literature on the control of contemporary knowledge work in software and creative workers by re-invigorating our understanding of how control operates for these organisational professionals amid managerial strategies to find a balance between allowing creative ideation and controlling labour (Lifshitz-Assaf et al. 2018).

The Contested Terrain of Work-Life Boundaries

The activities of work and non-work life have arguably never been so conceptually, practically, and structurally distinct as they have been over the past 100 years of industrial capitalism. Historically, work and life were tightly integrated through systems of reciprocity and householding where distinctions between work and non-work space and time were largely absent (Polanyi 1944). The socioeconomic structuring of space and time experienced considerable change following the expansion of industrial capitalism as work organised in predominantly cottage production systems began to give way to urbanised manufacturing and newly developed spaces of production. As work increasingly moved out of the home, the social construction of 'work time' emerged as the regulation and commensuration of labour became ordered by the industrial clock (Thompson 1967; Glennie and Thrift 1996). As Clark (2000: 478) noted, "work became synonymous with employment" in the market as spatial and temporal distinctions established work and home as separate domains. The home became a

space and time for family, leisure, rest and most importantly, non (market-based) work[21]. Through over a century of political and cultural change, these domains have become normatively embedded both within cultural experience and expectations, and politically institutionalised through employment legislations and organisational policies. More recently, the degrees to which these apparently distinct domains are 'fixed' has come under question, and social scientists have begun to explore the ways in which the boundaries between them are blurring and their implications for people's experiences of what has become a *contested terrain of work-life boundaries*.

Broadly speaking, a field of interdisciplinary research has emerged to examine the (re)shaping of the boundaries between these domains. The introduction of 'boundary work', 'border theory' and 'boundary theory' (Nippert-Eng 1996; Clark 2000; Ashforth et al. 2000) as early contributions have provided a framework from which subsequent research has built. Theoretically and empirically informed research in the field has proliferated over the past decade and contributors have identified a whole host of boundary management practices (Nippert-Eng 1996; Ashforth and Kreiner 2000; Ciolfi and Lockley 2018; Siegert and Löwstedt 2019; Reissner, Izak, and Hislop 2020). Nippert-Eng's (1996:7) intervention on the intricacies of the boundaries between work and non-work life advanced the concept of 'boundary work' to describe the "*strategies, principles, and practices we use to create, maintain, and modify…realm specific matters, people, objects, and aspects of self into 'home' and 'work'*" as individuals strive to achieve a desired configuration between a segmentation or integration of work and non-work life. Boundary theory has developed categories along continuums to describe the characteristics of boundaries and how people manage them in everyday life. On one end of the continuum are weak or thin boundaries that are often characterised by varying degrees of integration (i.e between work-life) and permeability (Clark 2000). On the other end, boundaries have been analysed as strong or thick where individuals construct boundaries to achieve segmentation or a separation between domains (Kreiner et al. 2009; Mellner et al. 2015).

The social construction of work and life (or private life) as separate domains implicates distinct roles, activities, purposes, expectations and behaviours that become normatively embedded within each realm (Clark 2000). How people enact boundaries between these domain specific

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[21] It is however acknowledged that there have always been specific cases where the spaces of work and home and the activities of work and leisure were one and the same. Moreover, the home has always been the key site of social reproduction and domestic labour it entails.

characteristics has been a core focus of much of the research on work-life boundaries. The literature has developed detailed, typological insights into the negotiation and inconsistencies of work-life boundary preferences, the boundary work tactics of individuals, and how time, space and objects are adopted as tools for boundary work in the everyday practices of workers (Kreiner, Hollensbe, and Sheep 2009; Sayah 2013; Ciolfi and Lockley 2018; Reissner, Izak, and Hislop 2020). Despite this wealth of understanding that we now have on the intricacies of individuals' boundary enactment practices, the literature is not so clear or explicit on the sources of the pressures leading to boundary blurring. Moreover, the vast majority of research on work-life boundaries has drawn on empirical data from various forms of what is typically categorised as knowledge work in the professional, scientific and technical services occupations. Any inclinations of the sources impacting upon these boundaries focus on either digital technologies or organisational demands, often with little consideration of the mechanisms shaping how these become pressure points for boundary blurring. We now know that (predominantly knowledge workers, and even more so – flexible, mobile, remote, tele knowledge workers) experience varying degrees of boundary blurring and adopt a multitude of practices to manage this process, however, we still know relatively little about the sources driving the pressures of boundary blurring and the implications these have for knowledge workers' capacities and opportunities to effectively engage in boundary work.

It is generally acknowledged within the knowledge work literature that knowledge workers experience a blurring of the boundaries between work and life, labour and leisure. Technology, of course has been identified as a key factor in this process and the literature has demonstrated how email (Mazmanian, Orlikowski, and Yates 2013), ICT devices (Sayah 2013) and social media (Siegert and Löwstedt 2019) can contribute to boundary blurring while also being used as tools for boundary work. The implications of digital technologies have most often been presented as shaping organisational pressures, for example through the changing expectations of peers and management (e.g. on deadlines, availability etc.) (Mazmanian, Orlikowski, and Yates 2013; Hislop, Bosch-Sijtsema, and Zimmermann 2013). However, although these accounts provide some insight into the pressures at play, their focus is primarily on how workers respond to and manage these changes. An explicitly systematic, conceptual and empirically grounded analysis of the sources of the pressures that lead to boundary blurring is needed. Digital technologies and organisational demands have been adopted as causal factors in much of the literature, but how these intra-act with the sociomateriality of knowledge itself (i.e the development, use and production of knowledges) has yet to be examined.

Recent developments in the study of digital technologies and work have moved beyond what Orlikowski and Scott (2008: 457) refer to as 'discrete entity' approaches that view technology and social processes as independent from one another, towards adopting a sociomaterial perspective that views technology and social processes as constitutively entangled in their practices (Orlikowski 2007; Wajcman 2006; Hislop et al. 2013). However, some sociomaterial approaches adopt a position of ontological inseparability that presupposes materiality (e.g., technology) and the social as lacking an "*independent, self-contained existence*" (Barad 2007). In contrast, a sociomaterial approach built upon critical realist foundations such as the one adopted here, approaches "*the 'social' and the 'material' as analytically independent entities that become 'sociomaterial' as they are put into relationship with one another through human action*" (Leonardi 2013: 69). In this sense, the focus shifts from viewing phenomena as always necessarily entangled in their essence towards an analysis of how materiality (in this case technology) and sociality (in this case labour) *become* constitutively entangled through their articulations or imbrications. Analysing work-life boundaries through the prisms of critical realism and sociomateriality pushes us to consider how and why social processes such as work and technology *become* constitutively entangled through the structuring of their relations. Applying the concept of sociomaterial exigencies to the analysis of this contested terrain seeks to account for the mechanisms shaping the process of work-life boundary blurring by examining the nature of software and creative working practices as necessarily material.

Work-Life Boundaries in Software Work

The software sector is often depicted in popular media as comprised of computer programmers coding away into the night with neither awareness nor care for any sense of routine temporality (Bronson 1999). Furthermore, the 'move fast and breaks things' mantra that permeates the sector and its obsession with technological acceleration lies in stark irony with the temporal experience of software work itself as a knowledge-intensive, creative endeavour with its own unfolding temporality (O'Carroll 2008; 2015). Software workers often work long hours (Perlow 1998; 2001), although this seems to vary depending on the national context with those working in Ireland exhibiting closer to a normal working week (O'Carroll 2015). As we have seen, this cohort is widely acclaimed to represent the 'vanguard' (Barret 2001) of the new world of work which is depicted in dominant cultural narratives as non-hierarchical, flexible, and where work and play become one (Kücklich 2005).

The work-life boundaries literature is primarily focused on what takes place after the fact of boundary blurring, through for example the analysis of people's boundary work tactics, with little focus on the sources leading to this phenomenon. Scholarios and Marks (2004:54) identify work-life boundary blurring for software workers "*partly as a result of increasing flexibilisation through outsourcing and offsite client work*", taking changing organisational demands as pivotal. Similar to wider w-l boundaries literature, the presence of boundary blurring is taken as a given and attributed to organisational factors briefly before moving on to the (still important) core focus of the paper - the analysis of the implications of work-life blurring for the attitudes of software workers. When the sources of boundary blurring are considered, they are often either attributed in this way to one or two factors: (i) digital technologies and/or (ii) organisational demands. Digital technologies, for example "*communication platforms and devices*" are positioned as the cause of works intimacy and 'presence bleed' for Gregg's research on IT workers (2011:2; 2018). Organisational demands and expectations are often examined as an important pressure that can blur the boundary between work and non-work time. Software workers, and other knowledge workers for that matter, are often subject to longer working hours which can be further intensified through the prioritising of deadlines as a benchmark production device (Kidder 1981; Perlow 1998; 2001).

Even in research that applies an explicitly socio-technical or sociomaterial analysis (Wajcman and Rose 2011; Ciolfi and Lockley 2018) and acknowledges the mutual constitution of technological and social phenomena (i.e boundary blurring), the implications of digital technologies for work-life boundaries are mainly considered through their alteration of communication capabilities between workers and organisations. In contrast, the analysis developed here positions digital technology as the necessary mediator *and* physical, albeit at times intangible, bearer of knowledges which are produced by digital knowledge workers. Knowledge must reside in a physical bearer, and in the case of digitally mediated software and creative work, knowledges are primarily objectified in the digital technologies used in both the practice of work and the provision of the digital commodity goods and services these workers provide. This transformational process of objectifying (or encoding) knowledges into digital assets shifts the analytical focus from digital technologies to the commodification of knowledges through use of digital ICT's.

Some research on software work has effectively pointed to the time pressures experienced by these workers beyond the remit of organisational space and time. Occupational communities have been identified as an important source of 'more work' (Batt et al. 2001; Ó'Riain 2002)

and of the spillover of occupational culture into private life through networking and socialising (Marschall 2012). Furthermore, Aileen O'Carroll's (2008; 2015) study of software developers and their experiences of time offers an important alternative account of the mechanisms impinging on the work-life boundaries of knowledge workers. The introduction of the term 'fuzzy holes' for the fragmented yet tangled work process and the focus on the intangibility of time spent gathering and sharing information and comprehending plans and ideas points in some ways towards the material experience of an apparently 'immaterial' labour process. Although O'Carroll (2008; 2015) does not provide an explicitly materialist analysis of knowledge work, her insights and articulation of the 'spaghetti' like entanglements of knowledge work time is perhaps the closest to such an analysis that the literature has provided. The key contribution, for the purposes of this research, comes from the explanation of intangible time as ephemeral and somewhat invisible to the workers themselves for *"while being an essential element of the work process, [it is] also seen as peripheral to it"* (O'Carroll 2008:185). This rendering of cognitive processes as 'peripheral' and invisible by the workers, and 'immaterial' in the literature contributes in the former case to a reductive depiction of the labour process and in the latter to a neglect of the material implications of knowledge work processes. Just because these workers are not lifting blocks or boxes does not mean that they do not carry heavy loads, it merely points to the fact that these loads are primarily intangible and carried cognitively.

Because the work-life boundaries literature is predominantly oriented around analyses of how individuals manage boundary blurring, yet an explicit conceptualisation and analysis of the sources leading to boundary blurring (in knowledge work) is still needed. In such accounts, the focus has unsurprisingly turned to the positioning of workers along the integration-segmentation continuum and to two important (and highly visible) factors implicated in boundary blurring in contemporary work – digital technology and organisational demands. However, in this preoccupation a crucial starting point has been missed, a 'first-step' in the analysis of boundary blurring, one that prioritises the sociomateriality of working practices and which pulls into question the ability of knowledge workers to ever segment the domains of work and life in any meaningful way.

Work-Life Boundaries in Creative Work

In many ways, creative work has been a central focus of research on the blurring of work-life boundaries, through for instance the notion of work as play (Kücklich 2005), although more recent empirical work has demonstrated how this depiction is far from universally held, especially by those experiencing work intensification (Thompson, Parker and Cox 2015). The influence of the autonomist Marxist tradition on creative work studies has played an important part in invigorating a debate on the (changing?) boundary between work and life through their introduction of the concepts of the 'social factory' and immaterial labour (Hardt and Negri 2000). While the social factory is used to describe the movement of capital's extraction of value outside of the workplace (i.e the factory) into the wider social relations of life itself (i.e the social), its bundling with the concept of immaterial labour causes more confusion than elucidation. While the concept of the social factory is effective in pointing to the emerging structures of datafication, practices of dataveillance and 'free labour', and the logics of dataism (Terranova 2004; Scholz 2013; Van Djick 2014; Jarrett 2016), its connection with the notion of immaterial labour seems to have resulted in an assumption that 'immaterial' labourers such as software and creative workers *are now* subject to value extraction outside of work because the workplace has become all of life itself. Such accounts tend to invoke a sense of novelty to current knowledge workers, something which is directly challenged in this thesis which understands the core working practices of these workers to be as Pitts (2016) would say 'ever thus' rather than new.

Similar to their knowledge worker counterparts, creative workers have been shown to work long hours, at times with extreme variations in intensity through the normalisation of 'crunch time' across many sectors such as game development and advertising (Gill 2007; Consalvo 2008; Cote and Harris 2020; 2021). In what has become an essential reference point for the debate on creative work, Gill and Pratt's (2008) article outlines the influences of autonomist Marxism on studies of creative work and problematises some of its theoretical propositions with the empirical literature through a number of core themes, one of which is temporality. As they state, "*long hours and the takeover of life by labour may be dictated by punishing schedules and oppressive deadlines [organisational demands]…but they may also be the outcome of passionate engagement, creativity and self-expression*" (2008:18, emphasis added). Of course, all of these factors are entangled in the blurring of work-life boundaries, but they point to an important trend in analyses of the work-life boundary for creative workers – the focus of subjective drivers.

Typically, research discussing the blurring of the work-life boundary in creative work often makes implicit and explicit connections with the role of subjectivity in rationalising the process of boundary blurring. For example, Taylor (2010:367) invokes the 'love of work' as *"both a compensation and an explanation when creative work overflows into private time and leisure"* as the creative labour process is characterised as one of 'immersion', 'exploration' and self-fulfilment. Furthermore, Wright (2015) attributes the blurring of work-life boundaries for digital game developers to their engagement in 'entrepreneurial practices' in order to find work. The entrepreneurial practices invoked by Wright (2015) are Vob and Pongratz's (2002) three entreployee characteristics (self-control, self-commercialisation and self-rationalisation). However, the search for links between boundary blurring in the terrain of subjectivity in creative work is at least partly driven by the same missing pieces in the wider work-life boundaries literature drawing on types of knowledge work. An explicit and sustained examination of knowledge, the primary factor within these labour processes, as a necessarily material entity (Orlikowski 2005a; Zukerfeld 2017) whose production implicates sociomaterial exigencies that shape the labour process.

In prioritising this premise, the analysis of the creative labour process in this thesis reveals the sociomaterial bases of these various forms of work attachment. In doing so, our analyses of the sources leading to work-life boundary blurring are made more explicit and help provide explanations prior to and beyond those linked and largely based upon the subjective orientations of workers, or as implications of changing organisational demands and digital technology use. Carreri (2020) notes how much of the work-life boundary literature fails to examine the practices which connect the structural drivers of boundary blurring to the micro-level experiences. The argument developed in chapter 7 provides an analysis that links the structural process of knowledge commodification to the sociomaterial practices of knowledge work, which it is argued, are the primary driver of work-life boundary blurring.

The Contested Terrain of Subjectivity and Identity

Beyond the ability of capitalist relations to shape the immediate terrain of production through the organisation, then from the domain of work towards non-work life and time, its reach continues to extend outwards from production and inwards to the subject. Here, the political economy and world of work deeply shape the actions, identities and subjectivities of the workers which constitute them. To unpack the *contested terrain of subjectivity and identity* we

need to consider the 'turn to subjectivity' that occurred across the sociology of work and labour process analysis which looked to Foucault's (2008) research on biopolitics as a theoretical frame through which to understand subjectification in contemporary capitalism. Through the articulation of the concept of biopolitics, Foucault (2008) laid the groundwork for what would become an influential toolkit for finding and analysing what some have called 'the missing subject' (Knights 1990; O'Doherty and Willmott 2001). The reader will forgive me for 'siting on the fence' by taking a middle ground in the debates that emerged from this turn to subjectivity because the significance of the debate for this thesis lies in its original aim rather than its diverging applications. Fundamentally, the core goal of Foucault's biopolitics and the 'reconstructionists' (Thompson 2009) in labour process theory, and even the 'consolidators' for that matter, was to bring the qualitative, human subject into socioeconomic analyses of the political economy and world of work. A substantial task that Arlie Hochschild's (1979) *The Managed Heart* showed was overdue and desperately needed.

The turn began from Foucault's (2008) critique in the 1970s of the neoliberal concept of human capital as a discursive and ideological sleight of hand by economists to collapse human labour, the third and most troublesome fictitious commodity (Polanyi 1944), into a form of capital – human capital. The success, it is argued, derives from neoliberalism's ability to constitute a form of control based on the 'conduct of conduct' (McNay 2009) where the hearts and minds of subjects (and thus workers) would be curated according to the principles of market fundamentalism. What emerged from the wave of researchers influenced by Foucault's biopolitics were narratives of the 'entrepreneurial self' (Foucault 2008; Watson 2012; Scharff 2016; Doody et al. 2016; Musílek et al. 2020) which were premised on the notion of homo-economicus and exemplified in the concept of human capital. Emanating primarily from the study of managerial, psychological and career texts (Casey 1995; Rose 1999; Boltanski and Chiapello 2005; Vallas and Hill 2018), this scholarship identified emerging depictions of economic action and the 'enterprising' subject and demonstrated their prevalence, and preference, across the fields of management and occupational psychology (Adams et al. 2019). Methodologically speaking, this body of research primarily positions discursive and ideological constructs (hence the focus on managerial and organisational 'texts') as the driving mechanism of subjectification in this new spirit of capitalism (Boltanski and Chiapello 2005).

Most recently, Musílek, Jamie, and McKie (2020) identified four approaches to the study of what they call personal attachment to work (see Figure 2), all of which are Foucauldian inspired.

Entrepreneurial Self	Biocracy
- Self as enterprise. - Maximise human capital and producitivity. - Entreployee (Voß and Pongratz (2003)	- Managerial strategy to merge work and personal life. - Increase commitment and engagement.
Lack, desire and affect - Managerial expectation of specific character profiles.	**Normative and Ethics of the Self** - Work and employment practices occur within wider socialnorms/values (e.g 'New Spirit of Capitalism' Boltanksi and Chiapello (2007).

Neoliberal Governmentality (based on discourse & ideology)

Figure 2: Neo-governmentality approaches to work attachment.

A common pattern which characterises much of this research which can be captured under the heading of 'neoliberal governmentality', is it prioritising of the ideological and discursive. These approaches, and in particular those that espouse entrepreneurial selves examine the effects of neoliberal ideological and discursive constructs on the control (or conduct of conduct) of workers and the shaping of their subjective orientations to work and life. However, and even as Vallas and Hill (2018:305) acknowledge, "*although it is important to recognize that conceptions of subjectivity represent "effects of a certain type of power" (Foucault 1979:29), the point can be taken only so far"*. In other words, the neoliberal entrepreneurial self or neogovernmentality accounts depicted by this body of work are best understood as influenced by over-arching discursive and ideological perspectives that are present in circulation in the neoliberal period (for example through managerial and psychological texts), but whose coordinating and governing effects on individuals (i.e workers) are not guaranteed or totalizing but *contingent* upon the agentic sensibilities of the individuals themselves.

Two most recent contributions to the analysis of contemporary working subjects offer a more fruitful path into conceptualising the processes of subjectification in the world of work. Gregory and Sadowski (2021) apply the concept of biopolitics within a firmly materialist analysis of the platform structures and algorithmic practices that shape subject formation in the

platform economy. They introduce the term 'perverse virtues' to describe the behaviours, personality traits and relationships that platform workers enact in order to abide by the 'biopolitical platform' in its material manifestations. The focus on the development and enactment of perverse virtues as a collection of characteristics adopted by workers through their entanglement in platform labour is a useful conceptual tool for articulating a sociomaterial analysis of the contested terrain of subjectivity and one that will be put to use in chapter 8. Moreover, Neely's (2020) depiction of the contemporary ideal worker as a 'portfolio-ideal worker' demonstrates how hegemonic cultural depictions of ideal working subjects can be embedded in and originate from organisational structures and highlights their significance for the persistence of social inequalities in the workplace. These insights are also adopted in chapter 8 where the analysis of subject formation highlights the (re)production of existing inequalities of gender and age in the knowledge-intensive workplace.

Tempering the tendency in much research on the working subject to centre discourse, it is important to note Foucault's (2008:9) description of the process of subjectification as involving:

> *"the analysis of complex relations between three distinct elements none of which can be reduced to or absorbed by the others, but whose relations are constitutive of each other. These three elements are: forms of knowledge…, relations of power…, and finally the modes of formation of the subject through practices of the self. It seems to me that carrying out this triple theoretical shift…we can truly study the relations between truth, power and subject without ever reducing each of them to the others"* *(Foucault 2008:9)*

Foucault's conceptualisation of subject formation as emergent remains key, although the specific sequences of entities (i.e discourse – subject) which constitute this cumulation of entanglements need to be reoriented. Although Barad (2007) is critical of the focus on language in Foucault's work, the development of Barad's 'ontoepistemology' seeks to further a 'new materialist' notion of the subject (Tobias-Renstrøm and Køppe 2020) which is based on the premise of ontological inseparability. However, as alluded to in the previous chapter and developed in detail in the forthcoming methodology chapter, this research is founded on the development of a sociomaterial critical realism that centres the role of cumulation and spatiotemporality in bringing entities *into* mutual constitution. It is based on this understanding that we can approach the 'subject' as emerging in constitutive entanglement with the

sociomaterial context within which it exists and acts. However, it (the subject) never reaches a state of completion, rather it is always in emergence, contestation and contradiction. The contours of subject formation in the world of work, which are based on this emergent flow of accommodation, contestation and contradiction, are therefore shaped by the configurations implicated in the sociomaterial exigencies of specific forms of work for it is in/from/through the practices of work itself that other factors (i.e discursive mediations) emerge as entanglements shaping subject formation. In other words, the practice of work comes first.

In adopting a sociomaterial analysis of the labour process and applying it to the contested terrain of subjectivity and identity, the aim is to locate and articulate an alternative account of the mechanisms, or exigencies shaping working subjects. It is by analysing subject formation through the sociomaterialist critical realist framework developed here that a more materialist understanding of the mechanisms shaping the subjects and actions of workers can be delineated, some labour process researchers called for (Marks and Thompson 2010). Taking the sociomaterialisations of working practices seriously means acknowledging that the entanglement of the situated actions of labour processes and their relations with the materialities of work (e.g., knowledges, technologies) are mutually constitutive through *sociomaterial attachments* and these attachments have a role to play in the process of subjectification. This is not to say that discursive constructs are not consequential in the shaping of working subjects and identities, for the wealth of research from this tradition has demonstrated that they are indeed, but that *there are also* alternative mechanisms operating which have their origins in the slippery and distributed sociomaterialities of working practices. The focus on discourses as increasingly 'defining and producing subjects' (Foucault 2005; Dorschall 2020) points to important trends in the *content* of popular cultural thought, however, a sociomaterial analysis considers subjects as enacted in their practices which involve actions such as discourse *and* a plethora of other daily doings, one of which is work. It is through the sociomaterial practices, or *content,* of work *itself* that contours of subjecthoods can form from 'within' regardless of whether they become discursively enacted by workers, employers, and anyone for that matter.

Subjectivity and Identity in Software Work

The proliferating accounts of knowledge workers as entrepreneurial subjects over the past decades have emerged primarily as an overhang from the dot.com bubble. In the late 1990's,

representations of the 'New Economy' and the rapidly expanding internet industry hit new heights, and the risk embracing organisations and 'venture labourers' were driven by entrepreneurial desires for lucrative shares in high-growth companies and hopes of a new world of work based on digital networks, flat hierarchies and egalitarian workplaces (Mayer-Ahuja and Wolf 2007; Neff 2004; 2005; 2012). This hype was circulating amid growth in outsourcing activities through freelancing and contracting, a trend which itself was overinflated by neoliberal narratives of 'free agents' (Pink 2001), a 'creative class' (Florida 2002) and 'portfolio careers' (Leadbetter 2004); and new cultural depictions of workers and capitalism (Boltanski and Chiapello 1999). In a sense, it is no surprise that such depictions have emerged considering the influence of the grand narratives of socioeconomic change discussed in chapter 2 throughout academic, policy, media and managerial circles. Nonetheless, the significance of these accounts for this thesis lies in their attribution of such 'changes' to novel or new causes (i.e new discourses and cultural ideals etc.). The cases claimed to exemplify these changes in the literature are predominantly drawn from software and creative work, the subjects representing this brave new world of work. As such, they serve as useful benchmarks with which I can position an alternative account of the mechanisms shaping knowledge worker subjectivity.

Research which touches on the terrain of subjectivity and identity in software work primarily focus on the role discourse plays in their formation. In focusing on the normative implications of corporate culture for the construction of occupational subjectivity, Kunda states that "*the organisational self is formed in transaction with the ideologically prescribed member role and the demands it makes on the members' experience*" through the construction and use of organisational texts and communications (Kunda 1992:213). Most recently, Ciccone (2022) illustrated how discourses of productivity operate as a 'technology of self', using a neogovernmentality frame. This focus on discourse is also present in key research on the role of occupational communities in shaping subjectivity and identity. For example, Marschall's (2012:51, emphasis added) study of the changing dynamics of occupational communities in the network society examines "*the interpenetration of the physical and virtual realms [to reveal] how occupational communities have been transformed in the network society.*". However, in focusing on networked occupational communities as "*shared knowledge, discourse structures, common ideological constructions, and patterns of signs and signals*" in a "*dematerialised form*", Marschall (2012:139-143) prioritises an interpretation of such communities as being somehow immaterial, existing in the ether of discourse and virtuality.

This interpretation is a common one across scholarship on digital, networked capitalism (Castells 1996) and one held in common with research on 'immaterial labour' (Lazzarato 1997). However, such accounts are premised on the notion of knowledge and information as an immaterial entity, something that happens in the intangible space between our minds and is produced and mediated through our discourse. A thread also present across wider labour process research on the 'missing subject'.

However, recent research on 'the subject' and identity within labour process theory has brought materiality back in through focusing on political economic and organisational structures, qualification credentials and labour market dynamics (Marks and Lockyer 2004; Marks and Scholarios 2008; Marks and Thompson 2010). This strand of research seeks to problematise the post-structuralist linking of subjectivity to identity and therefore identity to discourse (Marks and Thompson 2010) within those neogovernmentality inspired accounts which define subjectivity as "*a term used to denote an understanding of individual identity as the product of discourse, ideology and institutional practices*" (Thomas 2009:180). Furthermore, occupational communities whether offline or online are always necessarily enacted in practices which are situated in time and space (Ó'Riain 2002). In fact, Ó'Riain (2006) demonstrates how the compression of time and space (Harvey 1989) through digitalization, rather than resulting in their disappearance or collapse, can lead to 'time-space intensification' where they shape the situated practices of labour more explicitly. In bringing sociomateriality to bear on the analysis of work this research seeks to provide an alternative to neogovernmentality accounts by linking the materiality of working practices to subject formation by requiring that workers adopt and enact 'perverse virtues' (Gregory and Sadowski 2021). In doing so, the thesis contributes to the work of those stressing the continuity of materiality and to the aim of bringing materiality back into analyses of the working subject.

Voß and Pongratz (2003) advance the thesis of the 'entreployee' as an ideal type which claims to provide a prognosis of the dominant emerging character of labour in the early 21st century. Although they acknowledged the empirical limitations of the scope of the concept at the time, they identified workers in the IT and cultural industries as archetypes – in other words, software and creative workers. Three characteristics, or 'virtues' to use Gregory and Sadowski's (2021) term, are identified by the authors as constituting this new entrepreneurial subject: (i) self-control, (ii) self-commercialisation and (iii) self-rationalisation, attributes which primarily emphasise management of and by oneself. In proposing the emergence of this 'new social character', the authors claim it has been caused by "*certain reorganization strategies*" within

companies (p.250) which are loosely identified as teamwork, flexible working hours, digitalization of work and various outsourcing relations. Through these channels of reorganisation, Voß and Pongratz (2003) argue that organisations have effectively 'externalized' the indeterminacy of labour problem onto workers themselves, thus creating the need for 'new' reflexive, self-adjusting virtues. Although this is a welcome alternative to explanations focusing on discourse, the problem lies in its attribution of this 'shift' of the transformation/indeterminacy problem to those 'new' forms of work increasingly implemented across organisations, forms which largely subscribe to the 'collaborative work ethic' and 'new spirit' depicted within the management literature (Marshall 1995; Boltanski and Chiapello 1999).

In contrast, the sociomaterial labour process analysis developed here argues that there is no 'shift' but rather that the indeterminacy problem of knowledge work is *always* experienced by both management *and* the worker, as managerial systems of control have less capacity over the realisation of the labour process (whilst maintaining strong control over the motivations and pressures controlling workers like team/peer reviews, meetings, performance appraisals etc.). In other words, what accounts of the 'entrepreneurial subject' seem to miss is that the indeterminacy, or 'transformation' (Vob and Pongratz 2002) problem of labour has *always* been largely held by knowledge workers themselves. This becomes evident through the identification of indeterminacy and attachments as core emergent exigencies of knowledge production. Such a realisation turns the assumed directionality of causation which permeates the literature on working subject formation on its head. Suddenly, it is no longer *only* the conception and communication of managerial cultural ideals that shape the 'perverse virtues' of working subjects, but the sociomaterialisations of the labour process itself. In fact, it could even be argued that those managerial worker ideals largely originate from a latent acknowledgement of some of these sociomaterialities of knowledge work through the prism of organisational efficiency. Indeed, those ideals are consequential in the process of subjectification, but they largely (re)inforce those virtues (i.e behaviours, characteristics, relations) that are in fact always already sociomaterially implicated in the labour processes of software and creative work.

Finally, a sociomaterialist labour process analysis of the contested terrain of subjectivity can enhance our understanding of the (re)production of social inequalities in the workplace. For software work, the turn to engineering that has occurred since the 1960s (Campbell-Kelly 2014; Bogost 2015) has contributed to the gendered composition of the workforce (Little 2021), with

core development occupations overwhelmingly consisting of men (Greco 2005), a pattern also present across the Cultural and Creative Industries (Hesmondhalgh and Baker 2015). Minority genders, including women, have found their position within software development challenged by the male-dominated 'tech-bro' cultures that permeate the technology sector, leading them to enact tactics to circumvent and resist those challenges (Adam et al. 2006). However, the implication that software workers perform specific virtues can directly shape the opportunities of some workers to engage in circumvention and resistance.

Subjectivity and Identity in Creative Work

Research concerning the contested terrain of subjectivity and identity has perhaps found its locus in the turn to creative work which took place throughout the beginning of the 21st century (Banks and O'Connor 2009; 2017). Emerging primarily in response to the adoption of cultural and creative workers as the emblem of the 'new economy', knowledge economy, and newly minted 'creative industries' (Reich 1991; OECD 1996; DCMS 1999; Hardt and Negri 2000; Florida 2002; Lester and Piore 2006), the turn to the analysis of creative work was in part a critique of these narratives, and a continuation of them. Aside from the rich empirical analyses which revealed the insecure and precarious conditions of creative work and digital media companies (Kerr 2007; Gill and Pratt 2008; Hesmondhalgh and Baker 2011; de Peuter 2014; Morgan and Nelligan 2017), the terrain of subjectivity took centre stage in the research that followed (Gill and Pratt 2008). Many contributors were influenced by the autonomist Marxist tradition and the concept of immaterial labour and drew on Foucauldian-inspired neogovernmentality approaches to describe the shaping of subject formation.

Creative work has become an interesting exemplar for changes to work organisation (Banks, 2017) and worker subjectivities and is often depicted in policy and media favourably (Luckman and Taylor 2018). The project-based, informally networked labour markets of the creative economy are fertile ground for the intensification of competition and flexible, contingent labour markets where employers can mitigate responsibilities through the use of freelance work and unpaid labour. Such conditions can weaken labours position vis-a-vis capital and intensify the need to engage in activities such as self-commercialisation and the individualisation of risks (Neff 2012) in pursuit of just rewards. Oftentimes, the predominant virtues present in creative work (self-branding, reputation building, self-control and rationalisation of work) are attributed to the presence of an entrepreneurial subjectivity (Wright 2015; Gandini 2015; Scharff 2016;

Luckman and Taylor 2018). However, in prioritising the subject, the creative entrepreneurial subject for that matter, as the point of departure for the engagement in such activities these studies run the risk of missing where the subject 'checked in'. This blind spot is one common to the wider literature on neoliberal capitalism as an ideological-discursive construct which seems to pervade everything and everyone, but what these studies preclude is an understanding that there was a real, sociomaterially enacted word (of work) before the idiom of neoliberalism, a 'hidden-history' (Pitts 2016) of sorts in some literature.

As other researchers of creative work have highlighted, the pursuit of self-actualization through creative endeavour (McRobbie 1998; 2016; Taylor 2010) is an important subjective driver of subject formation and self-exploitation in the work of creatives. Rather than see this as the primary factor encouraging creatives to engage in the virtues of self-management, however, I understand the pursuit of happiness, fulfilment and self-actualization as constituting another cumulative entanglement in the practice of creative work itself. As a subjective desire that exists in, above and beyond the world of work, the pursuit of self-actualization is a common one present across a multitude of the life-forming activities that people engage in, only one of which is work. Another rich strand of research on the (creative) working subject comes from what DePalma (2021:134) has termed the 'passion paradigm', "*the pursuit of passion as a coherent ideology of work*". Here, the pursuit of passion through work drives workers through the experiences of precarity and encourages them to engage in virtues which contribute to self-exploitation (Gill and Pratt 2008; Umney and Kretsos 2015; McRobbie 2016), in addition, passion can be appropriated as a form of control over workers (Kerr and Kelleher 2015) and is often dependent on the precarious, invisible work of others (Bulut 2020). The pursuit of such personal desires and meanings are consequential in shaping subject formation. Indeed, Kathi Weeks (2011:37) notes how "*work provides a variety of satisfactions…in can be a source of meaning, purpose, structure, social ties, and recognition*", however, such explanatory accounts of why workers engage in specific virtues as working subjects are as she states 'insufficient'.

Passion, as a subjective experience, is an emotional and affective *attachment* to a particular activity or a particular genre of situated action (gaming, art etc.). Gill and Pratt (2018:15) point to this in their mentioning of the 'deep attachment' and 'affective bindings' exhibited by creative workers in the literature. Passion is best understood as an emergent subjective property of sociomaterial practices, in the instance of creative work practices which implicate numerous interactional and relational attachments that we can conceive of as constituting a form of embeddedness which consists of subjective, intersubjective and material ties to work. It is also

important to note that passion, as a subjective experience, is also non-determinate so it need not exist as a uniform experience across all workers engaged in creative work, or software work for that matter. In attempting to articulate an understanding of subject formation in the digital knowledge work of software and creative workers, the analysis of the virtues which predominate the working subject require that the sociomaterial practices of work itself are prioritised as a point of origin, the initial location which sparks (or not) the cumulative subjective attachments that workers develop to their work.

Some recent studies of creative and software work go some way towards doing this. Morgan and Nelligan (2017) introduce the concept of 'labile labour' to describe the work that creatives engage in to sustain and maintain their pursuit of creative careers. As a concept which invokes the 'invisible' work above and beyond organisational space and time, I position labile labour with other terms emerging in the sociomateriality literature that seek to highlight these *other* forms of work such as Jarrahi and Nelson's (2018) 'configuration work' and Gray et al.'s (2020) 'corollary work'. I articulate these concepts as successfully 'locating' the labouring involved in the practices of what I have referred to as the sociomaterial attachments of knowledge work. In acknowledging these attachments as an inherent emergent exigency in the knowledge labour process, in chapter 8 I seek to develop an understanding of their implications for the 'perverse virtues' (i.e actions, behaviours and relations) (Gregory and Sadowski 2021) that these workers enact in their everyday working lives by advancing the notion of the *agile agent* as an emerging subject formation shaped by the sociomateriality of digital knowledge work. In doing so, this sociomaterial labour process analysis of the contested terrain of subjectivity answers the call of labour process scholars stressing the need to combine with other theoretical toolkits to develop a more materialist understanding of subject formation (Marks and Thompson 2010).

Conclusion

Some literatures on work and the labour process have focused on what we could call the materializations of work through for example, emotional labour (Hochschild 1979), embodiment (Wolkowitz and Warhurst 2010) and affective labour (Moore 2018). We can view these as broadly socio-material in their approach to the realities of work, with the concerns centred around the social and material characteristics of particular forms of work. The labour process tradition is firmly rooted in an examination of the material realities of work through analyses of the contexts and structures through which work takes place and the organisation and struggles over the labour process through workplaces. This scholarship has provided

excellent empirically grounded cases from the labour process to the workplace and out to the sectoral, national and even global levels. Through these traditions we have developed a rich conceptual toolkit with which we can grasp the realities of work and the many contested terrains through which it unfolds in contemporary working life. One cannot help but wonder, is there more 'connective tissue' (Thompson and Vincent 2010) or another level that can shine light on the world of work as it relates to these contexts and terrains of struggle? In this thesis I seek to bring sociomateriality to bear on the world of work by asking - what are the emergent sociomaterial exigencies of knowledge work, that before and after and 'in-between' stuff shaping and connecting the commodification process to the practice of labour and work organisation, and the unfolding terrains of working life (i.e control, boundaries, subjectivity).

Chapter 4: Methodology

This chapter details the methodological foundations and research strategy combined to theoretically and empirically study the knowledge work claimed to be archetypically characteristic of changes to the world of work in a 21st century advanced capitalist society. The chapter is structured as follows: firstly, the ontological and epistemological foundations of the research will be outlined, with the intention of explaining the sociomaterialist critical realism developed here. Secondly, the methodological strategy used to guide the research topic and select the unit of analysis and case studies will be described. Third, the method employed to implement the research strategy and meet the aims of the study will be outlined and its specific role in this process will be discussed. After discussing the methods used for data collection, the data collected within the two case studies will be described in detail according to the method. Finally, the remaining section of the chapter will reflect on considerations of the methodological learnings and future recommendations which have emerged following the completion of the research.

4.1   Grounding the World of Work in a Sociomaterialist Critical Realism

Social scientific research is formulated upon beliefs about the nature of reality and what can be known about it, the sociology developed here is guided by an ontological and epistemological perspective based on what I call a *sociomaterialist critical realism*. To develop this meta-theoretical approach, it must be situated within its relationship to the paradigms from which it draws, critical realism (CR) and (socio)materialism. Building upon a combination of the work of Bhasker (1975), Sayer (2000), Elder-Vass (2010), Zukerfeld (2017), Barad (2007) and Orlikowski (2005a), the sociomaterialist critical realism applied in this research can be outlined by the following key methodological premises: *mind-independent reality*; *stratified ontology*; *(socio)materialist*; and *emergentist*. This section details each of these methodological premises that guide the research strategy and the units of analysis, before describing how this meta-theoretical foundation opens up new avenues through which the world of work can be examined.

As Fletcher (2017:182) notes, "*one of the most important tenets of critical realism is that ontology (i.e what is real, the nature of reality) is irreducible to epistemology (i.e our knowledge of reality).*". Critical realism is positioned as an alternative paradigm to the

empiricist regularity of positivism and the reductive interpretivism of constructivism and the postmodern turn (Archer et al, 2016). The paradigm holds as its basic tenet the mind-independent reality of the world, or in other words, critical realists believe there is a real world '*out there*' which is independent of our knowledge of it. This lies in stark contrast to positivism and constructivism as both tend to reduce reality to human knowledge, the former through empiricism and the latter through linguistic interpretivism. Critical realism is a reflexive science that understands that the world is theory and discourse laden, but not determined and exhausted by this knowledge (Bhaskar, 2000; Fletcher, 2017). Bhaskar (1975) makes the distinction between the 'intransitive' (physical processes/social phenomena) and 'transitive' (theoretical and discursive interpretations of these processes and phenomena) dimensions of knowledge and argues against any commitment to the content of specific initial theories in favour of recognising the 'conditional nature' of theoretical interpretations (or transitive knowledge). Indeed, the conditionality of theoretical knowledge necessitates the continuous re-examination and renewal of the core propositions underpinning the working of any theoretical construction and the adoption of this premise here is contingent on its ability to provide analytical scaffolding to support the research.

> Following from this, we can deduce our first methodological premise: human knowledge is fallible, and reality is not determined or exhausted by our knowledge of it.

The stratified ontology of a critical realist perspective provides an instrumental view which can enhance the process of conceptualisation and operationalisation conducted in the research process and can be particularly fruitful with case-based methods. Pioneered by Bhaskar (1975, 1979), the differentiation of reality into three realms (see figure 3 overleaf) posits reality as mind-independent *and* socially constructed (Byrne, 2017). It must be noted however that this ontological distinction serves a purely analytical purpose; as critical realists maintain that our knowledge is always fallible, there are no deterministic claims to objective truth. Therefore, CR is itself a form of transitive knowledge attempting to grasp the tapestry of reality and in need of constant renewal. Firstly, the *real* domain which contains all that exists in the natural and social world, is the realm of objects, their structures and powers or causal processes/ mechanisms. Causal mechanisms are "*the processes or pathways through which an outcome is brought into being*" (Lewis-Beck and Bryman 2007). Secondly, the *actual* realm, as described by Sayer (2000:12) "*refers to what happens if and when those powers [or causal processes] are activated, to what they do and what eventuates when they do*.". In this domain, events

occur, irrespective of their experience or observation. Finally, the third realm is that of the *empirical*, the level of experience and observability, at this level social phenomena can be empirically studied and interpreted. The stratified ontology encompasses reality, where the real contains the actual and the empirical as opposed to flat ontologies which consider one or conflate the three (Sayer, 2000).
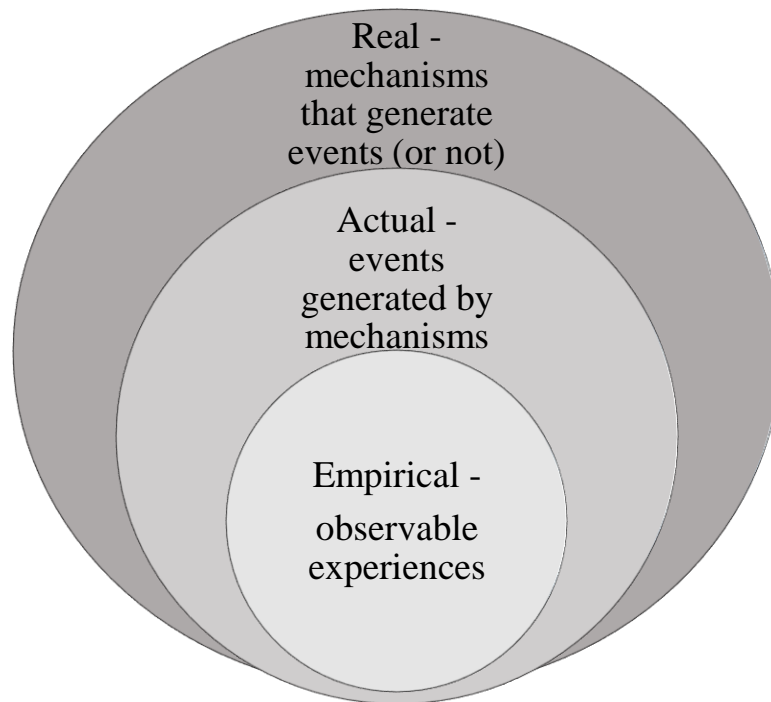
Figure 3: Critical Realisms stratified ontology

I suggest that using the notion of *cumulation* to understand the paradigms stratified ontology helps serve two important purposes. Firstly, it indicates the importance of spatiotemporality as the confluent fabric melding ontological strata. In this sense it compliments Margaret Archer's (1995; 2000) 'morphogenetic' model of social change where relationship between structure and agency follows a temporal cycle where antecedent structures shape social action and actions shape structures by either changing or maintaining them[22]. Secondly it helps resolve some of the tension that exists between critical realist applications of sociomateriality (Mutch 2013; Leonardi 2013) and agential realist perspectives (Barad 2007; Orlikowski and Scott 2008) where a fundamental divergence has occurred over agential realism's 'ontological

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[22] Thompson and Vincent (2010) have also used Archer's (1995; 2000) morphogenetic model as a route into the incorporation of critical realism into labour process analysis and theory.

inseparability'. Applying a sociomaterial approach to the study of work "*allows us to explicitly signify, through our language, the constitutive entanglement of the social and the material in everyday organizational life*" (Orlikowski 2007: 1438). Indeed, according to Orlikowski (2005:14) "*human knowledgeability is inextricably entangled with materiality*". Furthermore, "*entities (whether humans or technologies) have no inherent properties, but acquire form, attributes, and capabilities through their interpenetration*" (Orlikowski and Scott 2008: 456). This relational ontology that constitutes sociomateriality is deeply linked to this notion of ontological inseparability in agential realist approaches.

Ontological inseparability is aptly captured by the concept of constitutive entanglement, originally drawn from the work of Karen Barad, where she states that "*to be entangled is not simply to be intertwined with one another, as in the joining of separate entities, but to lack an independent, self-contained existence.*" (Barad 2007: ix). Moreover, other authors (Brown 2014) have critiqued CR based on similar ground, pointing to the inseparability of capitalist features such as commodities, money etc. The key sticking point here between a CR and an AR sociomaterial approach, is that the latter "*takes ontological inseparability as a central point of departure*" (Hoof and Boell 2019). This is the point at which CR and AR diverge, although, I see CR's stratified ontology as complimentary to the ontological inseparability of sociomateriality. However, I believe the use of the term inseparability is problematic. Strata are constitutive layers of a whole (real, actual, empirical), both *inseparable* in the sense that strata are imbricated through one another across spacetimematterings as Barad would say *and* existing on different (or stratified) realms that render them capable of being analysed as distinct units of analysis. This distinction is crucial as Leonardi (2013) highlights, adopting a sociomaterial approach upon the foundations of AR collapses stratified ontologies into a flat inseparable entity where everything becomes one big entanglement. Indeed, the material and the social, and for that matter reality and its strata as described by critical realists such as Leonardi (2013), are constitutively entangled through their confluence in spatiotemporality but that does not preclude the analysis of strata as *analytically* distinct entities, it merely heightens the importance of the consideration of spatial and temporal flows in our analyses of reality. This observation is in line with Barad's (2007) contention that 'things' only become 'separate' through the relational establishment of distinction. House (1926:621) touched on the importance of this in his seminal paper on social relations and social interaction where he contended that "*the actual (social) reality is in fact a process of becoming, but the concept of*

becoming, unless broken up into small units connected with types of social interaction, is not serviceable for scientific purposes.".

There are two reasons therefore why this study is grounded in its development of a sociomaterialist critical realism rather than an agential realist foundation: (i) although recognising the fruitfulness and reasons for adopting a sociomaterial approach based on an *ontological inseparability* in typically complex organisational systems where the focus of the researcher is distributed, applying this premise to the analysis of the labour process can inadvertently lead to the depoliticization of the working relations by removing the labour process, and its human implications, as the prioritised site of inquiry; and (ii) when the social and material entities under examination are taken as ontologically inseparable from the outset, the importance of temporality in considering the relations through which those entities become mutually constituted is downgraded or ignored.

> Following from this, we find our second methodological premise: reality is fruitfully understood as a series of entangled strata that are spatiotemporally confluent. It is possible to analyse these stratum as analytically distinct, but their imbrications/articulations/entanglements over spacetime must be acknowledged and the process of imbrication/articulation/entanglement should be an important feature of any analysis.

An important aspect of the meta-theoretical position developed here is its inclusion of a sociomaterialist perspective to broaden its analytic capability. The materialist philosophy has one central tenet: everything that is real is material. Raymond Williams (1983:5), the Marxist who pioneered cultural materialism, defines the materialist philosophy as "*a set of arguments which propose that matter is the primary substance of all living and non-living things*". Bringing a materialist perspective into a critical realist approach can be fruitful for social scientific inquiry, Elder-Vass (2015:1) contends that "*everything that exists and has causal effects is composed of physical particles or composes physical particles*". Furthermore, recent conceptual and methodological innovations have convincingly posited that knowledge is a necessarily material thing (Orlikowski 2005). In his critique of informational capitalism, Mariano Zukerfeld (2017) develops a theory of cognitive materialism which claims that "*knowledge matter*" only exists as an emergent property of physical matter and is therefore a non-physical but material entity. Merging these materialist perspectives with recent scholarship on the sociomateriality of practices (Orlikowski and Scott 2008) which are based on "*the belief*

that many social and organisational phenomena occur within, and are aspects or components of, the field of practices" (Nicolini 2013: 13) provides a foundation from which an analysis of knowledge work as a sociomaterial practice can be built.

The combination of these perspectives shed new light on socio-economic trends such as digitalisation and informatization, whilst 'grounding' emerging popular debates about the increasing 'immateriality' of a newly forming cognitive capitalism, understood as a digital knowledge economy imaginary. The proponents of such 'grand narratives' (Thompson and Briken 2017) mistake the intangible or diminutive with the immaterial and profess crises of measurability which it is said will lead to the downfall of capitalism. A particular strength of this sociomaterialist critical realism is that it provides the methodological scaffolding to analyse the impact of digital ICT's, social structures and human action on capital's ability to commodify knowledge and creativity in distinct ways. Indeed, as Kittler (1995) explained in his discussion of software as a "*necessarily material thing*", "*any transformation of matter from entropy to information…necessarily presupposes a material event*". In fact, it is the material properties of some knowledges that "*confer to them their fundamental economic properties"* (i.e the materiality of bits being electrical signals meaning that they have non-rival replicability at almost zero cost) (Zukerfeld 2017 on Cafassi 1998).

> Following from this, we can identify our third methodological premise: matter constitutes reality, and human knowledge is an emergent property of physical matter generated through sociomaterial practices.

The final key characteristic of this sociomaterialist critical realism is its emergentist nature. Social phenomena or events which arise through the intra-actions of generative mechanisms comprising two or more entities cannot be reduced to the individual properties of those phenomena (Sayer, 2000: 12), or as Elder-Vass (2011) explains "*emergent properties are defined as properties or powers of a whole that are not possessed by its parts*" (p.16). An example of this premise is developed by Elder-Vass (2011) through his analysis of the causal mechanisms of social structures by describing the emergent properties of organisations; a social structure comprised of humans, knowledges, and objects, which has causal powers that are irreducible to its components. This characteristic of emergence foregrounds the materiality, relationality and intra-activity that constitutes the natural and social world, a critical point for sociological inquiry as reality is composed of complex, open systems that are highly contingent based on their context and parts. The thesis adopts the sociomateriality term intra-action to

emphasise this constitutive entanglement of matter and meaning, subject and object, structure and action. Central to the Baradian (2007) term is the notion that agency emerges not from distinct entities (although as I have mentioned it is useful and indeed important to still consider them as *analytically* distinct for scientific observation) interacting but from the emergency properties (consequences, powers, changes etc.) that result from their entanglements. Emergence is deeply entangled with notions of mechanism-based causal powers, for as Mingers and Standing (2017:177) note "*the causal powers or properties of a mechanism result as an emergent property of the mechanism. Emergent properties themselves are seen as consequences of the structure of the entity*". The reflexive nature of social life and of the research process itself requires an engagement with how these emergent properties intra-act through the stratified realms of the empirical, actual and real.

> Following from this, we can identify the fourth and final methodological premise guiding this sociomaterialist critical realism: reality is characterised by emergence, and the natural and social world is relational, processual and always necessarily becoming and ceasing to be. How entities come to be articulated/imbricated/entangled and the emergent causal powers they subsequently exert are critical foci for scientific inquiry.

4.2   Research Strategy

As the previous section indicated, this thesis is mechanism-based (Mingers and Standing 2017) and the goal is to identify, describe and illustrate the primary mechanisms implicated in the production of knowledge, and which shape the labour process, organisation of work, and experiences of workers. The mechanisms (or exigencies) identified in knowledge production are emergent properties of the knowledge production process itself, and it is through their activation or triggering in the production process that they generate forces that shape the world of work. In order to build on the sociomaterialist critical realism outlined above, the thesis is supported by a type of analytical and conceptual scaffolding that links the central premises discussed in the previous section to the analysis of knowledge work (see figure 4 overleaf).
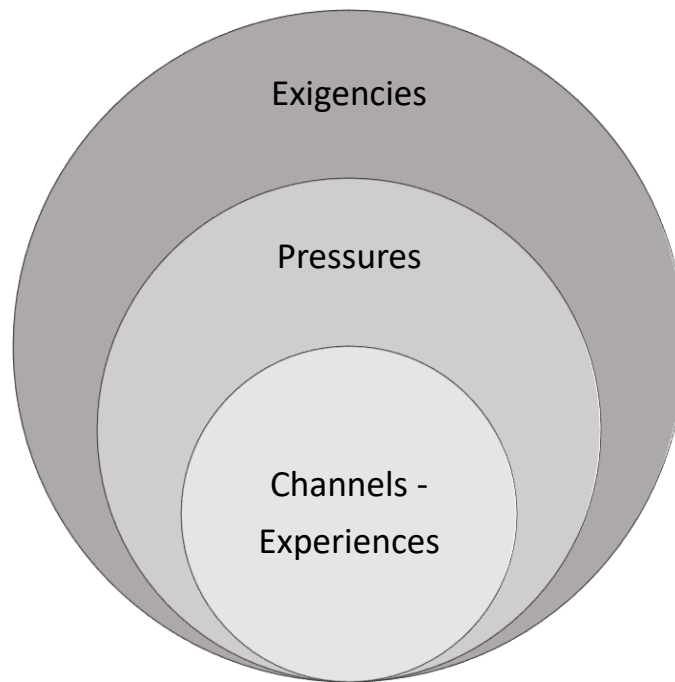
Figure 4: Analytical and conceptual scaffolding.

There are three conceptual tools used to examine this topic: exigencies, pressures and channels of experience, and these allow for the analysis of data through the prism of a sociomaterialist critical realism. I articulate these concepts as intra-aactive yet sequential layers of the world of work. The *exigencies* represent the core causal mechanisms implicated in the commodification of knowledge as a sociomaterial practice, these exigencies once activated then constitute *pressures* on the labour process and organisation of work and these pressures are experienced by workers through a series of *channels* – empirically observable phenomena. Together, these three tools represent the real, actual and empirical domains of a critical realist stratified ontology which labour process theorists have argued offers a powerful framework for connecting the labour process to forces and influences at other levels of analysis (Thompson and Vincent 2010).

The decision to approach the analysis of work through the lens of sociomateriality (Orlikowski and Scott 2008; Zukerfeld 2017) and build its analysis into the connective scaffolding outlined above, is driven by the recognition that the sociology of work (broadly speaking) can be stimulated "*through the marriage of empirical research with methodological, theoretical and conceptual innovation*" (Strangleman 2005: 56). As Thompson and Vincent (2010: 32) state, labour processes can be understood as "*antecedent structures within which various agents [or*

workers] are located, but the various interests and identities 'in play' are also shaped by extra-organisational influences that require broader conceptualisations". This is an important marker for articulating the benefits of the sociomaterial labour process analysis advanced in this thesis. Analysing the knowledge work of software and creative workers as a sociomaterial practice that is partly constituted through what I identify in the following chapter as various attachments of a sociomaterial kind, illustrates how the labour process is an *emergent* structure unfolding in practice, and how the experiences, actions and roles played by workers are also shaped by the sociomateriality of work itself.

Conducting social scientific research through critical realist foundations requires one to acknowledge that reality is multicausal, in other words it is characterised by equifinality. As Goertz (2003:25) noted, "*situations of equifinality by definition mean there are multiple paths to the same outcome. It is thus natural to ask if one path is more common or 'important' than another path*". One way of identifying the sequences and comparative relevancy of different conditions (or paths), is through unravelling the necessary and sufficient conditions for different social phenomena (Goertz and Levy 2007). Necessary conditions are those that must be present in order for an outcome to occur, whereas sufficient conditions are those that are sufficient for that outcome to occur but not necessary, meaning they are contingent factors. Reasoning through the logic of necessary – sufficient conditions (NSC) necessarily imply the use of counterfactuals: for example, if X is necessary for Y to occur then it necessarily implies the counterfactual that without X, Y would not have occurred (Goertz and Levy 2007:15). In the empirical chapters that follow, specifically chapters 7 and 8, the NSC logic is applied to the analysis of two existing concepts in the work-life boundaries literature (boundary blurring) and the subjectivity literature (subject formation/subjectification). I take these concepts, or social phenomena, as "*situations of equifiniality*" and the analyses that follow aim to contribute to our understanding of which paths take causal priority (George and Bennett 2005) in the sequencing of empirical phenomena.

Case-Based Research & The Units of Analysis

> "*Science studies cases. It examines – to use one of the more than ten dictionary definitions of the multi-faceted word 'case' – the instances of a particular situation or set of circumstances…We – the editors of this book – start from the proposition that the*

central project of any science is the elucidation of causes that extend beyond the unique specific instance" (Byrne 2009: 1)

This study implements case-based research methods to delineate and analyse the mechanisms shaping knowledge work for software and creative workers, which represent particular instances or cases of the phenomenon. In *The SAGE Handbook of Case-Based Methods*, Byrne (2009) makes a distinction between conventional 'nomothetic' approaches to scientific research which are premised upon universal governing laws and an 'ideographic' approach of case study research which is premised on the analysis of cases as unique instances shaped by non-determinate mechanisms. This distinction is important for relating this study's methodology to existing research. The conventional approach, whose influences drive quantitative research but are also evident in qualitative research, is concerned with cases as "*sites for observing and measuring variables*" (Byrne 2009:1) and is therefore preoccupied with analysing relationships among existing variables to determine case-based phenomena. This thesis, however, is aimed at questioning the tendencies in research on work to focus on the association of often popular, assumed and at times deterministically applied variables to the study of work-based phenomena. This is evident throughout the empirical chapters that follow, for example in chapter 6 which questions the assumed central role of digital technology in driving the blurring of the boundaries between work and life for knowledge workers by inverting the focus of analysis from the tools of work (i.e technology) to the subject/content of work (i.e knowledge) thus allowing for an analysis of the sequential, intra-acting pressures producing boundary blurring.

The study of work has been given a prioritised position in the history of sociology and as a site of analysis has been key for providing insight into class relations of exploitation, the logic of rationalisation, social change, and racial structures of inequality through the founding work of Marx, Weber, Durkheim and W.E.B DuBois (Halford and Strangleman 2008; Burawoy 2021). As a methodology, case-based research is the cornerstone of the sociology of work and employment and is employed to provide empirically grounded accounts of working practices, relations and experiences, as well as to develop, test and critique concepts, propositions and theories (McGovern 2020). This case-based research study engages in what Swedberg (2016) describes as the essential scholarly work of *theorising*, the process that comes before theory which involves observation, conceptualisation and explanation in identifying phenomena and their causal mechanisms. The key, McGovern (2020:148) stresses, is to "*not only use case studies to explore new developments but also to offer explanatory accounts that set out the*

sequences of causation or causal mechanisms behind these developments". This thesis, based as it is on its sociomaterial critical realism and the application of this to the analysis of case studies of the world of work, takes on this challenge. Central to this approach is the acknowledgement that causal forces are often multiple, contingent, complex (often in more ways than accounted for), combine in significantly varying configurations, and can be ''located' within analyses of sociomaterial practices as empirical phenomena.

Following the historical sociological endeavour of critically analysing the implications of modern work for the individual and collective (Strangleman 2016), this research takes the world of work as the vantage point through which it analyses the wider implications of capitalistic commodification. The project is designed to complement the burgeoning literature on the changing worlds of work in contemporary capitalism by undertaking a comparative analysis of software work and creative work as instances of work and production driven by the application and production of knowledge commodities. Despite the significant porosity between both types of work, for communicative and analytical coherence I refer to software work as the work involved in the conception, design and development of software programmes, and creative work as not exclusive to but highly concentrated in what has been popularly labelled the 'creative industries', 'new media', and 'digital media' industries, and which is involved in the conception, design and development of audio-visual content. In order to ground this study of work within the methodological scaffolding developed thus far, I identify the units of analysis (Frenkel et al. 1999) below as: the commodity form (i.e knowledge), the labour process and production process, and the experiences of workers within these worlds of software and creative work. These units represent a virtuous cycle of the microsociological process of knowledge commodification within the world of work.
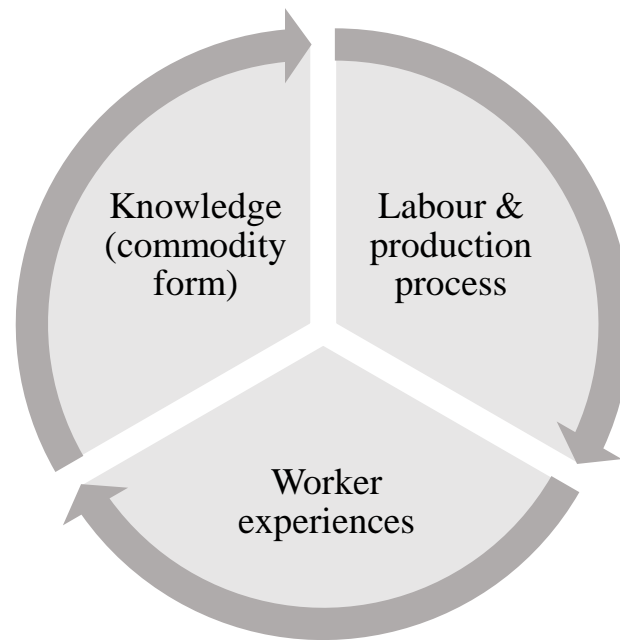
Figure 5: The units of analysis.

Firstly, it is important to provide some clarification on the scope and scale of the subsequent thesis and analysis. The study of work in capitalism can be approached from multiple disciplines and theoretical perspectives, of which the primary one is perhaps labour process analysis or theory, and it is in this field of inquiry that I wish I clarify and position the scope and scale of this thesis within its wider context. Labour process research has overwhelmingly tended to focus on identifying, describing and theorising different regimes of work and production (from periods, industries, sectors, and firms, to regions and even world systems). In doing so, labour process scholars attempt to examine the labour process within its wider structural context with particular emphasis on how the specificities of the labour process interconnects with wider social forces and vice versa. Oftentimes, the conceptual and theoretical outcome of this research seeks to elucidate an account of an over-arching framework, or regime, that shapes and constrains the labour process and experience of work. In other words, the scope and scale of traditional labour process research has been the workplace to sectors, regions, systems etc. This thesis pursues a similar endeavour of elucidating the connections that bind the labour process to the wider political economy and vice versa, however, the scope and scale of this project moves from the commodity form to the labour process, to the organisation of work at the point of production. The focus is more microsociological, examining the practices of the labour process itself as sociomaterial practice

(Barad 2007; Orlikowski and Scott 2008), its implications for the organisation of work and the workers' subject.

Case Selection & Method

The thesis is constructed around two case studies - software work and creative work. The rationales behind selecting these case studies out of the diverse worlds of work are threefold. Firstly, this thesis is an analysis of how the commodification of knowledge as both an input and output in the labour process shapes work and its organisation, these case studies represent the 'core' of digital labour (Thompson and Briken 2017). Software and creative workers are engaged in the core development roles that design and produce both the technical and audiovisual components of digital capitalism. Secondly, as Pitts (2017) effectively pointed out in his astute analysis of the persistence of measurability in creative labour, creative workers occupy a similar position in contemporary society to the manufacturing workers of Marx's analysis. Despite not being quantitatively dominant, the qualitative character of their labour processes, work organisation and objects of labour position them as important sites of workplace anomalies. The same has been noted for software workers (Beirne et al. 1998). Finally, the thesis mounts a critique against the digital knowledge economy imaginaries and seeks to provide alternative analyses of software and creative work that problematise some of the depictions of knowledge work across academic, media and policy discourses.

A point needs to be clarified due to the potentially broad number of occupations that could fit under these case types - I adopt two sets of terms to describe each of the case studies. The term software work or *software workers* is used to refer to the participants of the software case study as a whole, which is comprised of both authority roles (i.e Product Manager) and core development roles (i.e Developers). At other times, the term *coders* is used to collectively refer to only those core development roles within the case and to distinguish these from middle management. Similarly, the term *creative workers* and *creatives* are adopted for the same end, where creative workers refers to all of the case study participants and creatives is sparred for core development workers such as the designer, copywriter and so on.

As for the coders and creatives of the study, these workers directly conceive, design, build and disseminate the software and cultural content that drives the high-technology software sector, the Cultural and Creative Industries and the wider technological and audio-visual components of the wider economy. For creatives specifically, the work conducted by *these* creative

labourers in and beyond the Cultural and Creative Industries is aimed at crafting the interfaces, visuality and content of both the virtual digital environment and the physical world. They provide the 'work of combustion' in the sphere of circulation where commodity goods and services on the market are imbued with cultural value to entice consumption (Pitts 2017). On the other hand, coders are the digital engineers and builders of the virtual world. They write the rules of engagement and shape interaction through transmuting the qualitative intricacies of the tangible world into the intangible circuitry/network of the binary computational environment through machine language. Together, coders and creatives are the engineers, builders, architects, designers, and creators of the digital marketplace, virtual world and digital products and services. In other words, these cases create the virtual infrastructure and communications upon which digital capital operates and circulates.

On a comparative level, software and creative work represent interesting cases of different types of digital knowledge work. Despite both coders and creatives utilising bodies of abstract, theoretical, contextual, and cultural knowledges to tackle problems and provide their solutions in the labour process, they do so in very different ways and under very different circumstances. One useful way of elucidating the distinction between their labour processes is through its semiotic character (Freeman 2008; 2012). Although both cases are united in the semiotic intensity of their labour, coders primarily operate with signs through codified knowledge which affords greater degrees of certainty whereas creatives operate mainly with symbols through cultural knowledge which intensifies uncertainty. Furthermore, the two have quite distinct origins, software work finds its lineage within the fields of mathematics, statistics and later engineering, whereas creative work emerges largely from artistic and cultural fields. Structurally, despite both cases being integral (and increasingly integrated) within rapidly growing digital industries, they have differential labour market experiences. On one end, the knowledges and skills of software workers are highly sought after globally within conditions of a relative undersupply of labour, and this often results in high rewards (pay, conditions, power) in employment and relatively privileged status (Marks and Scholarios 2007; Dorschel 2022). In contrast, creative workers navigate highly competitive labour markets where demand falls short of supply, and they tend to be among the lowest paid of core development workers. The presence of commonalities and differences across the case studies is therefore conducive to delineating the mechanisms that shape these labour processes, whether they are actuated to the same effects or not, and for what reasons do they represent common or diverging patterns.

Ragin and Becker (1992) propose that in clarifying our objects of study, we should ask the simple yet important question '*what is this a case of?*'. In that same collection, Walton (1992:121) encouraged researchers to recognise the implicit claims being made in articulating cases as they "*are not simply glimpses of the world or random instances of social activity…they invest the study of a particular social setting with some sense of generality*". Furthermore, Walton demonstrates how '*what is this a case of?*' can change during the research process itself. In clarification then, this research began as a case study of the pressures and experiences of software and creative work and evolved (through theoretical, conceptual and empirical observation and analysis) to constitute a case of the sociomaterial exigencies of knowledge work and their implications for the contested terrains of control, the work-life boundary and subjectivity.

Method

The case studies were examined through the use of iterative interviewing methods and triangulation with supplemental data from online communities of practice. Interviews were conducted with software workers and creative workers working across the high-technology software sector and the Cultural and Creative Industries in Ireland. The topics, themes and questions guiding the interviews were developed in iteration with the research question frameworks (detailed in chapter 1) in a process of refinement and specification. The flowchart below demonstrates this process. Following the production of the initial empirical puzzles (see Table X) for the first phase of the study, the aim was to cast a wide net in the initial round of data collection to provide an expansive and comprehensive account of work and employment for these workers. The first interview guide (see Interview Guide A in Appendices) was partly structured around the themes of effort, boundaries, employment, control, culture, subjectivity and pressure/pleasures. This guide was used for the initial 10 interviews, and it provided extensive accounts of the conditions and experiences of work. Following this initial round, the interview guide was revised to help focus in on the core themes of the study. This next guide (Interview Guide B) was oriented around the (i) content of work, (ii) work-life boundaries and experiences of work, and (iii) the organisation of work and career and was used in the interviewing of the following 20 participants. Finally, the data that was emerging helped further refine the focus of the study and the movement into the final phase which was based on the

three contested terrain of work and the design of the final guide of questions (Interview Guide C) based on these terrains.
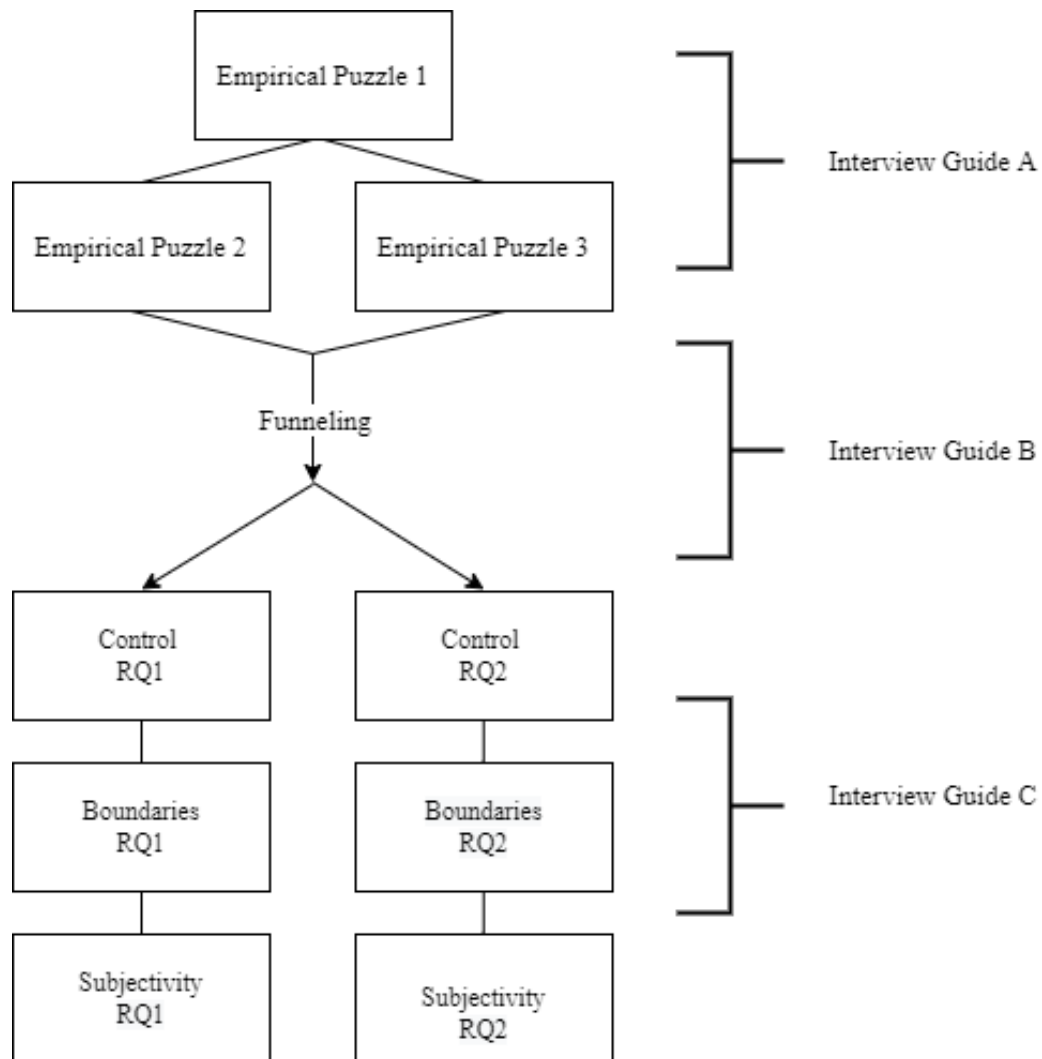
Figure 6: Interview guide flowchart.

Employing qualitative methods helped provide an in-depth contextualised account of working practices 'on the ground' in these cases. The collection of data throughout the project followed an iterative process with the help of key theoretical premises, where the interview guides shifted their focus based on the unfolding conceptualisation of the case studies and the refining of the research questions. The interviews were semi-structured (Bryman and Bell 2018), although the questions were fixed in advance, they served primarily as a guide for the discussion which was left open to allow the participants to elaborate on important events, practices and opinions. In particular, such points of elaboration were sought in relation to how each participant detailed their working practices. Important areas of interest in my questioning,

sometimes to the surprise of interviewees, were the specific material practices they engage in to do their work and the spatial and temporal locations of those situated actions.

Perhaps most importantly, this was a comparative case study analysis of two forms of digital knowledge work. The value in conducting a comparative analysis is in its ability to allow the researcher to observe the commonalities (i.e generated by the exigencies of knowledge) and differences (i.e how the exigencies of knowledge manifest within different cases) present across cases, and to examine the mechanisms shaping these dynamics. Fiss (2009) proposes that cases be understood as configurations of phenomena within specific spatial and temporal contexts and that the process of casing delimits the case in both space and time to produce an analytically distinct *case of* something. The implementation of a case study design in this project is shaped by the sociomaterialist critical realism detailed in the beginning of this chapter, and this provides me with a framework through which I can link this case study research to Fiss' (2009) configurational description. The case study is *of* the digital knowledge work of software and creative workers, which takes through labour processes that are enacted both within and beyond organisational space and time, and which involves distributed sociomaterial practices of knowledge application and production that thread across spatial, temporal and organisational boundaries. These practices, despite being mutually entangled, are therefore united by the prioritising of the labour process as a site of analysis.

4.3   Case Studies

Diverging somewhat from the traditional design of workplace case study research based on/within a specific organisation or organisations, this was a comparative case study of software work and creative work. Therefore, the boundaries of the case were distributed both within and beyond the organisation, and the focus of data collection was on individual workers, their working practices, experiences and organisational contexts. This approach provided the best opportunity to unravel the labour process as an entanglement of sociomaterial practices embedded within organisational contexts of control and commodification. Prioritising workers themselves as the site of analysis also provided additional benefits to the research through their varied experiences and employment histories which often spanned different roles and multiple organisations (SME's, MNC's), at times with different management practices and expectations. The data collected through discussions with these workers therefore provided rich detail on the practices, space and times of work, organisational demands and management

practices across a large number of organisations, and the cumulated experiences of the participants working lives through these practices and across these contexts.

The data collection took place over 23 months from May 2019 to March 2021 through a combination of face-to-face and online interviews. A total of 44 interviews were conducted with 21 software workers and 23 creative workers. A particular strength of the comparative case method is that it provides ample opportunity to increase the variation of the data collected, thus increasing the potential for generalisability and the possibility of identifying both common and diverging patterns. To take full advantage of this, a comparative data collection framework was designed in discussion with the research supervisors. The data collection framework (see table 9 overleaf) was designed to plan for an ideal distribution of variation based on case, gender, seniority and company size across the sample. One of the primary aims of the data collection was to achieve a balanced gender sample, however, this proved more difficult than initially anticipated. Despite contacting more female software and creative workers, the total number that agreed to take part in the study was 17 compared to 27 of their male counterparts. Furthermore, in light of the important recent research that seeks to bring race into analyses of creative work (Hesmondhalgh and Saha 2013; Saha 2018), it is important to note that those who agreed to participate are all ethnically white apart from one of the females in the software sample who is Indian but living and working in Dublin. The other two variables were chosen to help provide important context to the participants working conditions and experiences. Interviewing workers distributed across different levels of seniority from juniors, to midweight and seniors provided different perspectives into the nature of work in the cases. In particular, some senior roles were more active in the planning, coordination and evaluative processes of projects than their junior colleagues, and this helped give a rounded account of the operation of control in the production process. Finally, interviewing workers employed across a range of companies was essential to give to the study a wide range of information on varying organisational structures and practices. The differences across large multinationals with deeply structured processes, small scale start-ups organised around a single desk space, and small-medium sized digital agencies opened windows into different workplaces and worlds of work. Company size is divided in the comparative interview table (below) based on whether the participants worked in a small (under 50), medium (50-250) or large (over 250) company.

	Software (n21)			Creative (n23)			
Male (n27)	W31 W42		W02 W21	W39 W41			**Junior** (n6)
	W17	W19 W27	W20 W34	W14 W16 W26	W04 W09 W23	W33	**Midweight** (n12)
	W11	W30	W18 W35	W08	W05 W13 W22	W06	**Senior** (n9)
Female (n17)	W25	W29	W32 W38	W01	W12		**Junior** (n6)
		W28	W37	W15 W24 W44	W03 W40 W43		**Midweight** (n8)
	W07	W36				W10	**Senior** (n3)
	Small (n6)	**Med** (n6)	**Large** (n9)	**Small** (n10)	**Med** (n10)	**Large** (n3)	

Table 9: Data collection framework.

As the sampling process continued, the framework served as a guide in the search and recruitment process for new participants. There were three main strategies used to find, search, contact and recruit participants for the study: (i) professional online networks, (ii) snowball sampling and (iii) online networked communities of practice. At first, a combination of snowball sampling and the use of professional online networks such as LinkedIn and CreativeIreland were used to find and contact the studies first participants. As a past graduate of a communications and media degree, I had access to a network of both experienced and junior practitioners employed throughout the creative sectors in Ireland and this provided the initial 'foot in the door' for the case of creative workers and subsequently led to further interviews. At the same time, I made use of professional social networking sites such as LinkedIn and CreativeIreland to search for and contact potential participants. LinkedIn in particular proved invaluable to this end because the professional focus of the site provided a huge network of employees which were searchable through occupational title and sector. With the aim of distributing the sample across the key variables within the data collection framework, LinkedIn helped by providing information on levels of seniority (through job titles and years of experience) and company size. Furthermore, the social networking site also provided a means to contact potential participants and almost half of the sample were recruited through the site.

Finally, as the data collection progressed in to 2020, I was introduced by some of the interviewees from both cases to two online communities of practice housed on the Slack communications platform. After contacting the group administrators, I became a member of Ireland Designs (1,223 members) and Irish Tech Community (5,960 members) and put out a call for people interested in taking part in the research[23]. Over the next months, I held informal conversations with each community, and I was contacted by a number of practitioners interested in discussing their work over an interview. Outside of the formal recruitment of interviewees, interaction in these communities provided excellent insight into the current conditions, experiences, opinions and practices of these software and creative workers. Both communities were the largest of their sort in Ireland and were highly organised with member elected community administrators and engagement policies to regulate member interactions and the publication of content. Each of the communities were comprised of separate themed 'channels' (individual chat threads) that were to help cultivate and funnel the communities' interactions. With themed channels from 'general_tech_chat', to 'jobs' and 'how_we_work', the online networked spaces were hotbeds of occupational culture, knowledge sharing and social interaction for Irish workers in these sectors. Conversations flowed from sharing cat memes, to joking about popular media cult classics such as *Office Space*[24], to the benefits and pitfalls of new software packages and coding languages, to discussing project management practices, to sharing job opportunities. At any given time throughout the day, each community had 100s of members actively online and engaging both from within their workplace, and throughout and beyond their working hours. This posed interesting questions about how to consider the 'working day' of software and creative workers, and the integral role played by these communities (mediated as they were through a digital platform) in the practice of the work itself furthered my interest in the social and material attachments of their labour processes.

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[23] I was also in contact with an administrator (who was is also one of the interviewees in the study) of another Slack community – 'Women in Tech'. Women in Tech was the largest community of its kind in Ireland and served much the same purpose of ITC Slack, although membership was exclusive to women. It served as a safe space where women working in the technology sector or in technology jobs could interact, share information and advice. One of the studies initial interviewees (W07 Ciara) mentioned the community and then another interviewee later mentioned that she was one of the groups original founders (W25 Mary). Mary offered to reach out to the community to help my search for women software workers, however, this did not result in any participants.

[24] Office Space was a satirical comedy film released in 1999 that was based on a software company in America called 'Initech Corporation'. The movie has achieved a cult status throughout the software community for its satirical depiction of the 'typical' software company in the 90s. One participant in fact recommended that I watch the film and gain a software workers perspective of the workplace. Interestingly, the main points in the film depicted bureaucratically laden organisations and workers ailed with mountains of paperwork, broken technology and overbearing managers.

Ultimately, the aim was to provide a comprehensive analysis of what software and creative workers actually do, how they do it, what is required for them to do it, and what mechanisms shape how they do it. In doing this, the project drew on data from a heterogenous group of software and creative workers that differs from the majority of previously related studies that tend to focus on special cases of employment within the New Economy such as freelancers, the self-employed (Taylor 2015) or mobile workers (Gray et al. 2020). The decision to base the empirics within the everyday normality of working practices, as opposed to more fringe arrangements, in the software and creative sector in Ireland has the advantage of revealing the experiences of knowledge workers both beyond but still grounded within an organisational context. The majority of case study participants of therefore employed within organisations, with only three of those in the creative work case working as freelancers.

Originally, I had designed the study around two ethnographic workplace case studies in both the software sector and creative sector. The strategy was to gain access to two companies for a period of ideally 3 months where I would engage in non-participants observations (observing and speaking with employees, attending meetings, analysing company documents). The company ethnographies were to provide the foundation for the study and the initial pool of interviews, from which further participants could be found. However, gaining access for a period of ethnographic observation proved exceptionally hard despite my best efforts. After the first months of contacting companies (through their directors and management) with no success, I began conducting interviews with workers to begin the data collection process. Eventually, I had some success and in October 2020 with one of the larger Irish animation studios. Initial contacts were made following a helpful email introduction by an old friend who was working as a producer for the studio at the time. Negotiating access with line management and then the Head of Operations took from 14th October to the 30th January. At that point, the Head of Operations had notified me that "*due to the nature of our business to have limited bandwidth (i.e employees)*" the studio could only offer me a reduced level of access (3 days and 5 staff interviews). Unfortunately, the following weeks seen the spread of the Covid-19 virus globally and a global pandemic declared. The interview sample was therefore aptly suited to maintaining this sampling of organisational processes.

Overall, the sampling strategy provided rich variation across and within cases. The composition of the case studies had implications for the data and findings of the research in a number of ways. Most importantly, the inclusion of organisationally employed workers provided the basis for the analysis of work organisation and management strategies, and the inclusion of

demographic and status variations allowed for the analysis of findings with comparison across gender, age, seniority and company size.

Software Workers

The software case study comprised of 21 participants (table 10), which included a mixture of managerial roles and core development roles. In total, the software sample consisted of 17 software developers (or 'Engineers'), 2 Product Managers, 1 Head of Development and 1 Software Test Analyst.

Pseudonym	Title	Seniority	Organisation
W07 Ciara	Head of Development	Senior	SaaS Food-tech Start-up (B2C)
W25 Mary	Senior Software Engineer	Senior	SaaS Company (B2B)
W28 Amelia	Software Engineer	Midweight	SaaS Company (B2B)
W29 Ieva	Software Engineer	Junior	SaaS Company (B2B)
W32 Kiera	Software Test Analyst	Junior	Bank
W36 Rachel	Software Developer	Senior	SaaS Company (B2B)
W37 Julia	Software Engineer	Mid	SaaS Company (B2B)
W38 Rachna	Software Engineer	Low	IT MNC (B2B & B2C)
W02 Alex	Software Developer	Junior	SaaS Company (B2B)
W11 Colm	Programmer & Systems Architect	Senior	SaaS Company (B2B)
W17 Simon	Software Engineer	Midweight	SaaS Company (B2B)
W18 Seb	Product Manager	Senior	SaaS Company (B2B)
W19 Chris	Software Developer	Midweight	SaaS Company (B2B)
W20 Michael	Software Engineer	Midweight	Insurance Company (B2B & B2C)
W21 Kumal	Software Developer	Junior	SaaS Company (B2B)
W27 Ian	Software Developer	Midweight	SaaS Company (B2B)
W30 Brian	Software Engineer	Senior	SaaS Company (B2B)
W31 Liam	Software Developer	Junior	SaaS Company

			(B2B)
W34 Gerard	Software Engineer	Midweight	SaaS Company (B2B)
W35 Noel	Product Manager	Senior	SaaS Company (B2B)
W42 Adam	Software Developer	Junior	SaaS Company (B2B)

Table 10: Software workers.

As digitally mediated knowledge workers, the participants used and were managed by a suite of digital tools (table 11). These tools were both integral to the practice of labour and for the organisation of the workflow within the organisations where the participants worked.

Software Tools (*Digital)	
Practice Tools	**Management Tools**
StackOverflow (knowledge sharing platform)	Jira (workflow management system)
Git (open-source version control software)	Asana (workflow management system)
GitHub (proprietary version c. software)	Confluence (workflow management system)
GitLab (proprietary version c. software)	Azure (workflow management system)
BitBucket (proprietary version c. software)	HubStaff (workflow management system)
React (JavaScript library)	
jQuery (JavaScript library)	
W3 Schools (free to access coding library)	
Angular (application development platform)	
Slack (communications and CoP)	
Reddit (communications and CoP)	
Notepad++ (text editors)	
VisualStudio (text editors)	

Table 11: Workflow management systems used in software work.

Creative Workers

The creative case study consisted of 23 participants (see table 12 overleaf), also including a mixture of 'leadership' roles and core development roles. In total, the creative sample included 8 Digital Designers, 3 Product Designers, 3 Head of Creatives, 2 User Interface/Experience Designers, 2 Designers, 2 Digital Content Producers, 1 Web Designer, 1 Game Writer and Designer and 1 Copywriter and Content Lead.

Pseudonym	Title	Seniority	Organisation
W01 Sarah	Digital Content Producer and Social Media Lead	Junior	Digital Marketing Start-up
W03 Saoirse	Copywriter & Content Lead	Midweight	Digital Agency (B2B)
W10 Nancy	Head of Creative	Senior	Advertising Agency (B2B)
W12 Louise	Digital Designer	Junior	Digital Agency (B2B)
W15 Harriet	Digital Designer	Midweight	Digital Agency (B2B)
W24 Eleanor	Game Writer & Designer	Midweight	Game Studio
W40 Ruth	Designer	Midweight	Digital Agency (B2B)
W43 Jenny	Digital Designer	Midweight	SaaS Company (B2B)
W44 Talia	Digital Designer	Midweight	Digital Agency (B2B)
W04 Rory	Digital Content Producer	Midweight	SaaS Company (B2B)
W05 Callum	Head of Creative	Senior	SaaS Company (B2B)
W06 Martin	UI/UX Designer	Senior	Digital Agency (B2B)
W08 John	Designer	Senior	Digital Agency (B2B)
W09 Luis	UI Designer	Midweight	SaaS Company (B2B)
W13 Dean	Head of Creative	Senior	Digital Agency (B2B)
W14 Sean	Web Designer	Freelance	Freelance
W16 Ronan	Digital Designer	Freelance	Freelance
W22 Glenn	Product Designer	Senior	SaaS Company (B2B)
W23 David	Product Designer	Midweight	SaaS Company (B2B)
W26 Darragh	Digital Designer	Senior/Mid/Owner	Digital Agency (B2B)
W33 James	Product Designer	Midweight	SaaS Company (B2B)
W39 Darren	Digital Designer	Junior	IoT Product Company (B2B)
W41 Matt	Digital Designer	Junior	FoodTech Company

Table 12: Creative workers.

Similar to their software counterparts, these digital creative workers relied on a suite of digital tools in the practice of their labour (table 13). Furthermore, workflow management systems were also a common managerial feature for the participants.

Creative Tools (*Digital)	
Practice Tools	**Management Tools**
Slack (communications and CoP)	Trello (workflow management system)
Bootstrap (open-source web development platform)	Asana (workflow management system)
Adobe Photoshop (digital design tool)	Monday (workflow management system)
Adobe Illustrator (digital design tool)	ClickUp (workflow management system)
Adobe InDesign (digital design tool)	HR Duo (workflow management system)
Adobe After Effects (digital design tool)	Teamwork (workflow management system)
Sketch (digital design tool)	
Palleton (digital design tool)	
InVision Studio (digital design tool)	
Figma (digital design tool)	
Slack (communications and CoP)	
CreativeIreland (communications and CoP)	
Dribble (CoP and portfolio)	
Behance (CoP and portfolio)	

Table 13: Workflow management systems used in creative work.

4.4   Data Analysis

"Not everything that can be counted counts, and not everything that counts can be counted"

(Cameron 1963:13)

Conducting case study research on the world of work provided rich empirical data on the conditions and experiences of the workplace, the labour process, and the sociomaterial practices that constitute them. These qualitative observations and data are what counts when it comes to unravelling the practices, experiences and relations that shape the workplace. The interviews were all audio recorded apart from one participant (W12 Louise) who had requested that our discussion was not audio recorded. In this case, detailed notes were taken throughout, and these notes were subsequently used provide further support to the findings emerging from the rest of sample. The remaining 43 interviews were transcribed verbatim and analysed through a combination of digital and manual methods. The aim was to put this data to work in the explanation of the events taking place, and the mechanisms implicated in their actuation. I applied a form of qualitative thematic analysis (QTA) (Silver and Lewins 2014) which

combined elements of the Gioia methodology (2012) to the case study data that followed three steps:

Step 1: Get familiar with the data and begin coding at the descriptive level, valuing informant-centric terms and their elucidation of theoretical concerns.

Step 2: Locate patterns and themes in the data and move from descriptive level coding through to categorical level coding and thematic level coding.

Step 3: Review and revise thematic (and if necessary categorical) level codes in line with the research questions and in iteration with the literature.

To begin with, the transcripts were printed and carefully analysed to provide insight into the overall frame or context of the interviews and the workers' experiences. During this phase I was looking for both the overall picture that each discussion illustrated while annotating the transcripts for key quotes and points of analytical insight which I could return to at a later stage. This period of manual transcript analysis provided the initial 'picture' and helped identify informant-centric terms. Following this, I began coding the transcripts within their case studies through the use of the MAXQDA qualitative data analysis software package, a popular CAQDAS (Computer Assisted Qualitative Data Analysis Software) tool (Kuckartz and Rädiker 2019). It is fitting (and quite telling) that as a knowledge worker I am using a digital knowledge commodity to study the knowledge work of the professions which would have designed and developed the commodity itself. It represents just one example of the many ways through which knowledge commodification and knowledge work are deeply entangled through sociomaterial and relational practices. The coding method utilised for the analysis of the interview data through MAXQDA continued with the three steps of the QTA and introduced a tiered coding system to take advantage of the functionalities of MAXQDA:

Descriptive Level: At the first (or lowest) level lies the descriptive examples of particular concepts as they are described in the data (i.e mental load/cognitive residue). (Orange Code)

Categorical Level: The second level groups these descriptive codes/samples into categories (i.e interactional attachments) containing the different aspects of the phenomenon under observation. (Green Code)

Thematic Level: The third level groups corresponding/related/associated categories into broader themes (i.e cognitive residue as a form of interactional attachment into the theme of sociomaterial attachments). (Blue Code)

Meta-Conceptual/Theoretical Level: The fourth (or highest) level coding tier combines and links the lower level codes into higher order (meta)concepts and/or themes (i.e sociomaterial exigencies) . (Purple Code)

This method of analysis moved through different levels of abstraction and in iteration with emerging findings and conceptual insights from both the analysis of the data and the literature. The coding framework was implemented to both generate new informant centric concepts and to effectively link the workers' experiences to existing conceptual categories and themes from the literature (e.g., of control, boundary blurring, subject formation). In applying this tiered form of QTA, the coded terms, categories and themes were able to be assembled into what Gioia et al. (2012) call a 'data structure', a relational representation of the data that flows from raw text through to terms, categories, and themes. The period of analysis that immediately proceeded this was perhaps the most important in formulating these conceptual relationships, at this point all of the interview transcripts had been analysed, coded and recoded, and the key categories and themes left were those that achieved theoretical and conceptual saturation (Glasser and Strauss 1967). Analysing the data through these methods also complimented the stratified scaffolding (fig. 4, page 97) and units of analysis (fig.5, page 101) that represent the analytical framework. For illustrative purposes, figure 7 on the next page demonstrates the use of the framework in the coding of one of the thesis' core concepts – sociomaterial exigencies.

| **Theoretical** Level | **Thematic** Level | **Categorical** Level | **Descriptive** Level |

Sociomaterial Exigencies

Sociomaterial Attachments
- Interactional Attachments
  - Cognitve residue
  - Everyday ubiquity
- Relational Attachments
  - Com. of Practice
  - Emergent knw domains

Digitalization
- Digital Saturation
  - T-S restructuring
  - Habitual connectivity
  - Real & Perceived Press.
- Acceleration
  - Ren & Red of Expertise
- Quantification
  - WMS
  - Datafication

Figure: Example of two exigencies from the thematic analysis of data for chapter 5.

Figure 7: Tiered coding framework.

In engaging in the practice of theorising (Swedberg 2016) through case-based research, the aim was to observe, list and categorise the working practices, experiences and organisation of work for software and creative workers in order to conceptualise how they intra-act, their sequences, and to identify the mechanisms shaping these dynamics. The aim of articulating an analysis that contributes to the existing literature on the sociology of knowledge work and the contested terrains of control, boundaries and subjectivity was premised on the realisation that the literature constitutes what Maxwell (2013:35) described *"as a useful but fallible source of ideas about what's going on"*, and one in perpetual need of alternative analyses, renewal and constructive critique. It is through the development of these conceptual and theoretical toolkits that I hope to go some way in contributing to this collaborative, scientific endeavour.

A note on the analyses and structures of the empirical chapters

The primary aim of this comparative case study was to delineate both the common and diverging patterns across both of the chosen case studies. The two cases represented typical

types of digital knowledge work in contemporary society, and they therefore presented a range of similarities across cases, while also exhibiting within-case variations. These similarities and variations were crucial in the data analysis process, and they provided insight into the primary exigencies shaping both software and creative work (or digital knowledge work more widely), while demonstrating how those exigencies shape, in both common and diverging patterns, the conditions and experiences of the workers. In order to present these clearly, the following empirical chapters move from within-case analyses to cross-case analyses (Cresswell and Poth 2018). Overall, the empirical work from chapters 5-8 and the core arguments made throughout demonstrate that software and creative work, despite their distinctions, are shaped by similar mechanisms (exigencies) that unfold in similar ways across these different contexts. Chapters 5, 7 and 8 examine the sociomaterial exigencies of knowledge work, the contested terrains of work-life boundaries and subjectivity, and their findings are presented as common patterns across cases. However, in chapter 6 the contested terrain of control takes a dominant form across both cases, although the conditions and experiences emerging from this differ for software workers and creative workers and this chapter therefore includes a dedicated cross-case comparative section.

Chapter 5: The Sociomaterial Exigencies of Knowledge Work

5.1   Introduction

This thesis, and in particular this chapter, is an attempt to provide a renewed analysis of the 'connective tissues' that binds the labour process to the wider political economy, an essential task if we are to avoid "*the tendency to lose sight of phases of valorisation or capital accumulation as a key motor of the transformation of work relations*" (Thompson and Vincent 2010: 56). By taking the process of capitalistic marketisation and the engine of commodification as a systemic driver of change in capitalism and the labour process (Elson 1979; Huws 2006b; Harvey 2017), this chapter begins the work of articulating the connective *sociomaterial* tissue that links the commodification of knowledge in software and creative work to the organisation of work and the labour process. In doing so, I claim that sociomaterial exigencies are another systemic feature of the labour process that based on the emergent phenomena of sociomaterial intra-action and which constitutes a significantly forceful, albeit obscure source of mechanisms shaping the world of work. In order to undertake this task, the digital knowledge work of software and creative workers is analysed as a sociomaterial practice (Orlikowski 2005b; Orlikowski and Scott 2008; Zukerfeld 2017) that is characterised by the process of emergence, meaning things emerge from this practice that are constitutive of it but irreducible to it. In particular, the chapter focuses on four (displayed in the table overleaf) of these emergent properties, or *sociomaterial exigencies* as I call them.

Dimensions	Practices
Indeterminacy	*Sociomaterial Attachments*
Indeterminacy is the default state of human knowledge which is inherently characterised by fallibility, uncertainty and ambiguity.	Sociomaterial attachments emerge through the practices of the knowledge labour process in the conception, development, application, maintenance and exchange of knowledges.
Exclusivity	*Objectification (through digitalization)*
Exclusivity emerges from the relations that mediate the production of knowledge. All knowledge domains vary depending on people's access, understanding, recognition and legitimation (or lack thereof).	Knowledges reside in technological bearers through the practice of objectification. In the digitally mediated labour of software and creative workers, knowledges are primarily objectified through the process of digitalization.

Table 14: Four sociomaterial exigencies in the commodification of knowledge manifesting as dimensions and through practices.

Initially identified in the literature as the core *dimensions of* and *practices through which* the knowledge work of software and creative workers takes place, indeterminacy and exclusivity exist as core dimensions of the knowledge production process and sociomaterial attachments and digitalization relate to the practices of knowledge production. These sociomaterial exigencies are important mechanisms and they have implications for the worlds of knowledge work. Taking these emergent exigencies seriously helps centre the embodiment and embeddedness of 'mental' labour, remedy the drift towards notions of work becoming 'immaterial' (Hardt and Negri 2000; Lazzarato 1996) or 'weightless' (Lash and Urry 1994; Coyle 1999), and continues the LPT concern with the material experiences of work in capitalism. How do these exigencies unfold in software and creative work and what are the implications? The following four sections of this chapter demonstrate how they shape the organisation and experiences of work.

5.2   Indeterminacy of Knowledge in Software and Creative Work

Pre-existing knowledge of the workings of nature, society and the complex intricacies of reality are always mind-independent, fallible and irreducible to our knowledge of it (Bhasker 1975; Fletcher 2017). The production of knowledge in the capitalist production process is no

different. Although some forms of knowledge are comparatively 'solid' or durable through space-time, all knowledges are ultimately tentative and fallible in their existence and the emergent properties or outcomes of knowledges (e.g., value, usefulness, consequences etc.) are indeterminate. The sociomaterial exigency of indeterminacy then can be seen as a sort of default state in the production of knowledge, albeit emergent and contested in practice. Much the same as the indeterminacy of labour in the production process (Thompson 2010), knowledge enacted in the labour process and the knowledge commodities produced exhibit their own indeterminacies. This section details three channels within which these indeterminacies surface in software and creative work and ultimately shape and constrain the labour process and organisation of work within these sectors.

The Uncertainty of Value: Commodities and Labour

The uncertainty of value that characterises the digital knowledge work of coders and creatives surfaces through both the commodities being produced and the knowledge-intensive labour power being exchanged in the labour process. The creative labour process in the digital agency business model is premised on the social validation of users/consumers to establish the value of the goods and services being provided (Pitts 2016). This opens the labour process and organisation of work to the ebbs and flows arising from the indeterminacy of knowledge as the behaviours and interactions of individuals (users/consumers) do not lend themselves to accurate predictions and the inevitable deviations in 'engagement' shape and intensify the labour process concurrently. This often occurs through the quantification of 'performance' made possible by the digitization[25] of the creative workers labour, in both its inputs and outputs:

> *Researcher: You just said that there's a huge emphasis on whether the actual individual posts 'perform', that's quite interesting because is it not out of your control whether other internet users out there react to this?*
>
> *"Exactly, exactly! And sorry this just relates to this and the spreadsheets [management require her to monitor content 'performance' and record through spreadsheets]. **Every week I have to fill in a performance for each of these [social media] pages** as in how many followers it got that week, how many posts were posted that week, how many*

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[25] Following Brennen and Kreiss (2016) and Zukerfeld (2017), digitization is used here to denote the process through which physical exertion and action in the analogue world is translated into digital information through the digital mediation of action.

*LinkedIn followers, how many Instagram followers, YouTube views, like all of this needs to be filled in once a week so that's why as well, things are always on my mind, I'm like if the page isn't growing it's because of the content, it's not good enough or you know all this kind of stuff, it does weigh heavily on my mind…he [her manager] has created the spreadsheets and everything would be based around that so we would have a weekly meeting where he would **look over the stats of everything** and that would be what he would expect from me…for the pages to be growing each week etc, and if they weren't, if there was like only a few followers or if there was less followers in the week he would be like **"that is your fault" because the content wasn't good enough** or we need to be changing this, changing that blah blah blah." (Sarah, Digital Content Producer and Social Media Lead)*

Coders experience the indeterminacy of the value of their commodities in different ways than creatives. For example, computer programming is premised on the development of programmes through coding languages from front end C++, HTML to back-end JavaScript, Python to binary code and so on. There is a greater degree of certainty within the development and fixing of software as the programme can only operate based on the coded inputs, if there is a bug with the software then there is a definite and specific error with the code as it stands and the process of fixing that then becomes a routine search for the error, however complex that search might be. The impossibility of predicting future user interactions with the software means that 'troubleshooting' is a mainstay of software development work:

*"That [errors impacting the labour process] happens all of the time, **it's just the nature of it. There will always be bugs**. Someone will notice, obviously we will try to notice before but then someone will click a certain route and then **something unexpected will happen**. **The code is just doing what the code is supposed to be doing but no one ever accounted for that scenario**." (Alex, Software Developer)*

In contrast, indeterminacy appears as much more elusive in creative work. If a particular project is not producing the desired effect (such as generating online engagement, sales, subscriptions etc.) then the search for the source of that failure becomes a much more ambiguous and contested process whereby the burden of responsibility gets pushed onto specific individuals, occupations or departments:

"Yes [there are more pressures on creatives in businesses], 100%...if sales are down, they are coming to creative! Yes, like if sales are down, whether it's...you might have

designed a campaign maybe two weeks ago and your expecting it to last for a month,
if sales aren't great within those first two weeks [gestures with a clap of his hands]
your designing a new campaign you know. *There are people within the company that*
*work alongside you that are under a lot of pressure as well and **this is the first thing***
***that they'll go to.** Personally, I think it's just timing [whether a project 'succeeds']...I*
*think **it's all about timing.** People always want the latest visual, the most eye-catching*
visuals to make some sort of interaction happen and some sales. Definitely, if I'm being
brutally honest, I don't think a company that's surrounded in a business style or a
corporate model is the best for a creative to evolve in. Which is why I've tried to create
our own creative team within a company, do you know what I mean? Not just have a
graphic designer and a video editor and then that's it, you know then your kind of at
the company's disposal." (Callum, Head of Creative)

The software industry (and subsequently the creative industries) have been developing
techniques to manage the indeterminacy of software and creative content production with
admittedly limited success. One such technique which is now widely used in the technology
industry has been profiling (now called 'personas') where teams construct fictional profiles of
people to generate assumptions about how their software will be used or their content engaged.

"I remember, when I first started at Microsoft, they brought in this concept of-- It wasn't
as detailed as personas which we have now for user experience but there were just these
profiles of generic people that were not real people. Here's the mom, how is she going
to use Windows? Here's the teacher, how are they-- You would talk about these things.
The problem was none of these people were real. They were all just these made-- What
*if the mom-- Oh, she's got a laptop on her kitchen counter. **These weren't real people***
***so they weren't good assumptions of how people were going to use the software.** You*
have to go out and actually talk to them." (Mary, Senior Software Engineer)

Contemporary best practice in this technique seeks to develop comprehensive 'personas' and
consumer/user sentiments through the use of user data. The assumptions that arise from the
interpretation of these personas are then used to supposedly 'more accurately predict' how a
particular application will be used and its degrees of success or potential failure.

The ambiguity, uncertainty and subsequent pressures on the production process that arise from
the indeterminacy of knowledge commodities is in part a driver of new occupational formation.
Recently minted and rapidly emerging occupations such as User Experience and User Interface

Designers and Researchers have emerged as the new kids on the block across the high-tech and creative industries where there is an increasing (albeit still largely unappreciated by most firms slow to 'digitally transform') recognition that the inherent uncertainty involved in anticipating and predicting user/consumer behaviours and sentiments needs to be managed in order to secure and maximise user attention and commitment and thus profitability. Moreover, the construction of the role of Product Manager and Product Designer in primarily larger software firms validates the recognition by organisations that the indeterminacy of knowledge production is a sociomaterial exigency that requires careful management to meet the value producing demands of businesses.

Furthermore, the condition of value uncertainty extends beyond the indeterminacy that accompanies the knowledge commodities that are produced by software and creative workers to include the value of digital knowledge work itself. Saoirse, a Copywriter and Content Lead with experience working within digital agencies and now freelancing, describes this tension where fluctuating market demands can leave business models (and their commodity packages) obsolete and the workers whose expertise catered to them less valuable on the labour market:

> *"I suppose the risks are how the market is going really depends on how businesses are embracing things like digital or how they're managing budgets and things like that, as in one place that I was working, its actually closed down now, they weren't profitable, at the end of it they were profiting for years and years and years and **then the market was kind of declining** a bit. **Your job isn't as secure and you kind of have to be a bit more adaptable**. That's a risk, just **making sure that your upskilling especially with digital, that your kind of staying on the cusp of a trend**, not following trends but like your involved and you **know what the demands of digital are and where the work is**." (Saoirse, Copywriter and Content Lead)*

Similarly, this uncertainty and ambiguity surrounding the value of labour can lead to scepticism and a general lack of understanding and appreciation for the expertise workers bring to organisations:

> *"**As a UX designer, you have to stand by what your doing because business usually isn't sold by it**. Every business thinks they need UX, which I'd say they do. They're only filling that role because, Tom down the road has a UX designer. That sort of thing. They don't really-- They'll bring you in but then **they don't really buy into what UX does**, I've noticed quite a bit. You'd have to be on top of your presentation skills and*

your research. You need to be able to come up with scientific proof, really, of why you think we should adjust a feature." (Martin, UI/UX Designer)

Martin's experience of this across organisations that he has worked in is largely one of scepticism where management and colleagues are both uncertain and sceptical of the worth of his expertise. Rory (Digital Content Producer for a software performance analytics company), on the other hand, describes the impact this had on his experience working for his organisation. The uncertainty, and the 'battles' that followed arose primarily from a lack of understanding of the process and extent of labour involved in his work:

*"There's been a few battles [between creative and the business], and a few wars over the years. **At the end of the day it's because they don't buy into it. Then when they see the stuff your creating and they see the work that goes into it** and it's not just one video, there's so much elements to it, so much drafts. There's the storyboard, there's the shoot, there's the edit, there's all these things combined, and that's just for one thing. Then when they can see it in-house, and they're seeing what you can make, and they can come to you with other ideas and get stuff so quickly. Then they were like, "Okay, we get it now". After a year, they were like, "Okay. We want you to be permanent. We get it.". **They were like, "We didn't believe in this at the start and we do now."** That was the first point of that." (Rory, Digital Content Producer)*

The lack of understanding driving the uncertainty Rory's firm had for the value of his work, he believes, stems primarily from the emergent nature and prominence of the area where his knowledge and skills lie. Digital content, and the digital industry more widely was less prevalent (particularly in Ireland), although rapidly growing, when Rory began working:

"You have got to remember that was 2014, I think. That was the time where the digital industry isn't what it is now. It's now even stronger. Apart from being a software developer, I'd say creative is one of the most important jobs you can have in Ireland at the minute because digital content is proving so prevalent. When I started, we weren't at that point yet, it was only just starting to take off. That was the first year and then after that it's getting them to understand how much things cost, and then the next battle was with budgets and just getting them to understand that what might seem expensive to them is so cheap. That's still an ongoing battle. It's getting them to understand how much things cost." (Rory, Digital Content Producer)

Furthermore, the effort and negotiation that was involved in proving the worth of Rory's expertise to the firm had to be repeated as the company grew in size and new colleagues and management joined:

> "In more recent times with the new management [his company is a high-growth firm] coming in, it went from a case where your in a company for four and a half years, you got a new management team coming in that have just started, and they're coming from a business sales background. Our company is unique not just in the product that we sell but also there's not really another example of what we do. You **got these new guys coming in and they might see how you operate and it's like, "Why are we paying him to sit down and look at videos all day or whatever?". You have to win them all over again**." (Rory, Digital Content Producer)

Finally, once the struggles over removing ambiguity and establishing and asserting the value of his knowledge and skills had momentarily passed, the ongoing negotiations over what constitutes value and quality in digital content began:

> "It got to the stage now where they've acknowledged how much the project costs, so then **the battle is now just getting them to understand that not every video is the same**, sorry. **It evolves, it changes** because for now, for example, one week I might have nine different video assets to produce and hand it up and I put that in a report and the management can see what you produced whereas the following week you might have one video to produce, and they [management] will be like, "Really?". **They don't understand the creative thing that your doing. They might not realize that the work in the one [asset] is so much more, there's so much more that goes into it**. Now your trying to nearly just get them to understand how the different projects are that you have, and what they're for, and how long it takes, it's ongoing. Sometimes it's in your head as well. Sometimes you think they have it in for you." (Rory, Digital Content Producer)

Indeterminacy, as a default state and sociomaterial exigency of the commodification of knowledge results in the uncertainty of value that characterises the labour of knowledge workers and the commodities they produce.

> *"It's definitely stressful [the job] just because compared to what I was doing when I first joined the company working in the customer support team, there's absolutely zero ambiguity about what your responsibilities are and how your success is measured. You are here to complete this many cases every day; be online and connected to the phone system at these hours, this is your lunch break. That's like brain autopilot, it's fine, you know exactly what is expected of you at all times. **Working as a product manager, your job to the team is to remove ambiguity and bring context**. By nature of that, nobody else is telling me what I need to be doing every day so it can be very stressful and difficult for those reasons because I log in first thing in the morning and **I need to make a decision about what the hell I'm going to do today and how I'm going to bring value**. It's really exciting and rewarding because when things go well it's going well because of me; when things go bad, it's going bad because again, I have no one else to blame. It's two sides of the same coin…The negative is, **it's hard to tell if we're being successful because of that ambiguity, so we're always second-guessing what we're doing**." (Seb, Product Manager)*

Beyond the value uncertainty that mediates the coder and creative labour process, the work of producing software and creative content is filled with ambiguity that shapes and constrains both the labour process and organisation of work. Overall, this general experience of ambiguity shapes the momentum of work. In the above excerpt, Seb (Product Manager) explains how this indeterminacy surrounds his work and obscures the courses of action that must be taken to the point where his team are always unsure and tentative about what they are doing for fear of failure and the wasting of time and resources. Moreover, a failure to adequately 'remove ambiguity' both down [the chain of command] to the developers and designers on his team and up to senior management can result in the complete blocking of action and a lack of acknowledgement and understanding for the value that his team produces:

> *"I guess the easiest way I would explain it is, **if I'm not doing a good job at removing that ambiguity for my team, then my team won't be able to do their jobs, they won't be able to build software because they'll build something solving the wrong problem**. They won't be able to release something they're working on because they're not working on it in the right way. If I'm not able to answer those questions for the team and for my managers**, I need to remove ambiguity in two directions**. I need to **remove it for the***

*team about how to solve the problems your working on each day and how the customers might expect the software to work. I also need to **remove it upwards too to make sure that my managers understand the value that my team provides to the company**. I'll do that by putting together revenue projections for how a new feature might generate more money for the company. I'll do it by showing the customer feedback that's leaning towards the features that we're going to be working on. (Seb, Product Manager)*

From a software developers' perspective, having to constantly deal with ambiguity can be a source of confusion and frustration. As new projects come in or the design of new features begins, Project Managers, Product Managers and Team Leads need to define the scale and scope of the requirements involved in producing the feature. Once the parameters are (tentatively) outlined, the project is broken down into tasks and divided out through the team members, however, individual software developers picking up tasks or 'tickets' from the workflow management system (Jira, Trello etc.) still need to wade through ambiguous requirements with often very little understanding of how their component fits within a holistic whole:

> *"Yes. That [ambiguity surrounding tasks] happens. I've been in many jobs where specifically that's been a huge, huge, huge aspect of the job. Where **your fighting to figure out exactly what your supposed to be doing**. Honestly, I find that quite frustrating." (Ian, Software Developer)*

The extension of the exigencies of indeterminacy to the organisation of work is also evident in the excerpt below where the acknowledgement of fallibility is present in the work process. This directly influences the momentum of labour and pushes Seb's team to adopt the practice of churning out products and features as fast as possible with minimal effort:

> *"We always want to try and **do as little work as is possible to bring it to customers as quickly as we can because half the time we hit the nail on the head, half the time it's way missed the mark**. We try and avoid spending too much time on a project without getting feedback directly from customers so that we know whether or not we're on the right track...**You can never have enough information to make a 100% bulletproof decision. You either work with ambiguity and try and find clarity as quickly as possible or you spend way too much time trying to gather context, at which point the project's probably dead now and some competitor has leap-frogged us and released***

something that we can't catch up with. By nature of the speed that we work in, we're always working with a lot of ambiguity and a lack of clarity. (Seb, Product Manager)

As workers and organisations attempt to grapple with the indeterminacy of their activities, the emerging consequences of this ambiguity feed into the momentum of work by shaping and constraining the direction and speed with which workers operate.

The Pressures of Ambiguity and Uncertainty and the Imperative of Control in Capitalist Production

The ambiguity arising from the indeterminacy of knowledge shapes the nature and extent of control in the labour process but also the differences in autonomy and power awarded to different occupations within organisations. The importance of computer programming and development and engineering teams or departments within technology industries and organisations with a substantial digital presence more widely is well acknowledged by both management and the workers themselves, and this is evident in the real material rewards coders enjoy in the global division of labour (Marks and Scholarios 2007). However, an in-depth comprehension of the workings of computer programming more often than not eludes the managerial class unless they themselves originated from a technical background. The below excerpt describes the effects of this ambiguity on the ability (or lack thereof) to exert quantitative control over software workers beyond time constraints:

Researcher: how is your work measured or monitored?

"I would say, low software developers are generally assessed by their Git history, so their version control history, GitHub will do code reviews. All code goes into code review. That means there's feedback on all the code you submit but then there would also be old tasks and tickets you've taken and ticked off from Teamwork. Both would be far from perfect for a number of reasons, like you can't compare two commits [code submissions], for example. Do you know what I mean? There'd be a qualitative assessment rather than a quantitative one. There's never going to be a developer where you go, "You have a score of 82." Ultimately, their work would be reviewed, an opinion would be formed on it, and that would be the assessment measurements. There wouldn't be any formulas or any things, numbers, we stick into and then get an answer out or anything like that." (Simon, Software Engineer)

Additionally, this difficulty can create problems for the recruitment process of coders, with the hiring decisions verging on a best guestimate:

> *"**The hard thing to do is to measure performance**. Then even if you do decide to start measuring someone by certain measures, you generally can't tell that person what metrics your using to measure them by because then they'll be encouraged to just improve the measures not their actual work. **Generally assessing the work of a software developer is very difficult**. Also, that leads into other aspects too. Trying to assess software development to hire them is also a difficult task. I'd be first to throw my hands up and go, "I can't really do it," in an hour or two interview what I might be able to tell you is whether he's a complete noob or a complete expert at some degree of certainty but if that spectrum was to actually mark them down, it becomes very hard to do that. I would say it takes me working alongside them closely for a month before I start to have a good sense of what they're capable of.*
>
> *It's something that's thrown around in a lot of software companies. Some seem to have figured out the magic bullet and others haven't or whatever. I remember, I think, even Google, the head guy for recruitment in Google 10 years or 15 years ago, he just threw his hands up and said, "Look, we've no idea. We generally just hire people based on these criteria and we hope that they're doing a good job." **Even Google doesn't have solid ways of measuring people. We can measure CPUs and graphics cards very well, but we can't measure people. It's very difficult. That's just one of the inherently hard parts of the job. I think it's not going to be solved in two years with some piece of software**." (Simon, Software Engineer)*

The indeterminacy of knowledge then, surfaces in software work and pervades organisations with an intensification of ambiguity that drives the managerial pursuit for new strategies of control. How do the software workers on the ground deal with these levels of ambiguity in their work? Simon finds comfort in the knowledge that nobody escapes the ignorance:

> *"I think **it's okay because nobody knows**. Do you know what I mean? If it were a case where other people had a better idea, then they would be at an unknown competitive advantage, but the reality is no one has this competitive advantage really. **All businesses are just stuck with this problem. How do you assess a software developer? it's still very difficult**." (Simon, Software Engineer)*

One way software organisations have dealt with these levels of uncertainty has been to delegate the oversight of work, monitoring of tasks and (the partial) control of the labour process to atomised teams. Software development teams are typically small with between 4-12 developers and a Team Lead who is responsible for the coordination of the team. The autonomy afforded to development teams comes largely from the lack of understanding others in the organisation have of their expertise and teams are then expected to manage and measure their own productivity. Despite the intimate theoretical and technical knowledge developers have of their craft, the quantification of what is ultimately an indeterminate process remains a challenge:

> *"Because I am the Head of Development, I could also be giving them [senior management] technical advice, the people above me technical advice, like the CEO and CTO on what we should be doing, how we should be doing something, like they will come to me and say we have a problem and how do we solve it, and I would say 'well, we're going to need to change the database to be this way, it'll take maybe..',* **I will give the man estimate of how long it might take even though it's very difficult to estimate things in tech!"** *(Ciara, Head of Development)*

> *"At the start of every Sprint, we do a Sprint planning meeting which is usually quite long. You look at all of the things that the product guy wants for the next two weeks and we'll discuss that, and we'll give a very* **rough point estimates**, *which I hate. I mean, it's the one thing with the job that* **I just don't like is estimating how long something is going to take because nobody knows**, *but sometimes, obviously, your throwing around numbers to a wall." (Ian, Software Developer)*

In Ian's case, the engineering department has developed a points-based system to measure what he refers to as the 'velocity' of work. Similar quantification systems exist within some of the other companies that the coders in this study work, and all of them are characterised by the same crude calculability that makes software labour so hard to control. Of course, the imperative of control in the production process is still a core structuring feature of the work of coders as management continue its attempts to circumvent the indeterminacy of both labour and knowledge by introducing new strategies and systems, an topic tackled in further detail in the following chapter.

The organisational imperative of control is key to manage the indeterminacy of both labour and knowledge, and to anticipate, predict and minimise the risks associated with production in such emerging sectors where goods and services can be new and at times ephemeral. Tactics

to manage the ambiguity of creative labour commodities then become integral to the labour process of creatives. For example, Saoirse intentionally engages in the management of stakeholder expectations and client relations to circumvent some of the challenges that often arise from the confusion, scepticism and at times arrogance of client representatives towards her work. In doing so she simultaneously avoids issues from cropping up while constructing the appearance of clarity, certainty and the determinacy of value:

> *"...it's all about managing expectations...aesthetics are really important but its managing expectations at each stage of the process. The finished thing has to be really good quality but if your presenting something at the start [to a client] you might want to pull back a little bit because you want to manage the expectation of the client...It's really about selling a concept at the start...when your at that stage then it's easier to sell a concept that is not completely worked up on photoshop , and then when you get down the line its ok to start doing things like creating maybe, you know showing videos of how things are going to move or like showing how the design and the copy are going to work together...a lot of times marketing managers or branding people, it depends on how experienced they are, how they're going to understand a concept or a campaign or an idea or whatever so you kind of have to know the people in the room aswell and there's a lot to do with managing those expectations and knowing who's in the room and how to sell it." (Saoirse, Copywriter and Content Lead)*

At times the ambiguity in the digital knowledge workers' labour process is also experienced in the wider organisation and across the industry as the form, direction and intention of new products, campaigns etc. can be vague (albeit for the ultimate goal of profitability). Producing goods and services that drive 'digital transformation' and innovation is often shrouded in uncertainty and requires this management of expectations to incentivise action:

> *"That's [managing expectations] really important. Sometimes they [clients] maybe don't even know [what their expectations/goals are] so you might have to set them [targets/expectations] for them but yea exactly its setting...finding out what the problem is to be solved and then finding a creative solution to it and then looking at it and then analyzing it and then refining it and optimizing it then." (Saoirse, Copywriter and Content Lead)*

Callum on the other hand adopts a different tactic when dealing with clients that have conflicting and limited understandings of the production of creative content and the theory and techniques behind 'good practice' in the profession:

> *"Yes. It's difficult the first time [engaging a client or colleagues]. What I tend to do is let them [client/colleagues] have their way the first time and show what it could be and why this is better and then present that. I go, "Right, okay we're under a tight deadline." Submit it, get it out and then bring it back to the staff and go - "Look, I'm going to show you how this can be better." Then we jig it and then they'll go - "It does look better.".".* (Callum, Head of Creative)

Indeterminacy exists as a default state for those who endeavour in the production of knowledge, however, this exigency becomes triggered and intensified when brought into a context of capitalist production premised on value generation, competition, exploitation and control. When the indeterminacy of knowledge combines with the imperatives of speed and control that arise from the need to gain competitive advantage in commodity markets for goods and services and overcome the indeterminacy of labour power (and knowledge), the organisation of work and the labour process is reshaped, and the momentum of work directly influenced. The milieu that emerges is characterised by an intensification of ambiguity[26], where the resultant ambiguity and uncertainty are more acutely *experienced* as pressures, *mobilised* by workers (i.e to gain autonomy/control, shirk responsibility) and *managed* (i.e through removal etc.).

5.3   Exclusivity of Knowledge in Software and Creative Work

The procurement and management of knowledge is a purview of power in society, where its access (or lack thereof) shapes and constrains opportunities, experiences and the accumulation of resources. All entities (individuals, teams, departments, organisations etc.) ultimately relate to knowledge based on their varying degrees of access to it (Zukerfeld 2017). As a sociomaterial exigency in the commodification of knowledge, exclusivity emerges from the relations that mediate the production of knowledge. Who has access to and comprehension of different domains of knowledge, and how are knowledge domains differentially legitimised and acknowledged? Who gains power, control and autonomy from this exclusivity and who

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[26] Chapter 8 explores the 'intensification of ambiguity', where the conceptual architecture structuring the analysis draws on Ó'Riain's (2006) advancement of the concept of 'time-space intensification'.

loses it? These are some of the important questions that arise from the manifestation of exclusivity as an exigency shaping software and creative work, and ones in which this section begins to answer.

Exclusive Knowledge and the Rewards of Obscurity

The ambiguity that characterises the coder and creative labour process intra-acts with the emerging relations of exclusivity, access and intelligibility that mediate the commodification of knowledge in software and creative content production. On a comparative level, the case studies identified differences in occupational autonomy between software workers and creatives working broadly in design and content. The differences emerged primarily from the comparative exclusivity of computer programming and user interface and experience design as knowledge domains which were largely obscure for those whose expertise did not lie in that area within organisations:

> *"Interviewer: How is your work, or your output or performance monitored?*
>
> *So it's logging in time on the tasks that I do, but as well, I think **a big thing with UX still, is because people don't really get it**, or they feel like they can't do it...the design stuff, they don't really know. It's like people that hire a developer, **you hire the developer because you don't know how to do it yourself, you don't know if the code is good or not**, that sort of thing. **You just have to trust that your finding somebody who's not taking the piss."** (Martin, UI/UX Designer)*

In particular, coders generally experienced higher levels of autonomy and control over their labour process, but also over the organisation of work and coordination of projects as is the case with Colm and Ciara's privileged position in their organisations:

> *"So, **I spend a lot of my time in this company working on the harder problems** that we have, whatever those are, and **they are often poorly scoped and poorly understood**. One of the things that I do is to sit down and read a lot of documentation, read everything I can around a particular topic, take a lot of notes, break that all down and analyse it into something that we can use and then from that synthesise some kind of design to meet the goals that we have, and in fact to clarify the goals that we have, because you know often....my boss will come to me and say 'We need a thing and it would great' and I will go 'Ok, I will look into it', and that will take three or four days.*

There have been periods where that has been two or three weeks of work just to do that. So, I do a lot of reading and writing in my work and a lot of analysis and design, and I think that is more common if you are more senior, and I am a senior programmer, designer and systems engineer." (Colm, Senior Programmer and Systems Architect)

Because I am the Head of Development, I could also be giving them technical advice, the people above me technical advice, like the CEO and CTO on what we should be doing, how we should be doing something, like they will come to me and say we have a problem and how do we solve it, and I would say 'well, we're going to need to change the database to be this way etc." (Ciara, Head of Development)

The expert technical knowledge and skills that Colm and Ciara have places them in a position of occupational power within the knowledge hierarchy of their organisations. The power that is afforded to them based on the exclusivity of their knowledge also effects how their labour power is valued by senior management and results in high levels of autonomy to the point where both participants can decide how, when and for *how long* they work. For example, Colm works what he calls "*20 focused hours of knowledge work*" throughout the week and tracks his own working time based on his personal preferences.

Exclusivity, and the rewards that are enjoyed based on how it mediates relations within organisations can also be paradoxical as that same ambiguity and obscurity that leads to exclusive knowledge can also lead to increased pressures.

*"They decided, "We want to have OAS 3.0. We want to say our products supports OAS 3.0." Then, that's what they want and then that goes into the product owners and they have meetings with each other, and they're saying like, "This is what we're committing to, we're going to have OAS 3.0 done in three months, like for the next huge release that's coming out." The product owner then has a meeting with the whole team saying that - "This is the message from the higher-ups. This is what we're committed to and this is what we're going to try and achieve." **The mistake was they committed to having this OAS 3.0 thing without talking to us**. They said, "In three months, we're going to have this." Whereas, when it got there to us, on the developer side, we were saying, "This is going to take six months and that's just what it is." That's typically how things are done. I'm hoping it's going to improve. That as lowly developers, we'll have a bit more say or a bit more impact on the timeline of things, rather than trying to rush*

*things. **I think it's just a lack of knowledge on their part** and also a lack of planning."*
(Gerard, Software Engineer)

"That's definitely a big thing. There's a lot of "oh, we think this will take this long",
*but **unless your a software developer there's no way for you to say "oh, you can get***
***this done in three weeks it looks like, whatever, whatever".** It's like, me asking a nurse,*
"How long am I going to get better?" How do I tell them how long am I going to take?
*How long is it going to take? There's just there's no real logic behind it except **there's***
***just the sense of urgency. That's all that they're giving us really.** That sense of urgency*
isn't beneficial. There definitely is that kind pressure." (Liam, Software Developer)

For Ciara, this simultaneous experience of uncertainty and exclusivity is partially due to the
excessive layers of middle management and 'ideas' people in organisations:

They [some management] don't actually know what [software] people do, yeah that's
a big problem…just fire those people haha. I mean the people that don't know what
those [software] people do shouldn't be working there. There's an awful lot of those
people and then there's 'ideas' people…I mean the programmers have the ideas…and
we wouldn't need those people at the top. It's strange, it's strange…there's a hierarchy
there that needs to be flattened." (Ciara, Head of Development)

Non-Exclusive Knowledge and the Pressures of Intelligibility

In contrast to the exclusivity of computer programming as a knowledge domain and the
paradoxes of obscurity that influence the experience of work for coders, the comparatively non-
exclusive characteristics of the expertise of creatives can result in challenges and pressures.
The creatives in this study were hired for their expertise in aesthetic design and media
production more widely, however, the open and generally intelligible characteristics of creative
design (broadly speaking) opened creatives to more challenges to occupational authority. This
is in part a result of the increases of media production skills in the general population arising
from the global diffusion and integration of media technologies in everyday life:

*"And I suppose having a thick skin is, because **you will get a lot of creative feedback**,*
especially with writing and things like that and things like social media and stuff like
*that, everyone…**if your consuming it, everyone thinks they're an expert** so they can*
give you back feedback because they consume, they see it and they're using it they think

that they are an expert in it or do you know what I mean?" (Saoirse, Copywriter and
Content Lead)

Saoirse is a senior copywriter and digital content lead, she experiences occupational encroachment from colleagues, other departments and clients based on the comparatively non-exclusive position of her knowledge domain expertise. The production of engaging and creative content, whether through copy, illustrations or video, is becoming an increasingly everyday practice for those who use digital technologies and social media. Similarly, Callum experiences this challenge in relation to his design expertise:

*"It could be an old cliché or saying, but **everybody is nearly a designer or have some***
thoughts on how they can present work**. I think really**, technology like smartphones
is now only making it worse because you can cut out heads in Snapchat or you could
cut out heads in this. Everybody thinks, "Yes, that took me two seconds. I'll do that
***now, Callum can do that in Photoshop."** Yes, it's very hard to explain, even the*
differences between how long it would take to get a digital brochure done to how long
it would take to get a print brochure done." (Callum, Head of Creative)

Occupational encroachment occurs when a worker experiences a gradual or direct intrusion on their occupational authority and expertise. The creatives that were part of this study frequently experienced this encroachment due to the comparatively open and more accessible knowledge domain of creative media design compared to those of coders and computer programming. Furthermore, experiences of occupational encroachment are also inflected with gender discrimination and unconscious bias. Ciara is a programmer with over 15 years' experience working across numerous roles in the software industry. She is currently the only programmer and the Head of Development at a small start-up company based in Dublin. Ciara prefers working here compared to the larger firms where she was previously employed because she has more freedom and autonomy to decide how she works and working in an environment where she is the only coder frees her from the gendered pedantry that she used to experience when male colleagues criticised the quality of her work.

Interviewer: Because you are in a start-up and at the moment you are a one-woman
team, do you think that you have got more freedom and autonomy in how you do your
work?

"Yeah, because in a regular company you would often have code reviews, and there is
*nobody to review my code right now, **there's nobody to be pedantic about for example***

*spacing or you know 'I would like to see it done this way rather than that way…'. So, yeah, there's that level of freedom and that would mostly come from other **people being critical of how your code is written…and actually as a woman, men tend to be more critical of women's code than of other men's code, I have learnt that throughout my career as well**, so its definitely less stress that way, that **I don't suddenly have all of these guys being critical of my coding**, when they wouldn't be that critical of somebody else new, do you know what I mean." (Ciara, Head of Development)*

Gendered pedantry describes those excessive concerns and quibbles that women can experience over minor, trivial aspects of their work. The exclusivity that mediates the knowledge domains where coders and creatives operate in the production process shape their experiences of power, control and autonomy in the workplace as different expertise (and genders) are differentially acknowledged. How this exclusivity combines with the indeterminacy of knowledge in the production of software and creative content has implications for the intensification of ambiguity and the navigation of occupational power in the coder and creative labour process within the contested terrain of control.

5.4   Sociomaterial Attachments of Software and Creative Work

The production of knowledge is a deeply socially and cognitively intensive practice that is embrained, embodied, encoded (Blackler 1995) and socially embedded in webs of social ties and collaborative work (Amin and Cohendet 2004); but it is also material (Orlikowski 2005a; Zukerfeld 2017) and as such it has physical consequences for the experience of knowledge work. Understanding how this sociomateriality is experienced by digital knowledge workers who are tasked with the application and production of knowledge is essential if we are to fully comprehend the mechanisms shaping the organisation and conduct of knowledge work. This section is dedicated to the exposition of one such mechanism – *sociomaterial attachments* as they emerge through the (i) interactional and (ii) relational practices that arise in the construction, development, maintenance and legitimation of knowledges. By attachments, I mean the social and physical connection and linking of the situated actions of knowledge producing labour and the tools, communities and domains from which it draws and contributes to. The production of knowledge requires specific interactions (e.g. cognitively engaging with texts, formulas etc.) and is characterised by emerging relations (e.g. with colleagues, collaborators, communities/networks of practice etc.) and these interactional and relational

practices form sociomaterial attachments between the individual, commodity form and labour process. The remainder of this section will demonstrate the channels through which these attachments unfold in the coder and creative labour process.

Interactional Attachments: Task Engagement, Cognitive Residue and Everyday Ubiquity

Sociomaterial attachments arise through the interactions that take place within the production of knowledge as two or more entities, or events act upon one another to produce an emerging effect. The intentional and direct engagement in work related tasks, whether situated in the workplace or within work time, is a permanent possibility for knowledge workers without spatiotemporal constraint. Furthermore, the digitalization[27] of knowledge work and the world of work more widely extends this possibility beyond those whose labour involves primarily mental exertion to other, more routine occupations such as those involved with data entry. The socially and cognitively intensive nature of the coder and creative labour process, and knowledge work more generally, involves an interactional attachment through what I refer to here as *cognitive residue*. The concept of cognitive residue speaks directly to the sociomateriality of knowledge, and I define it as the mental, intellectual and sensational remnants that are carried by workers following the 'completion' of their labour process. Building on Leroy's (2009) advancement of the concept of 'attention residue' to describe the cognitive load that people bear when switching over tasks and the implications this has for productivity, cognitive residue emerges from the interactional engagement with the production of knowledge. The processes of conception, contemplation and analysis are deeply sociocognitive processes that are at once embodied and simultaneously embedded within the human mind and its relations with the reality within which it is situated. How these processes materialise in the everyday lives of coders and creatives is triggered by the cognitive residue leftover from the engagement of knowledge producing labour.

> *"You don't have that defined line, dependent on nine to five, you can do work whenever or wherever, it is easy to do work at home…I very much clock-out mentally when I leave the office. Now, definitely things are still musing around in the back of my head while I'm having dinner or while I'm hanging out at home, so I just will jot down notes into my phone, just to the Apple notes app. By doing that physically, it all just leaves my brain so I can just make sure that tomorrow 'me' checks those notes and will pick up that thread and take it up for the next day. I don't deliberately muse*

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[27] The final section explores 'digitalization' as a sociomaterial exigency.

on things at home. Sometimes it will just happen, and I'll get it out of my brain by putting it in a note." (Seb, Product Manager)

Despite Seb's conscious efforts to construct clear boundaries between work and life based on his "*counterproductive*" past experiences of allowing work to colonise "*whenever or wherever*", the sociomaterial attachments of knowledge production mean that "*definitely things are still musing around in the back of [Seb's] head*". To manage this cognitive residue that appears as a persistent, spontaneous and unintentional "*thread*" of labouring activity, Seb believes that the physical and intentional act of transferring the thoughts into his smartphone notes app frees his mind from the unwanted burden of cognitive residue. However, in doing so he is engaging in labour irrespective of his intentions as he ensures that "*tomorrow 'me' checks those notes and will pick up that thread and take it up for the next day*". Similarly, cognitive residue can at times be enjoyed and welcomed depending on the subjective preferences of the individual at the time:

> *"Back in the day when we first started when we were a young start-up, and I was writing code it was super exciting and everything was very blurred. There was no switching off, really. I would wake up and I'd be thinking about, "Oh yes, I could do this. I could probably project that onto that. Yes, I think that would be faster if we do it that way," and then again as I was walking into work, and as I was walking home from work…It can be difficult to know when to stop. Your like, "The code's almost working. Oh, no wait, there's a bug there. Hang on, it's almost working." You don't notice, and the clock ticks, and you stay on late. **Even when you go home, you haven't fully disengaged from that**. What I carry home with me can be exhausting. I do get tired because of the mental rigors of having to think to do things very carefully during the day." (Noel, Product Manager)*

Despite the descriptions of excitement however, the experience of cognitive residue is still a 'mental rigour' and source of exhaustion. Likewise, Saoirse is content with her experience of the sociomaterial attachment of her labour that often arises in the early stage of projects where creativity, idea generation, conception and exploration are at its most heightened:

> *"Yea, like definitely [engage in labour outside of work], especially if your at the start of a project…**you are kind of really in it and your thinking about the initial concept and brainstorming things**…So yea, in that sense **it would take up a lot of your time but I don't mind that part of it because I kind of find that interesting** you know, it*

doesn't infringe as much on your life as say like managing something like, so yea that part is grand, it's good to kind of take time and be thinking about things creatively as well." (Saoirse, Copywriter and Content Lead)

Interactional attachments can also be calculatedly intentional and in conversation with the social relations mediating a particular experience. Alex describes his decision to directly engage in upskilling through online YouTube tutorials in his own time with the hope that this would be favourably acknowledged by management and colleagues:

"you want to be as good as you can at your job because you want them [management & colleagues] to think your good because you want to make more money and be successful or whatever so I would look at YouTube videos. I found a guy that does really good tutorials and I just like him and the way he describes things, it makes it really easy to understand because sometimes it's hard. So, I'm watching these YouTube videos and then following along with what he's doing and then I know it and I can do it now. Then when I'm doing it in work I have spent time outside of work to make myself better at it." (Alex, Software Developer)

More frequently though, the cognitive residue emerging from the sociomaterial attachments of commodifying knowledge is more reluctantly experienced.

*"Yes [he engages in labour outside of work], it's something that I've tried not to do too much, but there have certainly been times where maybe if the pressure is turned up a bit in work, if there's a lot going on and I just haven't had time to get something done and maybe your struggling on a problem where you just haven't maybe had time to meet with other people to figure it out properly. There have been times when I've been at home thinking about things. Not for hours in the evening, but **there are times when you get home, then you'd be thinking, "Oh, I'm not really sure how we're going to figure that one out" or even, that's not bad in itself, but there have been times where maybe you can't fall asleep at night and it just pops into your head and your like, "Why am I thinking about that now?".***

There have been a couple of occasions where I get a little idea in my head or I try and clarify some thought I had in my head and I just jot down something at home *out of working hours just on a piece of paper, just **to try and crystallize something in my own mind** and be like, "Oh, maybe I can try this approach," or something like that. **I acknowledge that it's not something I actually want to do much of**. I think work*

should generally be left in the office. Or if your working in an office, then I think it should generally be left there in the interests of your own mental health. Everybody benefits from their time off in the evening or the weekend.

Researcher: Your work is inherently cognitive, it's intellectual work, your using your brain and your trying to come up with original solutions to problems. I'm fascinated, what impact do you think that has on your ability to switch off when your finished work?

*"Yes. **I haven't always been able to switch off.** Just when I was telling you there earlier, **sometimes you take a problem your working on home with you**. A solution always gets implemented and something always comes out the other end that people are happy enough with, but just when your in that moment, **you feel like there's an expectation on you. Your the problem solver. The expectation on you is to come up with the design and sometimes you just hit a wall."** (James, Product Designer)*

An important driver of these sociomaterial attachments is the *everyday ubiquity* and pervasiveness of the commodity forms which coders and creatives produce. Software programmes, user interfaces, design and digital media increasingly colonise our everyday lives through smartphones, computers, televisions, wearables and more. The frequency with which coders and creatives come into contact with the commodities that they produce constitutes an interactional attachment that triggers labouring activity. Noel describes this vividly in the excerpt below:

*I remember at one point just walking either to or from work and just looking at the fabric and flows of this woman's long coat. My friend was working on motion graphics at the time and as she was walking, I was watching the ripples on the back of the coat form and deform. I was looking at it thinking - "You want to capture that level of detail" and I was thinking about what we could do to achieve that. **It's always stuck with me. It's like there was just no getting away from it. It was in my head all the time**. We were working terrible hours. We were working long hours. Occasionally, very occasionally I remember working all night. I remember walking home from work as everybody else was walking in going - "Ha! everybody's going into work, and I'm walking out." (Noel, Product Manager)*

Noel's everyday interactions, such as the one encountered on this particular work commute, prompt labouring activity as he engages in cognitive processes directly related to and

contributing to the value of his work. Other examples of coders and creatives being sociomaterially attached to their labour through the everyday ubiquity of their commodity form can be seen below:

> *"on a regular basis buying products myself in the supermarket I would think, 'how would my app use this?' or 'how would I get the data that I need to get that information that doesn't show up on that receipt?'."* (Ciara, Head of Development)

> *"It's just scrolling through Reddit or the 'gram, TikTok at night time, that sparks a lot of ideas as well. **I truthfully don't think I'd be able to switch off at all**."* (Dean, Head of Creative)

> *"You will be **getting inspiration from anywhere**…I use the notes app on my phone a lot to jot down and write lines down and stuff like that so I can go back to it**.."** (Saoirse, Copywriter and Content Lead)

Ciara, the Head of Software Development at a green food technology start-up describes engaging in labour beyond the workplace as she shops in the supermarket and is triggered by her surroundings. Dean, the Head of Creative at a digital agency in Dublin frequently engages in labour beyond that for which he is paid as the use of social media "*sparks a lot of ideas*". Saoirse understands the spontaneity involved in the generation of inspiration and when your labour involves the creation of content designed to engage users/consumers, capture their attention and persuade their actions, everyday ubiquity becomes all-pervasive. In terms of how the concept of cognitive residue adds to existing analyses, the primary value that it brings originates from its focus and naming of what was often either a completely invisible experience/phenomenon or a messy, intangible and hard to grasp one in the literature. By analysing knowledge itself as material, some of this conceptual and analytical fuzziness can be removed and the cognitive experiences of knowledge work can be traced to find this real material residue that people carry as a cognitive load.

Relational Attachments: Communities of Practice, Emergent Knowledge Domains and (Passionate) Connections to the Commodity Form

The production and commodification of knowledge necessitates the emergence of interpersonal relations where subjectivity melds in 'internal conversation' and intra-actions with the intersubjectivity of sociality which is the bedrock of human knowledge. Of course, the entanglements that always constitute knowledge domains, although in a perpetual state of becoming, pre-exist individuals as they enter into relationship with those domains (i.e to become an expert, begin working etc.). Therefore, it is analytically useful to approach interactions and relations as distinct analytical categories that become intra-active over space and time. Afterall, the concept of relation implicates some form of temporality that threads together a series of repeated interactions into a connection or association. Sociomaterial attachments emerge from this relationality that accompanies and mediates the conception, development, maintenance and legitimation (i.e production) of knowledge. Occupational communities or *communities of practice* emerge as an integral relational form in the production of knowledge for coders and creatives, albeit in less bureaucratic and more informal formats such as through meet-ups, conferences and online blogs, communications and social media platforms:

> *"I think a lot of current information in my industry is **communicated via tech talks, conferences and blog posts and these days even Twitter threads**, you know…just **getting the pulse of what's going on and what people are doing**, and what people are doing it differently." (Colm, Senior Programmer and Systems Architect)*

These relations become crucial to the process of building, communicating and legitimising expertise in specific or multiple knowledge domains, whether computer programming or digital design and so on. Furthermore, *knowledge domains are not static but emergent*, and it is therefore not enough to build knowledge and skills in an area to become an expert, these expertise are ultimately related to knowledge domains and thus must change with them as Colm (above) and Saoirse (below) indicate:

> *"Its [networking] really important just so you have like a constant flow of work and you can kind of go back to those people that you have made an impression on and then I think **keeping up to date with creative stuff**, like creative events and chatting to other people about the work they've done. It's just **good for inspiration** as well and looking outside of Ireland as well is really good **because you get to see what markets are doing and what's working and what's not**." (Saoirse, Copywriter and Content Lead)*

The relational attachments of occupational community are integral for knowledge commodification in the coder and creative labour process, however, those very same attachments can constitute a new social form that can be cultivated and exploited for individual or organisational purposes:

> *"We do have this network, we actually call it **the love network**, and it's just essentially amazing young people from all over the art world and from all over the world that **we draw on for anything that we need**." (Dean, Head of Creative)*

These relational attachments encompass not only occupational communities of practice but a dispositional 'networked sociality' (Wittel 2001). The coders and creatives in this study were aware of the role that networked relations can play in their labour, and they enacted network sociality to draw on these networks in different ways to finesse their expertise through learning, from customers and competitors as Seb does or from occupational peers as in Mary's case (below):

> *"**Networking is important in the sense** of networking with customers and with competitors or similar folks in the industry just because **we all learn from each other**. Learning from customers is how I am most effective at my job so in that sense, it's important. **I do that networking through being connectable**." (Seb, Product Manager)*

> ***Interviewer:** I'm curious, are you personally an official member or do you informally engage or associate with any occupational communities (meetups etc.)?*

> *"Yes. Oh, man, yes. I love going to them. I do as often as possible. Since I had a kid, it's tougher. I started one for women in the tech industry just because I wanted to meet some of the women that were programmers and talk about that type of stuff with them. That one I've handed it all over to someone else and it's still going. I do go to PyLadies which is Python women programmers basically, as often as I can. I've been to professional conferences like DjangoCon and PyCon and stuff like that. I think those are **great ways to meet people in the industry and learn and skill up as well**. I think **in-person meetups despite the whole current climate of isolation, I think they are really, really useful for people to find mentors to improve whatever they're doing to stay interested and to get excited** again about different things that they're doing." (Mary, Senior Software Engineer)*

Moreover, relational attachments also comprise of the real and expected subjective connections that individuals construct with their commodity forms and knowledge domains. The strength of ties to the commodity form appears differently depending on individual subjective orientations and occupation, however, there exists a strong and widespread cultural expectation that coders and creatives cultivate a passionate connection to their labour. Creative labour and the Cultural and Creative Industries are renowned for their passion-driven work ethic (Gill and Pratt 2008; McRobbie 2016), and this is often experienced as a desirable artistic romanticism or as Dean's excerpt below demonstrates, an obsession due to the cultural intensity of the creative commodities:

> *"Yes [he maintains his expertise through passionate connection to the commodity form/knowledge domain]. Truthfully, I would be very hard pushed to find any creative director who says otherwise. I think if your only creative nine to five, well, good. **I don't really work nine to five, and then switch off afterwards**. That's not the case, even in the demographic that we're working with, they will come to life at 7:00 PM. For me, **I'm obsessed with internet culture and meme culture and internet language**, because that is the heart of where young people are…**I truthfully don't think I'd be able to switch off at all**. If that ever did happen, then maybe I'm not in the right industry."*
> *(Dean, Head of Creative)*

Furthermore, the expectations that emerge around the strength of ties creative workers have to their commodity form also mediate the coders labour process (and different forms of knowledge work more widely):

> *"there are demands made on your time, **in fact there are demands made on your emotions [emotional demands and subjectivity expectations] you know, it's like 'god, don't you feel passion for you work?'** and I'm like 'no, I don't, I feel passionate about providing a home for my family, I don't particularly feel passion for like…what design I use for a time-series database or something like that'…but **there is that narrative there and that demand is made on people**, I think, yeah and its mostly coming out of the **Valley kind of culture of like 'don't you feel passionate about your work? don't you want to work every hour that god gives you to change the world?'**…its like no, come on man, relax, your not changing the world your just building a company to sell to VC's! I mean it does make demands on people and I think those demands trickle down through the culture of the industry, wherever you are, whatever part of it your*

in…and some places can be unreasonable with the demands they place on peoples time and energy and emotions…and other places can be more reasonable, and I want to work at the later." (Colm, Senior Programmer and Systems Architect)

The labour of the creative extends beyond that involved in building and maintaining networks for collaboration, knowledge acquisition and "know-how". As the Head of Creative at a successful digital content agency in Dublin, Dean's role merges oversight of the creative content and direction of the firm with recruitment and management. Creatives looking for work with Dean's agency need to ensure that they possess the right "cultural-fit" and embrace and build culture in their everyday lives:

Interviewer: What do you look for when you are recruiting employees?

*"If they're coming in for a full-time role, **for me it's cultural fit before anything else**. We've always been very famous. We kind of positioned ourselves as anti-agency. We don't really follow the norms of other agencies. So, we never really enter awards. We try to think outside the box. We don't necessarily hire safe people. We hire people from all walks of life who maybe never worked in an agency before but could be a savage graffiti artist. **The first thing I look for is a cultural face. Do they embrace youth culture? Do they build the youth culture?** And then secondly, if it's for a creative role is the work great. I suppose creative and culture goes hand in hand. Over the last few years, I've actually got a real sticker for it. The more you meet people, the easier it becomes." (Dean, Head of Creative)*

This understanding of the melding of 'creative' and culture is rife throughout the accounts of creative workers:

*I think you have to be interested in culture…what's going on around you like culture and trends and things as well. I think, probably **one of the biggest fears for a creative is to kind of be like 'oh, am I out of touch?'**, you kind of have to stay on top of stuff like." (Saoirse, Copywriter and Content Lead)*

These subjective attachments to the commodity form, which are often described as distinctive features of these types of work (Gill and Pratt 2008; Huws 2014), are best understood as an emergent and contingent feature of the wider sociomaterial attachments that permeate the production of knowledge. Taking the example of the creative worker: the relational attachments (whether really experienced as passion or not) are an emergent implication of the production

of a cultural artefact. The commodity outputs of creative workers are often cultural artefacts that are conceived through the labourer's (sociomaterial) embedding within specific social, cultural, political, economic and technological contexts, and their production as creative commodities (or cultural products/outputs) occurs through the labourer's embedding within specific, diverse and converging domains of knowledge (in the form of design theory, craft/technical know-how, artistic communities and networks etc). These multiple embeddings necessitate relational attachments that produce the sociomaterial conditions through which subjective (passionate) orientations emerge. In other words, the creative workers labour process is comprised of articulations of relations that are consequential for the conditions and practices of work that make experiential, subjective phenomena such as passionate connections increasingly likely, yet non-determinate and contingent. This is a topic explored more specifically in the contested terrain of subjectivity in chapter 8.

5.5 (Objectification through) Digitalization in Software and Creative Work

The production of knowledge has assumed a new significance in the digital age as the global integration and convergence of digital information and communications technologies and the digitization of information both proliferates the volume of knowledge production and commodification and expands the parameters through which it takes place. Following Brennen and Kreiss (2016), I adopt an analytical distinction between the concepts of digitalization and digitization. Digitalization refers here to the process in which digital ICT's, their integration and convergence, encircle everyday life through their embedding within the social, cultural, economic, political, technological and infrastructural fabric of society. In contrast and on a more specific level, digitization is used here to denote the process by which physical exertion or actions in the analogue world are transformed into digital information through the mediation of digital ICT's. Moreover, the fundamental function of technology in human sociality, from its most primitive (spear, wheel etc.) to complex forms (machines, software etc.) is understood here to be as a physical bearer (Zukerfeld 2017) and actant of knowledge. It follows that the digitization of work and consumption through digitalization has extensive implications for the commodification of knowledge, its extent, form and effects.

Digitalization emerges as a sociomaterial exigency in the commodification of knowledge in the coder and creative labour process through the extent in which these "core digital labour" (Thompson and Briken 2017) processes are mediated by digital technology. The digital

mediation of the labour process is both by input (labour enacted through digital tools) and output (production of digital assets/artefacts), and these technologies play an integral role in the imbrication[28]process as diverse bodies of knowledges become objectified in them (recorded, stored, and datafied). Digital technologies increasingly saturate and contribute to the acceleration of our everyday lives (Wajcman 2014; Kitchin and Fraser 2020) and their integration and convergence simultaneously compresses and intensifies space and time (Harvey 1989; Ó'Riain 2006). Furthermore, the exponential growth in data-driven business models shifts the underline emphasis of digital technologies from one of tools-based technology to behaviour-based technology that is no longer inert and idly waiting to be put to productive use but instead incorporates the psychological and technological techniques to nudge, seduce and drive behaviour and addiction (Harris, 2020). The following section explores how digitalization, as a sociomaterial exigency manifests through the channels of digital saturation, acceleration, and quantification.

Digital Saturation: Real and Perceived Pressures, Habitual Connectivity and Time-Space Compression and Intensification

Creative and software workers live digitally saturated (working) lives where their work, which takes place through the use of digital tools and produces digital artefacts, mirrors the increasing digital mediation of non-work social life through mobile smart technologies. The use of the term saturation is to denote the extent of digitalization beyond the point of necessity and desirability. Digitalization in the coder and creative labour process is pervasive and is experienced through direct pressures, habitual connectivity and time-space compression and intensification. As one of the participants, Colm (*Senior Programmer and Systems Architect*) puts it – "the network follows us everywhere", and the 24/7 economy (Smith 2013) that has emerged from the digitalization and globalisation of socioeconomic activity means that the option to do work is always 'there'. At times, this possibility leads to expectations and pressures to either directly engage with work or to engage in what Gray et al (2020) refer to as 'anticipatory availability'. Sarah is a digital content producer and social media lead for a small event management and marketing start-up based in Dublin. She is expected to produce digital

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[28] Imbrication is used here to describe the practice through which *analytically* distinct entities (human labour, technology, organisations etc.) become melded (i.e imbricated) as they enter relationship with one another (Leonardi 2013). Through these imbrications, things can be understood as constitutively entangled sociomaterial assemblages (Scott and Orlikowski 2008).

assets for numerous social media channels, and she describes here the pressures to engage in labour beyond the workplace that arise from the digitization of her labour process and the subsequent sociomaterial attachments that extend her working day:

> *"Interviewer: Do you find that your responding or your posting on social media when you are not in work?*
>
> *Yea, all the time. So, I run three [social media] pages for the place I work for. And like I said, **I'm expected to post daily…so that would include the weekend**. And I haven't been given any kind of like platform to schedule posts for the weekend. And as well I think **because it is social media and it's so easily on your phone and something that we do every single day that I will be on my way to work and I'll be like checking the performance of a post** that I posted yesterday or on my way home and I'll be checking the performance of a post because as well my employer had made me feel like if the posts are not performing well, you know it's not good enough, so I would constantly be just, even I was just bored at home you know the way you go to your social media but I have fricken four social media pages that I'm like flicking through to see.*
>
> *Interviewer: So just on average how often do you think you would be doing these activities and checking while you are not in work?*
>
> *On the bus up, on the bus home, before bed, so yea a good chunk of my day. And obviously then my whole workday is on the social media so a good chunk of my day I would be scrolling through those pages." (Sarah, Digital Content Producer and Social Media Lead)*

The explicit and perceived pressures to engage in labour beyond organisational space and time are also present in the coders labour process:

> *"**I think that pressure is there…it is certainly perceived whether it is intended to be put on anyone**… I keep quite a firm boundary between what I call my real life and work, you know there's this idea that 'hey, work is part of life and it should all be this holistic thing' and it's like 'fuck you…', I experience work as hard and I don't like it, that's why we call it work…I mean I enjoy my work and I enjoy being good at it but I mean it's hard and it's unpleasant, don't tell me it's just like this wonderful part of life. I do think those pressures are there, for example, **I don't have a smartphone…and I'm very unusual in that, I am something of a luddite…and it's because I can't handle***

all of that interaction and disruption, I don't want to be called back or pulled back into work." (Colm, Senior Programmer and Systems Architect)

Although the digitalization of work can lead to direct pressures such as those described by Sarah and Colm, what is most interesting about how these experiences are depicted are the underline suggestions of some sort of spontaneity and compulsivity in their accounts. This is described quite well by Callum - *"I think **there's something always at the back of your mind that makes you want to check** [work through the network/device etc.] or like get out of what your currently working on to check, to check in with what's happening."*. The ease at which work can be accessed through these technologies and the habituation of their uses in everyday life can result in experiences of habitual connectivity. Habitual connectivity is a spontaneous, impulsive and at times compulsive habit to connect and engage with the digital network through technological devices. It emerges in the everyday use of smartphone applications, social media and mobile technology more generally, however, the digitalization of the work of coders and creatives brings this practice into relation with the sociomaterial attachments of knowledge as a commodity form. As habitual connectivity and sociomaterial attachments intra-act in digital knowledge work, the cognitive residue of labour combines with the attentional lure of habitual connectivity to intensify the experience of work. Avoiding this then requires active and coordinated discipline from individual workers such as Colm's 'luddite' like refusal to buy a smartphone and Seb's account below:

*"**By nature of the fact that this laptop right here is my work console**, I could throw this out of the window, get a new laptop and I'm back to exactly where I was. My job is not moving boxes, my job isn't something physical. **My job is digital and it can be everywhere at all times so you have to be really disciplined** to not bring it home with you and not just quickly check your email when your on the bus home or whatever. That's kind of the negative side and that takes a lot of discipline." (Seb, Product Manager)*

The emergent effects of digitalization are in part a consequence of the spatial and temporal restructuring made possible by global integration and convergence through digital networks and mobile digital devices. Time and space become compressed (Harvey 1989) and the emerging effects of this restructuring result in what Ó'Riain (2006) called time-space intensification where space and time become more intensely experienced, mobilised and politicised in the workplace. Colm's excerpt below describes how these processes have become

an integral part of software development through the emergence of software reliability practices in the industry:

> *"One of the big changes that's happened in software provision or in the average life of an engineer in the last I would say 20 years has **been this idea that we don't have working hours anymore in which the system must be up or in which we can expect customers to contact us, now you have this always available thing and your customer could be in a number of countries all around the world**…I think people are experimenting a lot right now with different ways of working…so for example you have got this whole industry around **this whole 24/7 operation** where you have people that are on-call at the end of pagers… And what I find interesting about a lot of **reliability stuff in the software industry** is…I mean it's immature, we have only been doing it for you know…I say we haha, since I suppose the life of the web…you know for me I was around when it started and it was like 'I don't give a shit if my website is down, really your going to call me in the middle of the night because the website is down? Really?', you know but it's a thing now and **this whole idea of 24/7 operation comes in once you have website on that are global**. And you don't have customers who are just in one time-zone, **you have customers that are in all of the time-zones**."* (Colm, Senior Programmer and Systems Architect)

Acceleration: Knowledge and Skill Renewal and Redundancy through Technological Change and Automation

The advancement and development of digital computational technologies exhibit a type of technical and social performativity such as the prediction that microchips would continue to multiply in power while decreasing in size which became known as Moore's Law (Pollock and Williams 2010). Subsequently, computational digital technologies experience accelerating rates of change and this process of technological acceleration has implications for the labour processes of workers whose expertise are sociomaterially attached and imbricated with technology. The expertise and knowledge domains of both the coders and creatives in this study were tied to the operation and manipulation of digital technologies and the acceleration of change in those technologies in turn accelerates the rate at which their knowledge and skills become redundant or require renewal:

*"[What does somebody need in order to be successful in the software industry?] the wish and the ability to constantly learn, because you actually cant…like **it would be nice to be able to stand still and just sort of like rest on your laurels a little bit but unfortunately you can't because the industry is changing crazy**, too crazy…I mean it doesn't change that fast…things that were true fifteen years ago are still true now **but the technology is different**…and I think being able to differentiate those two things is very useful but I do think that being willing to learn all of the time and not rest on your laurels and…I mean take a rest every now and then, absolutely, but be aware that **you are going to have to dig back in and reconnect to the intellectual firehose on a regular basis in order to grow**." (Colm, Senior Programmer and Systems Architect)*

In part this is due to the customization and feature-based business model in many software firms and advances in hardware, processing and graphics capabilities such as 5g, virtual reality and augmented reality. The degrees in which these labour processes are saturated with and dependent upon software applications deepens the existing sociomaterial attachments of knowledge production. For illustrative purposes, some of the applications used by the software and creative workers in this study included the Adobe suite (Photoshop, Illustrator, InDesign, Premiere Pro etc.), Google suite (Google Docs, Google Presentations, Google Sites, Google Sheet etc.), Sketch, InVision, Notes app, Slack, Teamwork, Jira, Trello, Github, Git, Azure, Airtable, Mockups, Redmine, Bitbucket to name only a few. Any changes in these programmes such as their cyclically released added features produces a pressure for coders and creatives to engage in "*extra-curricular*" *(Ian)* labour to extend their knowledge such as John (designer) and Simon (software engineer) do:

*"[How do you maintain your knowledge and skills?] By **taking on new little tests and tasks and things maybe every month or every couple of months**, a bit of experimentation really. Sometimes it might be a tutorial or it might be just a bit of exploration with a new program. **Sometimes it's just getting in and spending time, getting to know a program in detail**. Really, that's sometimes the best way of staying up to date-- **A lot of these apps are actually updating monthly or very often. You find Adobe Suite are updating a lot so you really need to be using them in detail** even if you might not use an app for a couple of months or something, it could change completely by time you reuse it. I think its ongoing use is really the main thing now." (John, Designer)*

*" There'd be a few newsletters that I would keep subscribed to, things like that, industry kind of papers. The first will be **newsletters**. There'd be a couple of dedicated ones there just niche enough for me without being too niche or too generalized. There's a guy called Dave [unintelligible] who does one. Then could be **community participation** in communities like **Reddit** where there are thousands of people discussing what they're doing. Maybe an alternative for Reddit would be **Twitter**, but I prefer Reddit over Twitter, or **Medium**, or something like that. That's generally how I keep up to date."*
(Simon, Software Engineer)

The production of digital knowledge commodities is a deeply imbricated process whereby the commodity forms being produced by the coder and creative emerge through the intra-actions of labour, technological changes, competitive pressures, future expectations and market demands. The constitutive entanglement of the commodity form and those triggers that emerge through these intra-actions intensify the pre-existing attachments that arise through the commodification of knowledge by linking them more immediately to changes in the states of those triggers (i.e tech, market etc). The example of technological developments and the subsequent acceleration of labour pressures and demands demonstrates this: the addition of new features to software programmes or the development of new hardware capabilities establishes the need for those using these technologies to conduct their work and also those who produce goods and services for those platforms and devices to update their knowledge/skills, adapt their working practices to meet the new demands (as in the case of 5g requiring more robust 'reliability' systems which then intensified the labour processes of coders in Colm's company) and create new methods for delivering goods and services.

Furthermore, the pressures emerging from the acceleration of digitalization also extend to the automating and deskilling capabilities of emerging technologies. Martin and Callum progress through their working lives with the expectation that the value of their skills and knowledges will continually come under pressure as technology accelerates their redundancy, they both adopt of a similar stance to Colm (*Senior Programmer and Systems Architect*) and Saoirse where they prioritise adaptability to technological change and market demands. What's most interesting about the intra-actions (following Barad 2007) of technology and the labour processes of coders and creatives is that the workers individualise the responsibility for keeping up with market changes and maintaining their expertise, ultimately engaging in labour above and beyond both working time and pay:

"I think really, technology like smartphones is now only making it [creative work] worse because you can cut out heads in Snapchat or you could cut out heads in this. Everybody thinks, "Yes, that took me two seconds. I'll do that now; Callum can do that in Photoshop… I don't think it's one that you would fear of your job not existing in 10 years' time…It eventually will get that way. Look, it mightn't happen in our lifetime but your going, "Jeez." I look at it now, as what's available now, there are web builders, there's Squarespace, there's WordPress, anyone can pick that up and do it." (Callum, Head of Creative)

*"Like everything, everything bursts, every bubble bursts. **I'd imagine UX could be replaced entirely by autonomy** at some stage, so I don't know. Right now, **I'm doing contracting because I may as well make hay while the sun shines**. But yes, I could imagine **my role would have to adapt, or people start to lose value in UX** because there could be automation in terms of analytics on the site. It adjusts itself based on analytics, so **organic sites**, websites that fit the user, that sort of thing."* (Martin, UI/UX Designer)

The skills and knowledges exercised by coders in their labour process are tied to existing technological states (in both hardware and software), and pressures to engage in extra-curricular labour to change in step with developments and advancements in those states is always present. It often emerges as an awareness of the need to be 'adaptable' and responsive to technological change, market demands and consumer sentiment. When your labour is knowledge-intensive in the sense that the primary resources being exchanged in labour process inputs are in-depth theoretical, technical and cultural knowledges, your labour process becomes intricately attached with the state of the knowledge domain within which your expertise lie. Knowledge domains (such as computer programming, systems engineering, graphic design or UI design), as sociomaterial assemblages are emergent through the many complex intra-actions constituting their existence and development and are therefore always in a state of becoming. This emergent state itself leads to the need for renewal and maintenance depending on the speed and scope of change, however, the fact that the knowledge domains of coders and creatives are constitutively entangled with the digital technologies they use and produce intensifies those sociomaterial attachments and ties them more deeply to the velocity of technological change.

Quantification: Control through Workflow Management Systems, Datafication and 'Digital Residue'

The digitalization and subsequent digitization of work has the effect of generating information on both the labour processes of coders and creatives, and the 'performance' of the digital knowledge commodities that they produce and provide. The generation of digital information on the inputs and outputs of the production process provides a means for organisations to develop and extend strategies to monitor, evaluate and control the value being produced by labour. Through the adoption of workplace management systems such as workflow management (WFM) systems, customer relationship management (CRM) systems or the latest human capital management (HCM) systems, the datafication of production inputs and outputs and the 'digital residue' left by workers through their online identities, the trail of digital information following the activities of coders and creatives makes them susceptible to quantified digital control.

The software and creative firms where this studies participants worked all adopted similar production methods in their organisation of work. A combination of digital Taylorism (McNally 2010; Holford 2019) where complex, multifaceted projects are broken down into simplified and routine tasks through WFM software and a hybrid mix of 'self-organising' agile management systems (Moore 2019), despite some organisations holding back in from adopting their full logics. Martin suggests the reasons behind the reluctance to devolve more control to development teams is trust and accountability:

> "Everybody's trying to do agile. They are all having scrums, they are trying to have these small agile teams, but they're still releasing in waterfall method. It just means they're too slow to catch up.
>
> **Interviewer:** What's blocking people effectively implementing the agile method?
>
> **Interviewee:** Accountability. I think everybody shits themselves…when people try to get new features in, tons of specs are required. Proof, requirements, documents. "Why are we spending the time on this? You'd go" - Usually they're wasting more money and time making sure that they're not going to be the one that's held accountable for a feature that goes wrong. But in fact, the best way to build and design is to get something in, analyze it, research it based on what the users are doing, and change it, as quick as you can. Yes, it's iteration, the point of UX, well, part of the point, is that your meant to screw up. Because you don't ultimately know what the user really wants. I would say people just don't want to be called out for bad work." *(Martin, UI/UX Designer)*

To extend and consolidate organisational control over the indeterminate and ambiguous coder and creative labour process, firms have across the board adopted new WFM software 'solutions' such as Jira, Trello, Monday, Teamwork and so on. These systems allow for the implementation of Taylorism and agile as projects are divided into narrow tasks or 'tickets' that are then allocated to designers and developers. The implementation of the ticket system then allows for the monitoring of the labour process as the time and progression of tickets are tracked by management and peers. Ultimately, control over the labour process was made possible by the digitization of work. The channels through which digital quantification exercised control included not only WFM systems but the 'performance' of the commodities being produced as they integrate into the market through user/consumer use and consumption. For example, the digitization of Sarah and Saoirse's labour process leaves them more exposed to performance monitoring from their employers as the user/consumer engagement with their products (digital content) is quantified through datafication. The social recognition that is required to validate the value of their labour outputs is itself an inherently indeterminate process, especially within the context of online engagement (Duffy et al. 2021), however, this becomes intensified when the 'performance' of digital content is subject to quantification:

> *"It depends on what they're [management and clients] looking for, say if it's for a product and your content is working or connecting and **you can see that people are engaging with the product** or they're using the website as it should be. Or if it's ecommerce, if they're **getting the conversions**. For things like advertising if your creating campaigns, like **that's the good thing about digital, it can be measured, and you can see the results and you can see the engagement with people. You can see the [consumer] sentiment and how it's going**, say if it's for sign-ups and stuff like that, seeing those results, they [management and clients] value it." (Saoirse, Copywriter and Content Lead)*

Similarly, Seb's performance is measured through the quantification of the 'business metrics' of his teams product:

> *"In the most easy to define sense, **my value is measured in the business metrics for my software**. Those metrics are new user acquisition, how many new customers are buying NetLink because of our email software, which is new user acquisition revenue. How many people are upgrading from our free product to our paid products because of the*

marketing email software? **How much net new revenue am I bringing into the company?***" (Seb, Product Manager)*

The digital saturation of our everyday (working) lives that emerges from the process of digitalization gives renewed emphasis to the importance of reputation and the role that it plays in establishing and navigating a career. As online actions continue to generate information and configure online 'identities', the digital footprints of coders and creatives become a means of control over the value of their labour. The ambiguity experienced in the recruitment process due to the indeterminacy and crude calculability of knowledge work can also put increased emphasis on the role of reputation and exposure in the labour market. Mary (software engineer) speaks of the increasing need to manage your 'digital residue' in a manner that communicates employability:

> *"It's really quite scary how everything follows you around. I do think **it is really important to make sure that the digital residue that you leave around the web of yourself paints you in a picture that leaves you employable**. That's one thing that is different now."*

Furthermore, this digital saturation interacts with and intensifies the relational attachments that emerge though the commodification of knowledge. In particular, the professional network sociality that is integral to the construction, dissemination and legitimation of knowledge domains (through occupational communities, meetups, conferences etc.) begins to take on a new reputational role of exposure as people look to craft their digital residue into digital resumes:

> *"I do see now people that I have interviewed for roles and on resumes and stuff like that. **I see people crafting this evidence of solving problems whether that's in GitHub which is their social coding repository or whether it's on a website like HackerRank where they have a profile or stack overflow where they've amassed a load of points by solving problems or answering questions for people**. People do use that to say like, "Here, look, these people think I'm qualified." Alongside LinkedIn which I think people casually glance at these days but it's not really that representative of what your capable of anymore." (Mary, Senior Software Engineer)*

To summarise, the commodification of knowledge in the coder and creative labour process is characterised by the digitalization and digitization of work (as the primary means of objectifying knowledge) where digital knowledge commodities are produced. As a

sociomaterial exigency, digitalization manifests through three primary channels in software and creative work: digital saturation, acceleration and quantification. How these emergent phenomena intra-act with other exigencies can intensify the scale, scope and frequency of labour for these workers as is the case when the sociomaterial attachments in the production of knowledge become digitally mediated.

5.6 Conclusion

In order to identify and comprehend how the commodification process, in particular the commodification of knowledge, shapes the experiences of workers, this chapter introduced and developed the bridging concept of *sociomaterial exigencies*. The analysis identifies important 'connective tissue' (Thompson and Vincent 2010) that binds the labour process to the political economy by linking the process of commodification, and the sociomaterial consequences it triggers, to the experiences of workers and the organisation of work. In doing so, this chapter demonstrates the many ways in which the sociomaterial exigencies of knowledge commodification materialise in the embodied and relational practices of software and creative labour. The dimension of indeterminacy and exclusivity, and the practices of sociomaterial attachments and objectification through digitalization were identified as core exigencies of knowledge work, and the channels through which they manifested in the experiences of the software and creative workers were demonstrated and are collated in the figure below. Overall, the basis of this chapter are the four exigencies that exist as inherent, emergent properties of knowledge production, however, what is most significant in the chapter is the demonstration of what happens when these exigencies become activated or triggered (Mingers and Standing 2017) in the production and work process. The sociomaterialist critical realist framework pushes us not only to identify the core mechanisms implicated in social phenomena, but how those mechanisms manifest in the conditions and experiences of social life 'on the ground'. Each of the sub-sections in this chapter have focused on what I refer to in the methodology chapter as 'channels', specific routes and pathways through which active causal mechanisms 'touch down' in the empirically observable phenomena of research.
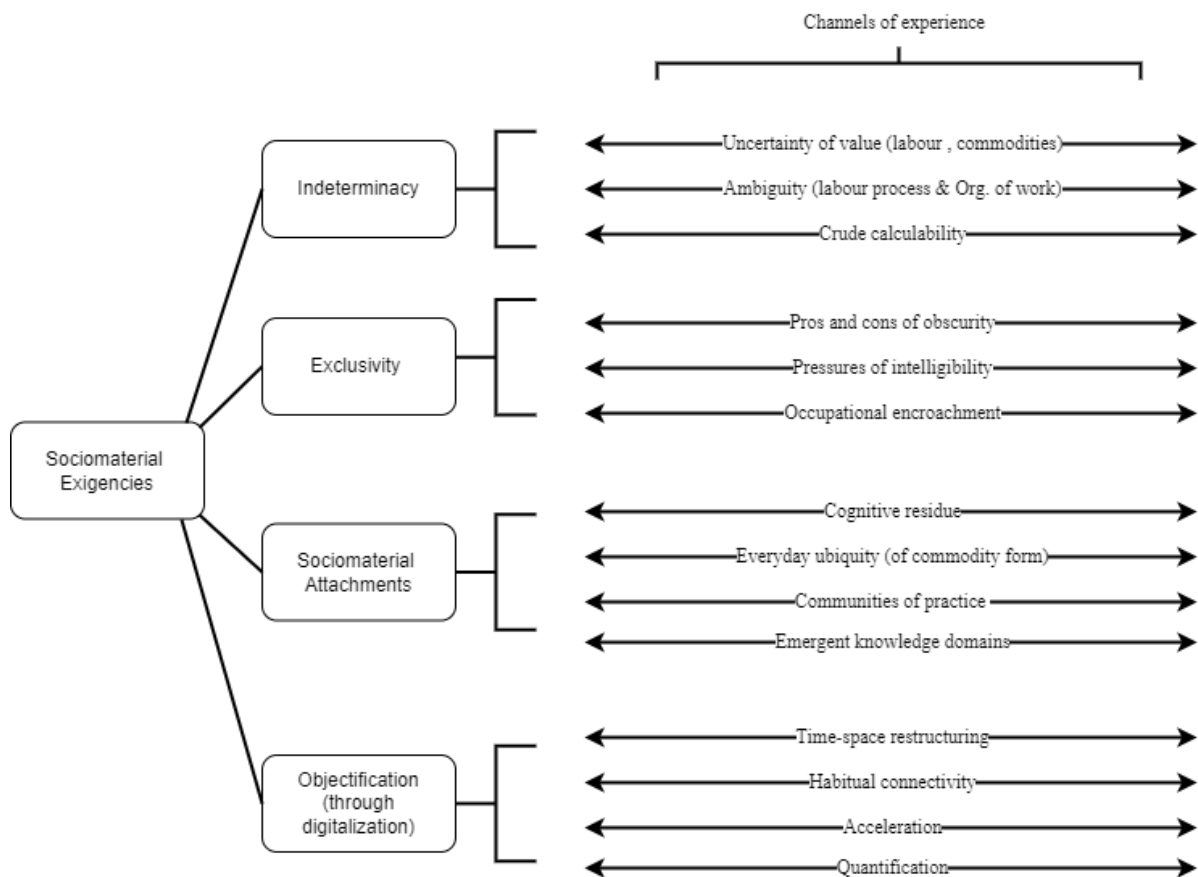
Figure 8: Sociomaterial exigencies and their channels of experience.

Much of the debate on knowledge workers has been contentious and at times fraught with confusion as researchers ebb and flow from revealing 'new' empirical characteristics of such work (networked, project-based etc.) to critiquing the distinctiveness of such observations by identifying their historical roots and presence in other non-knowledge forms of work. What is evident though is that much of this scholarship is focused on examining various cases of knowledge work as embodying something different, albeit ephemeral and hard to distinguish. The conceptual tools that are advanced here edge us closer in our sociological observations and help us identify the mechanisms at play in (digitized) knowledge work that may lead to distinctive, or emerging features in the labour process and organisation of work. The operationalisation of the concept of sociomaterial exigencies, and its introduction to labour process theory aims to extend the core theory by accounting for the sociomaterialisations of the labour and production process. The commodity form is the crystallization of capital accumulation (the pursuit of value), the expectations of the capital-labour relation (what employers expect from labour and what labour expect to produce), and the mediation of the relations and interactions between capital, labour and the market (customer, consumer, user).

163

Uncovering the emergent sociomaterial exigencies of different commodity forms as they arise in diverse contexts of work, organisations and national political economies helps unpick deterministic claims about the forces shaping labour and the organisation of work by prompting researchers to consider the materialities of the practice of work itself. This chapter has laid the groundwork for the sociomaterial labour process analysis that follows in the examination of the contested terrains of control, work-life boundaries, and subjectivity.

Chapter 6: The Contested Terrain of Control

6.1   Introduction

This chapter is the first of three where the sociomaterial exigencies identified in chapter 5 are used to extend and renew our understanding of a contested terrain of working life. The focus here is on the contested terrain of control – the organisational space and time where these workers are managed, and production is coordinated. It is here that we find that these workers are caught between the organisational imperative for control over work on the one hand, and the conditions of ambiguity that are generated from indeterminacy and exclusivity as exigencies of knowledge work on the other. The indeterminacy of knowledge and the emerging and contested exclusivity of knowledge domains, and the channels through which they surface in the labour process and organisation of work[29] act as driving pressures that imbue the production process with an inherent uncertainty and ambiguity. Consequently, ambiguity in knowledge work emerges as the antithesis of the desired rationality of capitalist production, causing tensions for the imperative of control and compelling management to devise and implement new strategies of control. The managerial and organisational strategies employed to manage both knowledge work *and* its ambiguities act as contingent pressures on the coder and creative labour process, manifesting as either more or less acute depending on factors like the context of individual organisations, level of seniority or even the preferences of individual managers. These workers are therefore caught between the need to navigate between two fundamental aspects of their work, each of which acts as a pressure influencing the organisation and conduct of work. The chapter thus focuses on how organisations achieve control over software and creative workers, and analyses how the condition of ambiguity that characterises the work intra-acts and at times intensifies the experience of control.

The chapter articulates the implementation of agility management and production logics (Moore 2019) across the software and creative sectors as a 'hybrid strategy' of managerial control. It builds upon Barrett's (2001; 2004; 2005) analyses of control over software development labour where she finds the simultaneous use of multiple forms of control, Hodgson and Briand's (2013) analysis of a game production team that identified the limited nature of autonomy afforded by agile project management, and wider literatures that examine the relation between (technical and creative) autonomy and control in software and creative

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[29] The four exigencies of knowledge work identified and examined, and the channels through which they manifest and are experienced by software and creative workers are explored in chapter 5.

work (Huws 2010; Hesmondhalgh and Baker 2011). I argue that the control of software and creative work under agile management logics, although organisationally contingent[30], converges under and constitutes a form of control that can be described as *regulated autonomy*. Regulated autonomy, as a form of control, describes specific strategies employed by organisations to control the knowledge work of software and creative workers. This hybridised form of control merges types of direct control and structural control (Edwards 1979) with *bounded* autonomies to achieve a mix that provides the organisation with more control and workers with the *minimum necessary degrees* of autonomy. The introduction of the concept *regulated autonomy* builds on Friedman's (1977; 1990) distinction between direct control and responsible autonomy, occupying a terrain closer to control and further from autonomy (see figure 9 below). It is based on the acknowledgement of the current need to accede degrees of autonomy to knowledge workers whose labour processes are characterised by ambiguity, while extending the reach of managerial control through configurations of regulative devices. *Regulative devices* are here defined as instruments employed by managers throughout the production process to establish rules, procedures and norms with the purposes of directing, evaluating and disciplining work (Edwards 1979; Kellogg et al. 2020). The regulative devices employed by management within the software and creative sector constitute five types of control: simple or direct, technical, bureaucratic, market and normative, and the following sections explore how these surface across both sectors and are experienced by different cohorts within each sector.
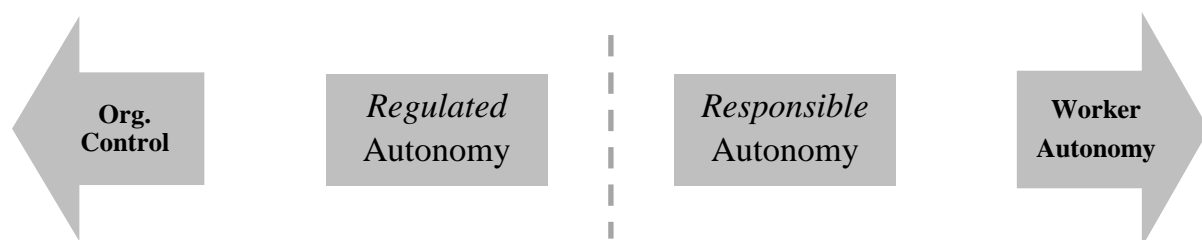
Figure 9: Organisational control continuum.

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[30] I use the term 'contingent' here to emphasise the diverse ways in which agile logics are present throughout the organisations where these workers work. In software companies, these principles are explicitly evident through their formal *institutionalisation* and normalisation, whereas the creative agencies tend to organise production along the lines of an *impromptu* agile method where the core principles of agile production are maintained without the explicit invocation.

The chapter is structured as follows: first, the organisational control of software work through the enactment of regulated autonomy is demonstrated, with consideration for the diverse ways in which this is enacted across organisations, second, how regulated autonomy manifests in the work of creatives is detailed and finally, the currently unfolding conditions for both software workers and creative workers that result from their experiences of control are analysed and presented before drawing some implications and conclusions for the organisation of work in the software and creative sector. The chapter is oriented around answering the following two questions:

RQ1.   How is organisational control achieved over the work of coders and creatives?

RQ2.   How is control experienced by these workers, and what are the emerging conditions unfolding from these experiences?

6.2   Regulated Autonomy in Software Work

The production of software has become a critical technology, product, infrastructure and activity in the ongoing digitalization of economies, and the software developers whose knowledge and skills provide its foundations occupy a privileged position in both the labour market and within their respective organisations. Software is an 'evolving object' (Adler 2005) and its development is a relatively new domain experiencing an accelerating rate of change and experimentation, and developers themselves are at the forefront of both driving and implementing new ways of making software. Phoebe Moore (2019) identifies 'agility management systems' as *the* current wave of management strategy, originating from these developments in software production and the 'Agility Manifesto' which was published by 16 software developers[31] in 2001. Agile production promotes the principles of adaptability, high commitment, iterative development and self-management, and its logics have become normatively embedded within the software development community and its methods are increasingly formalized within the organisations where the participants of this study work.

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[31] The 16 male creators and developers of the Agility Manifesto all occupy strategic managerial positions across the technology industry, from company founders, chief executive officers, chief technology officers to specialist development consultants. These positions suggest a direct alignment with business goals and the imperatives of production management.

It is within this context that the emergence of a regulated autonomy is established. In the same way that Friedman's (1977) responsible autonomy highlighted the importance of operational and temporal autonomy (Barrett 2004) for the organisation and conduct of (primarily professional) work, the analysis of regulated autonomy presented here focuses on the *bounded* operational (hereby referred to as 'technical autonomy' for software work and 'creative autonomy' for creative work) and temporal autonomy of work for coders and creatives. This section on the regulated autonomy of software workers, and the following on creative workers, is therefore oriented around the analysis of organisational control through regulative devices (see table 15 below for software work) and the bounded autonomies these workers experience.

Regulated Autonomy in Software Work				
Direct (Simple) Control	**Structural Control**			
	Technical (Operational) Control	Bureaucratic Control	Market Control	Normative Control
Regulative Devices	Deliverables	WFM Systems	Institutionalisation of Agile production methodologies	Responsive to tech.	Affinity with 'Agile' logics.

| **Regulative Devices** | Deliverables = requirements, user stories, acceptance criteria, tickets. | WFM Systems Ticketisation, formalization of work, digital assembly lines. | Institutionalisation of Agile production methodologies = new organisational units (Triad), new procedures (story pointing) | Responsive to tech. Responsive to business stakeholders (clients, competitors, users, managers, colleagues) | Affinity with 'Agile' logics. Teamwork (interdependencies, peer control) |

Table 15: The types of control and regulative devices used to regulate the autonomy of software workers.

For the purposes of this chapter, the total number of software workers included in the analysis of control is 19. The remaining two participants in the software case are Seb and Noel who occupied the roles of Product Manager and their perspectives are used in the following analysis to provide managerial insight. For details on these software workers, their level of seniority and the organisations where they are employed, please refer to table 10 on page 112 in chapter 4. The control of work for these software workers was achieved through the implementation of agile production and management systems which merged forms of direct, technical, bureaucratic, market and normative controls. The corpus of Agile software development is built

upon the twelve principles outlined within the Agility Manifesto[32], and as a development methodology and management system, it was institutionalised across all the organisations where these coders worked, and its logics were normatively embedded within the ways that these workers thought about and talked about making and managing software. The Agile production model in software is illustrated in the figure below. Agile management in software is organised around contained development cycles called 'Sprints' and two organisational units - the 'Triad' containing the Product Manager, Design Lead and Engineering Lead, and the 'Team' containing the individual developers and testers (figure 10).
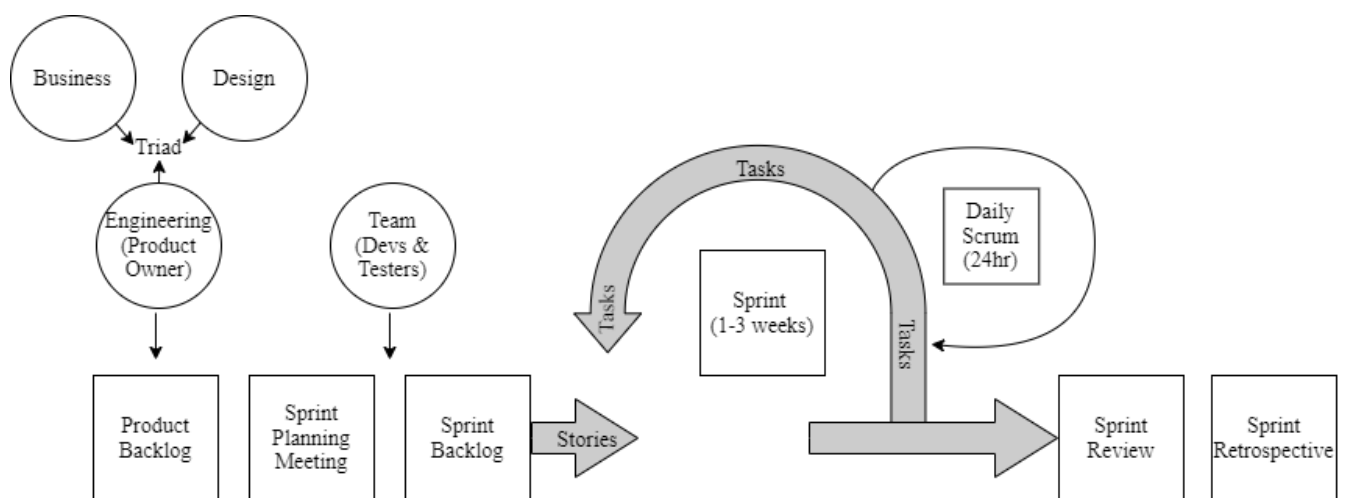
Figure 10: Agile production process.

Direct control through Deliverables and Managerial 'Feature Creep'

Despite the popular belief that agile represents the antithesis to hierarchical control where workers are subject to direct control by their superiors, its implementation in software organisations restructures production and control by shifting the epicentre of control to 'the product'. Now, both middle management occupations and developers are subject to the success of the products that they work on and are responsible for:

> "**I have a team** in the region of 12-14 engineers, a couple designers and then a few abstract team members that fill in the gaps. **The counterintuitive aspect of that is that none of those people actually report to me. I'm not their manager**. I don't have

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[32] 1. Customer-value first, 2. Constant change, 3. Frequent delivery, 4. Alignment with business, 5. Build and trust "motivated individuals", 6. Interaction over documentation, 7. Working software over perfect software, 8. Set and maintain a "constant pace indefinitely", 9. Technical excellence and good design, 10. Simplicity, 11. Self (team-based) organisation, 12. Self (performance) management.

*performance review meetings with them. **They are individual contributors on the product just like I am**, but its my responsibility to oversee the overall success of the product and to make sure that everybody's working towards a single goal." (Seb, Product Manager)*

Explicit hierarchies are repackaged around the organisational units of the 'Triad' and the Team, and the traditional notion of 'the boss' becomes diffused within a discourse of leadership for the benefit of the product:

"We call it the 'Triad', which is the leadership on each product which is the Product Manager – me, the Product Designer and the Technical Lead. Between the three of us, we make up the brain trust for any particular product. Every single [Agile] team will have one of these units associated with it." (Seb, Product Manager)

Within this new Agile setup, *direct control* over the strategic and technical operation of software work is achieved through the definition and organisation of projects around deliverables. In her seminal study of software developers, Barrett (2001; 2004; 2005) identified managements use of milestones as a form of simple control over software work. The use of milestones is a cornerstone of work within sequential 'waterfall' production systems, and agile production as the now almost universally adopted new system of development diffuses the use of milestones within a re-structured production cycle. Now, direct control is achieved through the deliverables of 'Sprint' development cycles which are generated and prescribed by the Triad "*braintrust*" (Seb) and then filtered down to the development team. In most cases, the engineering lead within this 'leadership' unit decides which technology stack the team of developers will use during the programming of the product.

"We have our squad; we're called squads now! We have a Tech Lead who's in charge of day-to-day technical decisions, so what language we work with, what things we update, he would have an input into what way we tackle technical decisions. Then there's an Engineering Manager who's over us and another squad as well, and he is also very technical because he is from a software engineering background as well so he would be deciding who does what and chatting with the product guys to see what goes into our sprints and I suppose it is up to him how much tech debt we handle and how much is new features. There's a product guy that is in our daily sprint meeting and he decides what product features get added, so between those three guys [the 'Triad'] they decide what is important." (Rachel, Software Developer)

Direct control over the work of coders is therefore established in the first instance through the formalization of this new agile system around project deliverables defined by middle management. The organisation of work and division of labour[33] within agile software production is coordinated around this new organisational unit of leadership and authority. As strategic and technical control rests with the organisation's senior management and product leadership, the *bounded technical autonomy* of software developers is confined to the unit of the task. The experience of direct control also differed for some developers based on their managers preferences (Ian) and the size of the companies where they worked (Adam and Simon). For Ian, Adam and Simon, control was also more personalised. The demands and management style of individual managers was the source of this control for Ian and Simon because:

> *"When we dealt with the CEO himself, he had a tendency to be extremely terse in his requirements. We found ourselves doing a lot more [work] and he was a devil for feature creep, he'd say 'Oh, let's do that!'' and change his mind a few times halfway during a ticket." (Ian, Software Developer)*

> *"The CEO asks for last minute changes, even though they seem easy – 'That should be easy, shouldn't it?', but the problem is you make that change and the whole thing [system] has to go under batch testing again." (Simon, Software Engineer)*

At the early start-up stage of Ian and Simon's companies, as was typically the case in start-ups, the CEO had solely assumed the responsibilities of the Triad or product leadership. In doing so, their personal tendencies for "feature creep" further regulated the technical and temporal autonomy of developers, and "terse" communication of deliverables intensified the ambiguity surrounding work requirements. These experiences of personalised control were also noted by Adam and were most evident within start-ups because these firms tended to have less than 10 employees and both the founders and developers often worked from the same desk space.

The re-organisation of work around the contained Sprint cycle not only prescribes the content that coders work on but also the timeframe they are provided to complete the work, bounding the technical and temporal autonomies of coders. Across the participants' organisations, Sprints varied from 2-3 weeks and the labour of workers was monitored, measured and evaluated

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[33] The 'Engineering Lead' within the Triad unit is more of a placeholder term, and sometimes it is referred to as the Tech Lead, Technical Architect, or even Chief Technology Officer depending on each organisation and how they choose to distribute roles and responsibilities.

against the set Sprint deliverables as the *"work is monitored on how many items [tickets] I get done in each sprint or each release." (Kiera)*. The product leadership (i.e Triad), which is primarily coordinated by the Product Manager/Owner *"does stats on the velocity of the team and how much work we're getting done…and the value I'm adding" (Amelia, Software Engineer)*.

Technical control through workflow management systems and the formalization of work

While the setting of project deliverables through the conception and prescribing of requirements, user stories, acceptance criteria and tasks are controlled within the Triad, this *bounded technical autonomy* afforded to coders continues once these project tasks are uploaded as 'tickets' to the workflow management systems (WFM) used within organisations.

> *"My typical day would involve working on tasks that I'm assigned for the Sprint, which is two weeks. We use Azure [WFM system]. The Product Owner will receive all of the requests and filter out the priorities, then that would go down to us [developers] into Azure as a ticket on our Backlog." (Ieva, Software Engineer)*

> *"Between him [Chief Technical Officer] and the Product guy, it's a big filter as you can imagine and we [developers] don't know what happens above the filter, but work [tickets] come down from above and that would be the work that needs to be done…It's [Work] all centred around Jira tickets, the Sprint and the Product guy pushing things along." (Ian, Software Developer)*

The metaphor of a filter that Ian invokes here aptly describes the organisation of software work under agility management systems. The Triad acts as "a big filter" that generates the deliverables and specifications that are fed down to developers through their workflow management systems. *Technical control* is achieved through the formalization of the organisation and conduct of work with the implementation of these WFM systems in what could be described as a digital assembly line. Jira and Azure are the two most common WFM systems used to manage software production, and their technical design are premised on agile management practices which merge techniques of Taylorism, lean production, Kanban[34] and

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[34] Kanban boards are based on the Japanese Kanban principles of continuous improvement, and they have been adopted throughout agile management. For example, one of the main providers of agile software management tools *Atlassian* describe them as '*an agile project management tool designed to help visualize work, limit work-*

continuous improvement or 'Kaizen'. As Michael asserted *"the whole lean Agile approach is all about tracing back your work to a particular value-stream"*. Alex's description (below) of the technical interface of Jira illustrates how it orders the work of developers along an assembly line through digital Kanban boards:

> *"It's an industry standard now how to do work in terms of Jira – breaking up big tasks into smaller pieces. So with Jira you have a list, the tickets are in the 'To-Do' pile and then you move them into 'Development' when you are working on it and when you are finished it goes to 'In-Test'...if it passes the testing stage it moves into 'Done' and then you pick up the next one [ticket], and that's the process until everything is in the 'Done' pile." (Alex, Software Developer)*

These WFM systems are effective regulative devices used by management to extend control over the knowledge labour process of coders. Through their formalization of the work of developers, programmes like Jira help organisations tackle the ambiguities of knowledge work by reducing the exclusivity of computer programming. By dividing software projects through the process of ticketisation and requiring that developers work through tickets within the system, the implementation of these WFM systems makes the tacit and implicit knowledges of software work explicit, codified and accessible for management and other business stakeholders. Because *"everybody knows the problems that you are working on, they get to know how long you are taking on a particular problem. It's all clear! The fear of judgement can be very crippling.*" (Rachna). Adam describes the effectiveness of Jira in formalizing the knowledge of software developers below when he compares it to a previous ticketing system:

> *"we used to use Redmine, it was very techy, if I gave it to you, you wouldn't be able to read it. It just wouldn't make any sense. What Jira does is for better or worse, it lets our marketing team [and management] come in and see what we're doing, which could be a negative in the future. It makes it more user-friendly." (Adam, Software Developer)*

One of the consequences of the formalization of work through WFM systems is that they erase the intangible, communicative labour that is the glue that binds software development projects and teams together. Furthermore, this was felt most often by those few developers that were "*more people-focused*" such as Rachel:

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in-progress, and maximize efficiency (or flow)...Kanban boards use cards, columns, and continuous improvement to help technology and service teams commit to the right amount of work, and get it done!' (Atlassian.com).

"I find sometimes it does put a bit pressure on you to do work that's in Jira, which is not always…I actually said this to them yesterday, because I am there the longest and I get landed with all sorts of random support queries and I am just talking through older parts of the code with other guys, sometimes I often don't get to any of the tasks that are in Jira and I feel pressure in tomorrow's stand-up when I have to say "what did I work on yesterday? I can't remember, it was mostly phone calls and support and tracking down this random bug." Likewise when we get to…we do quarterly reviews and I know that when we get to that at the end of the year I would like to say that I achieved this this year and I developed this nice big piece of software and it's released and it looks great and I'm not going to be able to say that because I have been doing loads of random little stupid tasks that have to be done but nobody else is doing them!

So, Jira keeps that pressure on." (Rachel, Software Developer)

Bureaucratic control through the institutionalisation of Agile structures, procedures and norms

Perhaps one of the most important factors driving the adoption of agile production is the general disdain the software workers had for 'bureaucracy' within their organisations, echoing wider post-bureaucratic narratives of the New Economy. As Mary stated, once "*you have to add structure [to the organisation of work] you also get bureaucracy and people don't feel as free to work the way they want or to build things the way they want. That structure creates a bit of constraint and frustration as well.*" The paradox of the widespread adoption of agility management in software production is that its principles have become institutionalised as a set of structures, procedures and normative behaviours across the organisations where these coders work. Agile production is designed as a modular method of managing software work, as Brian, a Software Engineer working in a large software multinational stated "*the idea is you can take as much or as little of it as you want. You can have the daily Scrum meetings, or you can go full-on with Sprints and all sorts.*". Within all the organisations where these software workers were employed, the whole suite of agile structures, practices and procedures were adopted: from organising production around Sprint cycles, dividing labour through the Triad and Team structures, dividing and formalizing work through ticketisation and quantifying work through the metric of 'story pointing'.

The introduction of the *story point metric* is an essential regulative device employed to increase the efficiency, calculability and predictability of software development. Story points are a numeric metric which are attached to the bodies of work tasks (i.e User Stories) to provide the organisation with a quantifiable basis of measurement for the qualitative ambiguity of the coder labour process. The criteria through which these calculations are based changes across teams and organisations:

> *"Researcher: In relation to the specific tasks or user stories, how do you determine the points that each task gets? Do you do it based on effort or on time?*
>
> **Time, it's definitely time**. *At the start of each sprint there will be a meeting with all the developers, the business analysts, everyone writing the script [i.e requirements doc], all that sort of stuff, so we'd all have a meeting. Then, we would go through each item and discuss what it's about and what part it's supporting. Then we go back to our desk and **we spend the day looking through each script and which ones are signed off by business and that sort of thing and then put timings on each one of them**." (Michael, Software Engineer)*

> *"The **story point is supposed to be related to the complexity of the task. More often than not, people associate it with how long you think the task would take you. That's a common misunderstanding**. It's usually using the Fibonacci sequence, like you say one is a really simple task, **a three pointer is something a little bit more complex, a five pointer more complex - that's twice the amount of complexity as the lower one** and things like that." (Kiera, Software Test Analyst)*

In some instances, as was the case for Chris and Brian, two Senior Software Engineers, story points were disclosed by management to their teams, and developers needed to complete the work within the expected timeframe and criteria. However, for most of the participants these metrics were teased out in meetings with both management and team members. Typically, this would occur in both the sprint planning meeting (before each sprint) and the sprint retrospective meeting (after each sprint) which is described in the excerpt below:

> *"Then on top of that, there would also be sprint retrospectives. They'll be usually around the end of a sprint, it's basically where the dev team gets together. Even though I'm not a developer, I'd be involved in those meetings as well where they would talk about things like what went well during the sprint, what could be improved, any action items that can be taken for the next sprint. The idea of it is, it's usually facilitated by*

somebody called a delivery lead, now that person traditionally in other companies could be called a scrum master or agile coach, in our company they happen to be called a delivery lead at the moment. Their titles have changed from time to time.

Basically, **they facilitate that meeting and they just try and capture some metrics first. We record the team's metrics in Confluence, it's an online tool and basically they record things like the velocity of the team. The team, how fast they're working through their stories or their work to do**. *It's not really captured in order to put teams against each other because the way the work is sized, is what it's called, each team does it differently and it's usually just the team gives a number. Usually, they say that's a one-point piece of work, that's two, that's three, that's five. Some teams won't even go up past five, other teams they'll say, "That's an eight-point story." Each team sizes it differently.* **You can't really compare teams to each other but it's more to give the teams an idea of what their velocity is**.*" (James, Product Designer)*

This description of the sprint retrospective meeting used within agile development illustrates the use of story pointing as a regulative device measuring the performance of coders. By (mostly) allowing software teams to quantify the effort needed to complete their work tasks, the organisation simultaneously achieves control and consent. Consent is generated by affording software workers degrees of what Pawlicki (2013) termed 'negotiability' – the exercising of voice within the organisation/conduct of work. However, as a device of control, the story point metric removes ambiguity for management by making workers translate their tacit knowledge of the labour process into explicit, codified forms, making it more accessible and intelligible to management. Quantifying the knowledge labour process as an activity in itself is a source of frustration for these workers, but this then becomes intensified when story points are used by management to construct a team's work "*velocity*[35]". Moreover, the introduction of quantified logics within the workplace provides a basis for measurement and therefore comparison, however "*pointless*" this may be according to developers. The story point system thus provides a trigger for workplace politics and group friction:

*"**What I see a lot of is forging with story points**. We're on a program and there's one team. Our team is averaging about 20 points or so per sprint. There's a team, they're an outsource team, they're of similar size but they're hitting 50. It is comical that **there***

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[35] The term 'velocity' is used within agile production to describe the scope and pace of work (i.e stories, tasks etc.) achieved by development teams within a given sprint or cycle of development.

is a little bit of posturing being done with story points and stuff like that. I know one thing is you shouldn't compare the points or the number. **Your cadence[36] stuff is only relevant to your team and it's relevant to how you compare the cost of your set of sprints, not anyone else's**. I do think that there's a little bit of forging going on, like that teams think bigger number of points makes it look like we're getting through more work." (Michael, Software Engineer)

The institutionalisation of Agile management in software production establishes *bureaucratic control* over software work by introducing these new structures, procedures and practices as regulative devices. As Julia, a Software Engineer argued *"following a methodology to the point where it started feeling constrictive, it's suffocating you, it's sucking all of the creativity out of the process"* means that the normative belief in the autonomy agile brings to workers because *"Agile teams are self-organising and there's no watchdog"* (Rachna) in fact represents something of a paradox. These normatively held assumptions of the superiority of agile production served to generate consent to agility management systems. The implementation of these new structures and practices, and their alignment with business goals through key performance indicators (KPI's) and objectives and key results (OKR's) served to extend organisational control over software work.

Market control through the demands for adaptability and responsiveness

Perhaps one of the most essential features of Agile production is that it exposes workers to market pressures and control. Moore (2019) argues that agility management reverses the roles of workers and technology as it requires workers to become adaptable to changes in technology as opposed to technology adapting to the needs of workers. However, this demand for adaptability and responsiveness by workers is not exclusive to technological advances but also spreads throughout the organisation, exposing workers to the demands of other business stakeholders such as users, clients, managers and other departments such as sales and marketing. The principles of customer value, constant change, frequent delivery and alignment with business goals that Agile enforces meant that there was a normative belief that software workers would be poised for responding to changing demands and "feature creep". The market

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[36] In agile production, a 'cadence' is the length of a team's development cycle or sprint in days or weeks.

within software production, and particularly the software as a service market (SaaS) is extremely fast paced and competitive and as Kiera described, workers:

> "...need to be able to problem-solve and problem-solve fast because its very, very fast-paced...We don't have time to waste while we're doing production support. We need to get as many of these [problems] fixed as possible in each sprint." (Kiera, Software Test Analyst)

This is the environment in which Agile production has overcome traditional production methods. Rachel details the need for this transition based on market pressures below:

> "Waterfall just doesn't suit anybody, by the time you have developed something its too late to say 'I don't want that, I wanted something different', and the world is full of changing requirement and customers don't know what they want anyway!" (Rachel, Software Developer)

As a production and management system, Agile exposes workers to the pressures of the market in an attempt enhance competitiveness and responsiveness to the demands of consumers and stakeholders:

> "there are two different parts to that. Responsive to whom, there are your stakeholders whether that's your boss or customers of whoever you are developing for, you do have to be conscious that they are going to change their requirements and then also your competitors are going to do something and then suddenly you are behind or maybe you have a better idea and to keep ahead of them you just keep having to make it better or maybe go in a different direction if that's what needs be. The other thing is just the technology, I don't know how many times we have got caught on the backfoot of something needs to be updated and this can't be updated because we rely on a library that hasn't been updated yet and yeah, you can get caught in a complete mind loop of what to update and what not to update." (Rachel, Software Developer)

It is through the re-organisation of production within short iterative bursts of development and the normalisation and acceptance of the logic of agility premised on constant change and adaptability that exposes software workers to *market control*. Another prominent form of market-based control that is often identified in the literature is the exposure of workers to crunch time based on strictly set release dates, a practice most common in the games sector.

Normative control through the internalisation of Agile logics and teamworking

The normative acceptance from developers of the need for adaptability echoes Gray et al.'s (2019) identification of an 'anticipatory availability' among IT managers. However, this need moves beyond the performative act of making oneself available in its demand that workers also become responsive by engaging in some form of adjustment through the technical and temporal re-organisation, and at times intensification of work. This is one of the many implications of internalising Agile logics within both the organisation of work and the subjectivities of workers. The normative affinity software workers have with not just Agile but also wider notions of 'the best way' to make software emerged as a common pattern across the sample. All of the workers were not only deeply knowledgeable of Agile principles and methods, they had an underline belief in and acceptance of its apparent superiority as a production method. Oftentimes, the issues and pressures that Agile management produced were justified based on organisational inefficiencies in how the method was implemented:

> *"The effectiveness of the [Agile] methodology is limited by people's understanding of what their role is" (Michael, Software Engineer)*

The above statement made by one of the senior engineers in the study effectively captures the normative veil's that come with the institutionalisation of agile production logics for software workers. Michael describes the limitations in implementing Agile when project managers are turned into scrum masters or agile/sprint coaches "*they see their roles as telling people what to do instead of clearing blockades and facilitating the dev team to do their work in the most effective way possible*" and the "*devs are still stuck in 'tell me what you want me to do', instead of feeling that they own the process*". The problem with the practical and normative adoption of agile methodologies in software work is that they imbue the process and roles of work with normative veils that mask their true nature and in turn amplify their contradiction. Scrum Master's and Agile Coaches are framed as non-hierarchical, de-politicised facilitators, yet they adopt the role of team and sprint managers ensuring that the defined workload (i.e sprint user stories and requirements) is achieved within the specified time (sprint cycle). Similarly, these developers working in agile systems are not the responsible professionals that they perceive themselves to be, with all the trust and autonomy that comes with that, instead they remain workers embedded within structures of control where their autonomies are regulated.

This perpetuated a belief that software work is not 'managed' per se in Agile, it is instead 'facilitated' not only by product 'leaders' but apparently objective 'tools':

> Researcher: How is your work and that of your colleagues coordinated, monitored, measured and evaluated?
>
> Rachna: It's mostly done with the help of tools and strangely enough, not by people as it was back in the old days or traditional way of software development. It's not like that anymore, being an Agile team, you only have your Scrum Master who's there to facilitate the process with tools…Essentially, Agile teams are self-organising, so there's no watchdog…the team is there to manage themselves.

As Rachna, a engineer in a large software MNC effectively describes, there exists a belief that managerial control through 'the watchdog' has disappeared when in fact it has become diffused, embedded and re-factored through new agility management systems. This normative belief, deepened by the diffusion and obscuring of control through its embedding within Agile procedures and logics and workflow management systems served to generate consent among software workers through *normative control*.

Conclusion

Agility management in software work is a sociomaterial assemblage of control over the labour process and organisation of work based on a form of *regulated autonomy*. By effectively merging forms of direct, technical, bureaucratic, market and normative controls using regulative devices, agile production systems at once constitute new social *and* material structures of control in software work. Agile infuses the development cycle with control through time (2-week cycles), content (requirements – 'stories') and evaluative (story points – work velocity) containers in the form of the Sprint through its bureaucratisation within software development organisations, while exposing developers to market pressures (users, clients, competitors) in its demands for responsiveness. Furthermore, because the notion of 'agile' is based on *"self-organising teams"* and the self-management of performance (Agility Manifesto 2001), developers have a normative affinity with its logics and a belief that properly implemented agile methodologies remove hierarchical workplace relations, achieving those idealised 'flat' organisations said to characterise knowledge-intensive companies (Alvesson 1995). However, this normative affinity masks the extent to which control persists through the regulative devices that agile production establishes within the organisation of software work. The normalisation of agile production logics across the software developers and the adoption

of formal agility management systems within the organisations where they worked served to embed direct and structural controls and produce *bounded* autonomies within the organisation and conduct of software work.

6.3   Regulated Autonomy in Creative Work

The regulated autonomy of creative work exists within what are defined here as *impromptu* agile production systems. As the previous section demonstrated, the Agile Manifesto and founding principles were formally *institutionalised* across the software sector for the coders within this study. However, the organisation and conduct of work for the creatives was characterised by systems of production that upheld agile principles such as adaptability, customer-value and iterative development but without the formal Agile labels. Within this context, regulated autonomy was also achieved through a combination of direct and structural organisational controls, although the regulative devices through which these were enacted had both similarities and differences to software workers (See table 16 overleaf). Similarly to the bounded technical autonomy of the software workers, the creatives in the study operated with bounded creative autonomy that was confined to the domain of the task. It is the struggle over the creative autonomy of the labour process that animates much of the experiences of control for these creatives (Hesmondhalgh and Baker 2011; Hodgson and Briand 2013; Weststar and Dubois 2022), and the inherent contradictions between the imperative for organisational control and the necessity of autonomy in the creation process (Huws 2010) that shapes this contested terrain for creative workers. This chapter therefore builds these strands of research on autonomy and creative work by demonstrating how the hybridisation of multiple intra-acting types of control combine to constitute regulated autonomy.

Regulated Autonomy in Creative Work				
Direct (Simple) Control	**Structural Control**			
	Technical (Operational) Control	Bureaucratic Control	Market Control	Normative Control
Deliverables = tasks/assets) Work overload	WFM Systems Ticketisation timetracking apps attendance bot, clockify and clocky	'Style/Design Bibles' (standardised, circumscribed rules and procedures) 'Design by committee'	Responsive to tech. Responsive to clients. Responsive to competitors. Responsive to consumers.	Activation of passion Identification with practice, product and occupation. (Smith and McKinlay 2009)

Note: The leftmost row label for the data row is **Regulative Devices**.

Table 16: The types of control and regulative devices used to regulate the autonomy of creative workers.

Within the creative sample of 23 workers, this chapter draws on the data from 20 of those participants who were employed on a formal basis within organisations. The remaining three participants worked as freelancers within the sector (*W15 Sean, W17 Ronan and W28 Darragh*), and their experiences are used within the analyses of chapter 7 and 8 to follow. Out of those 20 creative workers included in the following analysis, 10 worked within digital agencies that provided creative content services (design, video, copy, animation etc.), 1 worked in a game studio and 9 worked as creatives within product-based software companies.

Direct control through deliverables, managerial impulse and work overload (800w)

The organisation of creative work is highly varied compared to the formal agile structures and procedures implemented in software organisations, however, the impromptu agile production within creative work is still premised on an organisational unit of product/project leadership and upholds the principles of iterative development and adaptability. The leadership roles differed based on the organisations where the creatives worked, for example, Creative Directors and Heads of Design were the authority figures within digital agencies while those

working in software companies were directed by the same 'Triad' structures of their software development counterparts. The regulative devices of deliverables and Sprint development cycles prescribed the technical and temporal containers for coders, and these were normalised and accepted through their embedding in agile systems which provided teams with degrees of negotiability. However, the labour processes of the creatives in this study were much more individualised because despite the use of meetings and 'brainstorming' sessions, the creatives worked in more individualised labour processes where their 'assets' combined with other 'team' members to produce products/services. *Direct control* over the creative autonomy of these workers was therefore more personalised and visible:

> *"Once a week for an hour my manager would take us [commercial team] in and have a 'discussion' about the weeks work where she would tell us what we were doing. You weren't able to discuss it or to say "What about this or what about that?", it was just her going "This is what your doing. This is what your doing, and this is what your doing.". You just had to accept that. If you had too much work you just had to work around it, that would usually take you up to Wednesday and around then she would've gotten three or four more calls and gone "Add this to you list.".." (Jenny, Digital Designer)*

> *"Sometimes I'm just given stuff and told what to do" (Matt, Digital Designer)*

Not only were the projects and deliverables filtered down to creative content producers by the project leadership in a manner that left the workers side-lined on technical negotiations of direction and style, the creative autonomy of these workers was further bounded by their need to produce content that fell in line with the visions and preferences of their Creative Directors:

> *"When projects are assigned to me, they would be assigned by our Studio Manager and Creative Directors. They would assign me a project by email and then give me an idea of what the client is expecting and what our internal Creative Directors have envisioned...I'll show them [Creative Directors] progress throughout just to make sure that I'm on the right track and I'm on the same page." (Talia, Digital Designer)*

The more personalised controls that were employed by the project leadership in creative production contributed to the exposure of creatives to the whims of managerial impulses. Managerial "feature creep" was identified by a small number of coders as a source of direct control, however these unpredictable demands by management were experienced as a common pattern for all creatives. These impulses led to direct pressures on workloads:

> *"My boss goes "I had a dream last night about a brochure and I think we need to do that.". Then suddenly, you have got a six-week project, and everything gets pushed out. Then he's [the boss] still going "Why is everything getting pushed out? We need all these things!".." (Jenny, Digital Designer)*

> *"On the side of management, they might be like, "Oh, could you do this for me?" or "There's some changes that have come back." That always really eats into your time, that there's always changes in different projects." (Ruth, Designer)*

These managerial impulses and the feature creep that they produced constrained the creative and temporal autonomy of workers and they also contributed to the work overload that was experienced and noted by many of the creatives in the study. The burdening of creative workers with unrealistic workloads was a frequent experience and it was most often produced not only by this exposure to feature creep but by the denigrated and strained position creatives occupied in their organisations. The creatives working within software companies were denigrated by the lack of respect and understanding that organisations had for their work which led to their employers expecting high volumes of work from a few designers as Jenny attests to below. Similarly, the creatives working in digital agencies like Ruth (below) were strained by work overload because of the small number of staff and the tight margins of agency billing models:

> *"I know this isn't an experience unique to me. This company [her previous employer] has two or three offices in about 20 countries worldwide, its got over 10,000 employees and in total, there was five designers across the entire world. My workload was insane!...there was two designers who had any UI/UX experience at the time and our sector of the mega-company was working on a particular app that had hundreds of thousands of people users, and there was two designers working on it!" (Jenny, Digital Designer)*

> *"I was the sole designer, we were having all these big meetings, being seen as this big team, fluffing it up a bit, and then when it came down to doing the work, it was just me sitting on a computer and doing a redesign for this very prestigious brand." (Ruth, Designer)*

This combination of project deliverables prescribed by Creative Directors and leadership figures, the personalised exposure to managerial impulses for new requirements and the common experiences of work overload were all effective devices in regulating and bounding the creative and temporal autonomies of creatives.

Technical control through workflow management systems and time-trackers

The monitoring, measurement and evaluation of creative work through workflow management systems established *technical control* over work, although the tools adopted by organisations were more varied than those in software work. For some of the creatives working within software companies, their work was also *"monitored by JIRA tickets and then I have to log hours saying this ticket has taken seven hours or one day or two days and then I'm sending timesheets every month."* (Luis, UI Designer). The ticketing system that is applied to production through workflow management applications such as Jira, Asana or Trello are used not just for the division of work across projects but to track time spent working on individual tasks and for the "real-time performance data" (atlassian.com) that can be used on their analytics dashboards. Other employers, such as Harriet's, have shifted to control the production process with what were originally designed as chat applications. Slack is perhaps the most widely used of these and in recent years it has expanded its capabilities to handle workflow management along with being customizable through plugins like AttendanceBot:

> *"We used to use Teamwork, but at this point we use Slack for our work monitoring, and we have AttendanceBot built into that. That tracks the timekeeping. AttendanceBot, it's a plugin for Slack. It tracks us for when we're in and taking breaks, but also for each client, as well, so that he [manager] can produce to the client then how much work has been done." (Harriet, Digital Designer)*

All the creatives were delegated work and monitored through either WFM systems such as Trello or Asana, or with spreadsheets in Excel or Google, and these tools were used by management to set the rhythm of work. Although less granular and systematic than the systems employed to manage software development, these applications still involved the use of digital Kanban boards where project briefs were broken into smaller tasks and the progression of each task was monitored and timed throughout the production cycle. As Ruth put it, they help *"management in your agency make sure that your delivering everything in a certain amount of time."*. The demand that exists for creatives to be able to put a number to their labour comes from both management and clients because "*brands are expecting that you give them the right estimates of your time and you can manage that time and they can get the most out of what they're paying you*" (Saoirse, Copywriter and Content Lead).

When discussing the topic of monitoring and evaluating work, most of the creatives made an explicit link between the pressure to quantify their labour and the tensions that existed within their organisations over the value that they were producing. Eleanor details this issue below by describing the difficulties with evaluating the performance of creatives based on the track record of their content:

"It's [evaluation of work] from track record. If they hired me for a year and the game exists. It has a massive amount of writing in it. It's been given excellent reviews when it comes to the narrative, that's on paper and decent work has been done. It's difficult though. It's very difficult because someone could create something that is-- and this has happened obviously in the past where people create great works of art that weren't recognized at the time. People could have looked at X painting, book, story, or video game and said, "That is worthless." Then a couple of years later, people can realize the worth of something. It's very, very hard to trace value in the creative industry. How do you even go about valuing creative output? It's very difficult to decide." (Eleanor, Game Writer and Designer)

For others, these questions that emerge over the value of creative work are experienced in a more direct way with management and other departments such as sales and marketing:

"The thing we get all the time is because what you produce is so tangible and it's so like it's there for everyone to see, sometimes they can be used as an excuse for someone else not hitting their targets. The thing I get a lot is-- It's tolerated. It's never said directly to me, but it always gets fed back to me that say, sales haven't met their targets – "it's because we don't have this video, we don't have this video" and that video hasn't even popped up on your radar, it's not even on your list of projects. That could be sales, that could be marketing, that could be any department in the company. The flip side of that is there's never been-- In six years of being there, nobody has ever talked to me and said, "We've got this target. We've reached this because we had this video." Do you know what I mean?" (Rory, Digital Content Producer)

This frustration that Rory describes with the way his work is evaluated and criticised is a common feature for creatives and a point of tension in the production process which generated pressures on the creative and temporal autonomy of creatives.

"If sales are down, they are coming to creative! like if sales are down, whether it's...you might have designed a campaign maybe two weeks ago and your expecting it to last for

a month, if sales aren't great within those first two weeks [gestures with a clap of his hands] your designing a new campaign!. There's people within the company that work alongside you that are under a lot of pressure as well and this is the first thing that they'll go to." (Callum, Head of Creative)

The visibility and tangibility of the content the creatives produced put them in a position where they were more exposed to the pressures, expectations and judgements of other business stakeholders. Consequently, the technical control of creative work typically came with either managerial expectations for more, or a scepticism over the value they contribute, and the pressures imposed on them bounded their creative and temporal autonomy.

Bureaucratic control through 'design bibles', design by committee, and "operating in the work-ahead space"

> *"I think it [organisation of work] completely depends on the agency themselves. I know some agencies where they have a very strict process where they have worksheets that they kind of start off, then they go onto the next phase where every stage is completely made out before you even get there. A very strict process. But then you have other agencies where they're a lot freer and it's kind of up to their designer to have that control on a project and make that process all for themselves. I think it really depends on what way an agency works, because I've come across a lot of different agencies that work in completely different ways. As a creative, you just have to adapt to the way they work." (Ruth, Designer)*

Despite the production of digital design, copy and motion content following the agile and 'design thinking' principles of iteration and adaptability, the organisation of work for creatives is best described as variable. Ruth's comment above illustrates the diversity of this organisational context across the creative sector and this contingency meant that the *bureaucratic controls* these creatives were subject to differed based on where they worked. Overall, bureaucratic control over creative work was realised through the implementation of design bibles, the practice of 'design by committee' and the unusual space that the creatives occupied in software companies where work was structured along formalized Agile systems. The design bible (other times referred to as brand bible or style guide) is a comprehensive guidebook containing the rules, formatting and styles of an organisations 'brand identity', and

many of the creatives worked within companies that required adherence not just to the visions of Creative Directors but also to these design bibles:

> *"It [the management/employer] was like "Well, this is the precedent, so just follow what's already there.". The very confusing feedback I got was "Follow the template", but also "Don't follow the template!". It has to be new, but still follows the template, but it has to be 100% you, don't copy other people's work, but follow the template!" (Jenny, Digital Designer)*

The popularity of these style guides within the creative content sector stems in part from the fact that a large body of the work done by digital content agencies is the conception, design or re-branding of identities for companies, and these practices have not only shaped the work of creatives within software companies but also internally within the agencies themselves. The constraints on creative autonomy that are imposed by design bibles can also be worsened by the presence of 'design by committee' procedures within some companies. As Luis, a User Interface Designer in a medium-sized software company describes below, there are real struggles over the levels of creative autonomy that designers are afforded within such systems:

> *"Designing by committee is a pain in the ass when you have people telling you how to design or what to design. It's a very different thing. In my job it is frequent because there are a lot of assumptions and there's no room for me to actually design for the users or on behalf of the users. It's more of, "I think this should be here or I think users won't use it this way.". That's where the committee comes in and is like, "Oh, change that. What about this color? Did you try that?" It's like, "Well, if I'm showing you this version, it's because I have tried numerous things." (Luis, UI Designer)*

For the creatives working within software firms, the primary frustration with how work was organised came from the ambiguous position of creatives within the highly structured software development process. These creatives spoke of operating in a "work-ahead" space where they were required to have design assets ready and waiting for the software development teams to use within Sprints.

> *"I should be involved [in Sprint planning] before this, I'd say one sprint before because I need to have all my designs ready, I need to know what's coming up. I need to get all my designs ready for when the following sprint happens, not when the sprint already happens because then I have the queue of engineers - "Who's handling this? Who's handling that? What is that design? Blah, blah, blah." That's when I'm like, "I didn't*

know I had to do that. One second. Give me one day, I'll have it for you tomorrow."
(Luis, UI Designer)

Moreover, they were often loaded with new requests by the development teams during Sprints. As such, their work occupied a liminal space within the software organisations where they were employed. The production process was oriented around the structures and procedures of Agile development, and designers were expected to both respond to momentary requests as they arose and lay the visual groundworks for Agile software teams. Working in this work-ahead meant that these creatives were 'betwixt and between' (O'Brien 2018) within the bureaucratic structures of Agile software production and this tended to generate more pressure through work overloading:

"We have an awful lot of meetings, some of which we don't need to be asked to but your invited automatically because your part of the development team mailing list, and its not possible to know in advance whether your actually needed to be there or not."
(James, Product Designer)

O'Brien (2018) describes the liminality of being betwixt and between as a transitionary space or phase that one occupies as they move from one state, status, role etc. to another. For these creatives working within non-creative organisations, they were not yet formally established within organisational structures and processes. The regulative devices employed by organisations to extend control over creative work were contingent on the organisational context. The implementation of design bibles and designing by committee were both devices used to exert a form of bureaucratic control over the creative autonomy of content producers, and the requirement for those working as creatives within software companies to adhere to the formal procedures of Agile systems left those workers scrambling around the edges of development teams and largely unacknowledged within organisational structures and practices.

Market control through the demands for adaptability and responsiveness

The institutionalisation of Agile within the software sector has exposed coders to market pressures through the 'customer-value first' principle, however, this agile principle has been a mainstay of creative work where the client-agency relationship has historically dominated. Within this context creatives are caught between responding to the demands of their superiors and the personal preferences of clients:

> *"Sometimes the challenge is I'm trying to interpret what my Creative Directors are expecting and what the client's expecting…for someone like me, who's taking Creative Direction internally and client direction externally, it can be challenging to interpret all of that." (Talia, Digital Designer)*

Beyond the presence of pressures from clients, there existed an expectation that these creatives be adaptable to the needs of business stakeholders within their organisation (managers, sales and marketing departments etc.) by becoming generalists. Working in design amid widespread changes in occupational roles and areas of speciality was a challenge because managers and recruiters either have a poor understanding of the scope of roles or they expect individual creatives to take on the duties of other roles, as Martin describes - *"there are companies that are getting there, but the majority of them, I'd say 90% of them in Dublin, they have somebody who's a designer and that person becomes wearer of all hats."* (Martin). As an occupational practice, (digital) design has tended to expand to a broader remit of digital media such as animation, videography and 3D, however, in recent years the practice has evolved around software production and the demands that come with changing hardware and interactivity capacities. Designers are expected to have *"a broad skill set and to be a little bit of a jack of all trades"* (Glenn) with competencies in graphic design, web design, animation and now into user experience design. Although this expectation to be responsive to the demands of business stakeholders by covering multiple disciplines existed within both digital agencies and the software companies that employed creatives, it was more pronounced in the latter because these workers were the only ones who possessed the skills to produce the interfaces and audio-visual content of the organisation:

> *"We deal a lot with different aspects of the company because a lot of people come to us because we're actually the only people that can design whether it's business development documents, brochures, marketing and then software. We cover a lot"* (Callum, Head of Creative)

The experience of being at the beck and call of clients, managers, and colleagues is generated from wider cultural shifts towards more agile production logics, albeit largely impromptu in the creative sector, where being responsive to market demands, technology and 'business needs' means being able to pivot skills and expertise in the workplace. However, this expectation for adaptability and the market pressures it exposes workers to is not confined to the workplace but also extends to consumer markets:

"I think that's why people come to us. We have set up the agency in a way that helps us-- the word is deep code youth culture. The youth lab is our trends and insights division, they basically analyse trends and youth culture changes, literally by the week. I think for us it's really important to educate our clients on that it's a fast-paced world, but don't worry, we're set up to respond to that, we've built the agency around that. We're super-fast in terms of creative turnaround." (Dean, Head of Creative)

Dean's description here is based on his 'youth marketing' agencies emphasis on adaptability but the same practice applied to the experiences of all the creatives despite whether they worked in an agency or product-based company. Being a 'creative' and working in 'digital' necessarily involves being poised to tap into swift cultural trends by "keeping your finger on the pulse" of consumer markets. As the above bragging by Dean of his teams "*super-fast*" turnaround attests, a consequence of this requirement for agile workers is an intensifying pace of work.

Exposing workers to market pressures was not just used as a device to regulate the autonomies and productive behaviours of workers, but as Sarah's case demonstrates it was also used as a device to scrutinize performance. Accountability and the responsibilities that it entailed was often directed back to individual creatives in a way that was not experienced by coders. Sarah produces digital content such as illustrations, video and audio shorts for the numerous social media channels she manages. Her experience with management is fraught with tension over the ebb and flow of the traction her content receives online, which is ultimately beyond the remit of both her and her company's control:

*"he [her manager] has created these spreadsheets and everything would be based around that so we would have a weekly meeting where he would look over the stats of everything and that would be what **he would expect from me, for the pages to be growing each week, and if it wasn't, if there was like only a few followers or if there was less followers in the week he would say that is your fault because like the content wasn't good enough** or we need to be like you know changing this, changing that blah blah blah but like a lot of things like that would be expected of me and obviously the daily content and good forbid an interview fell through or something because I mean it would be my fault. (Sarah, Digital Content Producer and Social Media Lead)*

Sarah's experience touches on the effects of the unpredictability and uncertainty of user interactions with the content being produced by creatives, and how this can intensify the experience of market pressures for workers. Moreover, these workers not only have to deal

with the indeterminacies of creative content production but also the accelerating changes in the demands for skills and knowledges in the labour market.

> *"Your job isn't as secure and you have to be more adaptable. That's a risk, just making sure that your upskilling especially with digital, that your kind of staying on the cusp of a trend or you know what the demands of digital are and where the work is…I suppose that the risk there is like anyone it's kind of knowing the market and how to adapt to it and how to upskill." (Saoirse, Copywriter and Content Lead)*

It is through the organisational demands for workers to become agile and responsive to the needs of managers, clients, colleagues, technology and consumer markets that *market control* extends the reach of control over the work of creatives. These market-based types of control further bind the creative and temporal autonomy of creative workers, a trend which recent research demonstrates has extended to the structures and demands of the platform economy (Nieborg and Poell 2018; Duffy et al. 2019).

Normative control through the activation of passion, identification and the engineering of culture

The presence of *normative control* within the management of creative work is achieved primarily through the activation of passion in what has been described elsewhere as the 'passion paradigm' (DePalma 2021). The passionate attachments that many creatives exhibit to their work arises from identifications with the content being produced and the craft-like framing of creative practice (Smith and McKinlay 2009):

> *"It [work] would take up a lot of your time but I don't mind that part of it because I find that interesting you know, it doesn't infringe as much on your life as say like managing something like, so yea that part is grand, its good to kind of take and be thinking about things creatively as well." (Saoirse, Copywriter and Content Lead)*

This cultivation of passion and identification can also extend to a commitment to the organisation like when John, a designer in a small creative agency frequently infers the company within a discussion of his individual networking activities. John spoke of his frequent engagement and enjoyment of networking events within the design sector and the importance of generating 'exposure" for his company which he invoked through use of "we", "us" and "our" in our exchanges:

"I enjoy going to [work-related] events outside of work, it's a passion for me. I don't even really see it as networking. I just, I go to events just because I have an interest in the area and I think it's important just to have exposure for a company, for people to know who we are, what we do." (John, Designer)

There was also evidence of the use of more common corporate culture devices to control work such as those identified by Kunda (1992) in the IT sector. Jenny is a Digital Designer currently working with a software company, but she discussed at length her experiences with being employed at one of the world's largest professional services firms where workers were encouraged to dedicate themselves to work through the normative veil of the "work family":

"They [Jenny's previous employer] had this whole idea of you were a family and you didn't want to let the family down. Everyone in work was who you were to hang out with outside of work as well. It became this big pressure of "I don't want to let anyone on the team down because we're all friends, I'm letting my work family down" and blah, blah, blah. I know other companies that do that as well!" (Jenny, Digital Designer)

Coders and creatives are usually in different positions based on the outputs of their labour that bear different degrees of risk on the labour market. For coders, both the nature of their labour process (inputs) and the commodities they produce (outputs) are largely exclusive in that they are typically unintelligible for non-experts. Furthermore, the coded components produced by software workers are usually concealed behind intellectual property rights and the interfaces of software programmes, so they are not visible to labour market stakeholders (i.e recruiters, HR). For creatives though, their work is fundamentally oriented around producing visibility for brands, and Duffy and Sawey (2022) demonstrate this 'visibility paradox' can leave some creative work socially invisible through its degradation of status within organisations. However, far from being rendered invisible, the evidence presented here highlights how organisations are using data analytics and software to quantify the 'performance' of creative content from social media, to copy, to promotional videoclips. This crude calculability of cultural communications inevitably intensifies what's at stake with the indeterminacy problem. Visibility is therefore part and parcel of the work and this means that creatives typically take on more risk with each piece produced and therefore tend to form stronger subjective attachments to the integrity of their work. In other words, the visibility of creative work as pieces of digital content scattered across devices, texts and objects, means that there is a

visually tangible trace of their labour and its quality that labour market stakeholders can access in order to make judgements on the value of an individual's work. This visibility leaves creatives more susceptible to normative controls based on the activation of subjective passion and identifications with both product and practice.

The normative effects of regulated autonomy in software work substantially differ from those in creative work. In software, work is almost always organised within teams where degrees of normative control are generated through the bounded technical and time autonomy that teams are afforded and participative practices through the presence of a (limited) negotiability in the organisation of tasks by setting story points. In creative work however, work is more often than not conducted on an individual basis. Although collaboration is present through brainstorming meetings and agreements on overall 'look and feel', outside of these coordinating mechanisms (which bound the technical autonomy of workers), creatives enact highly individualised labour processes and oftentimes invoke the notion of artistic originality in both the conduct and style of work. This serves to generate a form of individualised normative control where creative workers wish to preserve their "*own creative process*". In this way, software workers internalise normative control through their team-based acceptance and attempts to standardise the conduct of work through team-wide measurements, whereas creatives internalise normative controls through the adherence to and protection of individual creative processes. For both of these instances, team-based standardisation and adherence to individual craft, control still serves to subject these workers to the performance pressures imposed by the organisation, whether that is through the explicit need to quantify tasks in software work or the burdening of responsibility to deliver projects or assets that live up to (often unattainable) artistic standards by creatives.

Far from work being free from organisational structural and bureaucratic controls in favour of cultural forms of attachments (Jia and Zhong 2020), I find that the management of creative work entangles multiple intra-acting types of control in a process of hybridisation to achieve a regulated autonomy.

6.4   Momentary Equilibrium for Coders and Persisting Tension for Creatives

This chapter has thus far identified and demonstrated the existence of regulated autonomy within the management of software and creative workers. In doing so, it has positioned

regulated autonomy within an organisational continuum of control (see Fig.9, page 163) that extends Friedman's (1979; 1999) distinction between direct control and responsible autonomy. However, the experience of control through *regulated autonomy* differs across both sectors and within different cohorts in each sector, and it is possible to analyse RA as constituting a continuum in itself (see fig 11). Here, control appears in the work of software and creative workers as *tightly regulated* on one end, *firmly regulated* in the intermediate and *loosely regulated* on the other end. Where individual workers are positioned on this continuum is dependent on factors such as level of seniority, company size and individual managerial styles. Those who are tightly regulated experience the full constraints of control on their operational (technical/creative) and temporal autonomy, while those more loosely regulated enjoy the greatest degrees of autonomy. Within this context, a *momentary equilibrium* exists across the cohort of software workers while the creatives experience a *persisting tension*.

| Tighlty Regulated | Firmly Regulated | Loosely Regulated |
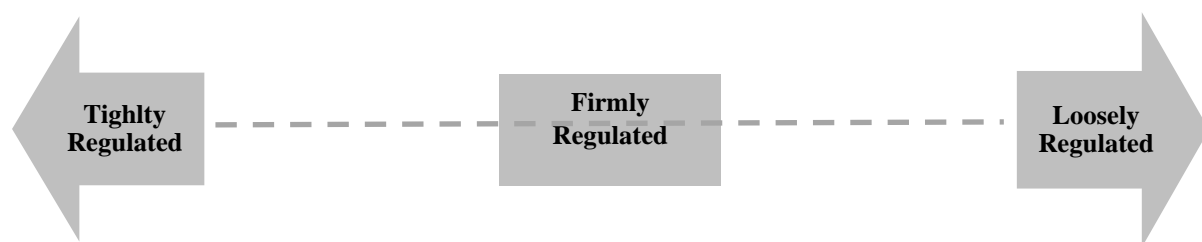
Figure 11: Regulated autonomy continuum.

Momentary Equilibrium in Software Work

Almost two decades after Barrett's (2001; 2004; 2005) seminal study of software workers, the privileged position of software developers within the occupational structure and labour market remains solid and appears to show little signs of changing in the short term. Through the dot-com crash, the great recession of 2008, and the COVID-19 global pandemic, the technology industry has grown exponentially, and its digital products and infrastructures have become embedded within both the worlds of work and everyday life. Barrett claims that software developers, just like other workers, "*are subject to management control but they also have the ability to influence how that control is constructed and applied and this is dependent on who they think they are, what they are developing and the specific historical and competitive circumstances of where they work*" (p.791). In addition to this, I would add that this ability to

195

influence how workplace control is constructed and applied also comes from the *exclusivity* of their knowledge domain as a largely inaccessible and non-intelligible body of technical knowledge and skill. The exclusive possession and ability to practice this body of knowledge, within organisations that are increasingly dependent or completely oriented towards the development of software, affords software developers relative occupational power in the places that they work. It is through the exercise of this expert and mobility power that is afforded by knowledge exclusivity and labour market demand that software workers can achieve comparatively high levels of 'negotiability' (Pawlicki 2013) in the production process.

The normative investment of these workers in building "good tech" helped institutionalise management logics such as Agile, this combined with their comparative (to creatives) knowledge exclusivity and the higher levels of negotiability it afforded plus the privileged labour market position that developers currently occupy produced conditions for software workers that are best described as a *momentary equilibrium*. This present (tentative) condition is maintained by the high rewards (pay, 'voice') and mobility power (Smith 2006) coders possess, and their comparative protection from occupational encroachment by other business stakeholders. Despite this, the experience of control through regulated autonomy differed across the workers within this case (see table 17 below) where the participants were divided based on their experiences of either a tight, firm or loose form of work regulation.

Tight	Firm	Loose
Ieva, Software Engineer (Junior)	Rachna, Software Engineer (Junior)	Simon, Software Engineer (Mid)
Kiera, Software Test Analyst (Junior)	Julia, Software Engineer (Mid)	Ciara, Head of Development (Senior)
Liam, Software Developer (Junior)	Amelia, Software Engineer (Mid)	Mary, Software Engineer (Senior)
Kumal, Software Developer (Junior)	Ian, Software Developer (Mid)	Colm, Programmer and Systems Architect (Senior)
Adam, Software Developer (Junior)	Gerard, Software Engineer (Mid)	
Alex, Software Developer (Mid)	Rachel, Software Developer (Senior)	
Chris, Software Engineer (Senior)	Michael, Software Engineer (Senior)	
	Brian, Software Engineer (Senior)	

Table 17: Software workers on a continuum of regulated autonomy.

Loosely Regulated

There are four loosely regulated software workers in the case study, identified in the above table:

Simon works for a software start-up in Dublin that produce digital payments and customer engagement software which they sell to their business customers. As the first software developer that the company hired, he occupies a position of relative prestige in the company which now employs 19 people. Mary's position is in many ways identical to Simon's, as the first and most experienced developer hired by the MedTech company where she works to design a system for the management clinical trials, Mary was solely responsible for the design of the software architecture of the product. Finally, Colm and Ciara both held somewhat unusual positions in their companies which afforded to them the highest levels of autonomy present across the entire study. Colm's official title is Programmer and Systems Architect although Head of Development would probably fit more. Employed within a small but growing software company that produces hosting services for the software sector itself, Colm was individually 'head-hunted' by the company's founders (who are also old friends) to be the system expert. He works what he calls "*20 focused hours of knowledge work*" per week, and his work primarily involves researching solutions to complex problems *"which are poorly scoped and poorly understood"* and formulating the company's plan to design systems to provide those solutions. As such, his extensive knowledge gives him a significant degree of autonomy in the workplace. For Ciara, working as the Head of Development (and only developer for that matter) in a small FoodTech start-up founded by two young entrepreneurs comes with the responsibility to research, design and develop the company's only product. However, with this responsibility comes higher degrees of occupational power as the founders rely on Ciara's knowledge and skills as the foundation for their product and thus company which provides to her loosely regulated autonomy in planning new features.

What unites these participants is the fact that all have one feature in common: they are either directly involved in or solely compose the product leadership (i.e Triad) roles within their organisations. These workers therefore **lead** the process of negotiability with upper management on the coordination of projects. Furthermore, three of the four are the most senior developers within their company and all four work within small firms (three start-ups and one post-start-up). As a cohort, these four workers all experienced the highest levels of technical and temporal autonomy across the case study of software workers. Although despite this, they

were still constrained and bounded by instances of personalised and strategic control. These loosely regulated workers therefore represent the closest cohort of 'organisational professionals' (Scarbrough 1999) in software work to Friedman's responsible autonomy.

Firmly Regulated

There are eight firmly regulated software workers, and the one unifying characteristic is that they are all involved in the process of negotiability and are able to exercise relative degrees of 'voice':

However, access to the ability to negotiate work content and organisation is differentiated by seniority. In software work, the levels of seniority are influenced by experience, which includes the number of years worked but also the ability to tackle technical problems *and* interpersonal problems through removing ambiguity:

> *"When I was a Junior [engineer], I was a bit frustrated by the fact that I was doing the same type of work as the senior colleague right next to me, code-wise, we were writing the same code at the exact same quality. The thing was that I was not part of the discussions. He was part of the discussion though, and I was eventually invited to be part of them, when I did go to those discussions, I had zero to no input, and mostly because I had no experience, not in terms of what technologies, but in the ways to look at the problem, and then you solve those problems and put them into perfectly written specs for the Juniors to implement." (Julia, Software Engineer)*

This plays an important part in differentiating the degrees of negotiability that software workers have, and it influences whether some workers experience a tight form of regulated autonomy as is the case for most of the junior developers within the study or a firm – loose form of regulated autonomy such as that experienced by midweight and senior developers who were directly involved in discussions about clarifying the scale and scope of work within Sprints. There was a mix between junior, midweight and senior roles within the firmly regulated group, and these workers were all actively involved in the negotiability process, for example by participating in the setting of sprint 'story points' in the Sprint Planning Meetings. Here, coders engaged in the quantification of their own (qualitative) labour processes by estimating the time/complexity of each of the project's tasks in order to provide project management with a means to measure their 'velocity' of work.

Tightly Regulated

There are seven tightly regulated software workers, and these were united by the absence of voice in the process of negotiability.

The factors influencing where an individual worker is positioned on the regulated autonomy continuum are dependent on organisational policies, managerial preferences, company size, the relative exclusivity of their knowledge and level of seniority. As junior developer and test analysts, many are required to 'take a back seat' within project planning. Although attendance at project meetings is required, this group did not possess the same amount of voice within the negotiation process. For example, planning what content/functionality was going to be added into each sprint involved discussions between development teams and project management about the balance between adding new features and tackling old issues in the product backlog, these discussions were typically left to more senior team members as they tended to possess the most extensive knowledge of the system. It was the same for the process of 'story pointing', although juniors were involved in the development teams pointing process, they were generally required to accept the measures suggested by senior members. However, being tightly regulated does not necessarily appear to be a negative thing for some of these coders, as Julia remembered from her time as a junior engineer:

> *"When your a Junior developer or when your working in those types of companies that don't allow you much freedom because they already give you specifications and even tell you what software to use and what tools to use, its very easy because you just need to follow some instructions." (Julia, Software Engineer)*

Five out of seven within this group were junior developers and test analysts within their companies. The one senior within this group (Chris) experienced tight regulation through his company's demands for the strict adherence to deadlines and through his lack of technical and temporal autonomy. In Chris' case, he was the only member of the software case study working within a software company in the game sector. The company provides game development technologies which support customers such as PlayStation, Xbox and Nintendo. Operating in the game sector often involves production cycles oriented around a culture of 'crunch time' based on release cycles which constitute artificially imposed deadlines on the workforce. Furthermore, Chris's technical autonomy is constrained due to the company specific technology stack used to develop their products and service, a technical feature of his work

which also placed him in a more insecure position on the labour market due to his lack of experience with more transferable technologies.

The general experiences of control in the software case represented a 'quasi-resolution conflict' (Scarbrough 1999) where organisational professionals reach a momentary resolution to the contradictions of commitment both inwards to organisational authorities and outwards to the profession as a domain of knowledge and practice. As organisational professionals, software workers have firmly embedded within the core operations of organisational structures. This produced a general condition of momentary equilibrium for software workers where consent was generated for regulated autonomy within organisations, in part by its normative diffusion which produced a sense of self-determination and through the affordance of degrees of negotiability for the workers. As a social device used to regulate the desire for autonomy from coders with the desire for control from management, allowing workers a degree of 'voice' in the production process allowed management to mitigate some of the challenges posed by the indeterminacy and ambiguity of software production, and the exclusivity of computer programming knowledge. Crucially, the present condition of relative equilibrium within the control of software work is *momentary* precisely because contradictions remain between organisational control and the knowledge labour process. Despite the general sense of equilibrium across the software case due mainly from the existence of a (limited) negotiability and the widespread consent to agility management, the presence of such issues and the tentative obscuring of control that agile systems afford means that this terrain of control needs constant transformation in order to avoid failure.

Persisting Tension for Creatives

Being caught between control and ambiguity for creatives is almost like fighting a losing battle on either side. Whether the participants were employed within creative sector 'agencies or non-creative firms such as software companies, they experienced conditions of *persisting tension* within the control of their work. In creative agencies that operate on business-to-business models, one of the difficulties is maintaining profitability through the provision of creative services which are at once constantly changing and becoming increasingly deskilled as new digital technologies increasingly allow for the production of creative content among non-specialists. Pressures to therefore maintain the viability of the business model and competition with other providers (agencies, freelancer etc.) often produce the 'tight margins' and

intensification of work experienced by the creatives in agencies. As for those working in other organisations, most of the creatives in this study occupied what O'Brien (2018) called a 'liminal' space where they were betwixt and between and confined to operating in the "*work-ahead space*" between the production processes of other organisational departments, such as development, sales and marketing. In other words, creative practitioners were in a transitionary phase where they were not yet embedded within organisational structures to the same degree as other departments, and they were often at the beck and call to those same departments.

Tight	Firm	Loose
Sarah, Digital Content Producer & SM Lead (Junior)	Saoirse, Copywriter and Content Lead (Mid)	Darren, Digital Designer (Junior)
Louise, Digital Designer (Junior)	Jenny, Digital Designer (Mid)	Eleanor, Game Writer and Designer (Mid)
Matt, Digital Designer (Junior)	Nancy, Head of Creative (Senior)	Martin, UI/UX Designer (Senior)
Talia, Digital Designer (Mid)		John, Designer (Senior)
Rory, Digital Content Producer (Mid)		Dean, Head of Creative (Senior)
Luis, UI Designer (Mid)		Glenn, Product Designer (Senior)
James, Product Designer (Mid)		David, Product Designer (Senior)
Harriet, Digital Designer (Mid)		Callum, Head of Creative (Senior)
Ruth, Designer (Mid)		

Table 18: Creative workers on a continuum of regulated autonomy.

Within the creative case, whether the participants experienced a tight, firm or loose form of regulated autonomy depended on a more diverse range of conditions compared to software workers. Furthermore, the experiences of control for the creatives was much more polarised compared to the software workers, with most experiencing either a tight or looser form of regulation on their autonomy. As the process of negotiability, coordinated primarily through institutionalised teams, represent the linchpin for the experience of regulated autonomy for coders, the differential experiences of regulated autonomy for creatives was based on factors

as varied as the relative non-exclusivity of their domain of expertise, the lack of understanding (and appreciation) for their work, the visibility of their outputs based on the use of different tools of quantification, level of seniority and managerial preferences.

Loosely Regulated

There are eight loosely regulated creative workers in the case study, and although most work in senior roles, the reasons each experienced a lighter touch of organisational regulation over their autonomy varied and was contingent on their specific company contexts. Firstly, 6/8 of this cohort help senior roles within their employments, and this certainly inflected on their experiences of control. Similar to the process of managerial consolidation that Ryan (1992) identified in his analysis of creative production in media (radio, TV, news) and advertising sectors, the same process is present across explicitly creative agencies providing digital content products and services to business clients. Art Directors, Creative Directors and Head's of Creative are fast emerging as core authority, or 'leadership' figures to use the industry's own term, and both Callum and Dean from this group held titles of Head of Creative in their companies and this positioned them as a bridge between management and core creative practitioners. As both Callum and Dean were responsible for the distribution of creative work through the workflow management systems their organisations used, they had substantially more creative freedom than other creatives as their 'creative direction' often provided aesthetic templates for their colleagues. Despite their relatively loose form of regulated autonomy, the exposure of creatives to the beck and call of other departments meant that there was a desire to personally formalise and establish in-house creative departments for some degrees of shelter:

> *"if I'm being brutally honest, I don't think a company that's surrounded in a business style or a corporate model is the best for a creative to evolve in. Which is why I've tried to create our own creative team within a company, do you know what I mean? Not just have a graphic designer and a video editor and then that's it, you know then your kind of at the company's disposal, do you know what I mean?" (Callum, Head of Creative)*

Similarly, as Product Designers in small-medium sized software firms, David (start-up firm) and Glenn (medium sized firm) enjoy more creative autonomy than their colleagues primarily because they directly lead the creative direction of projects. Glenn's experience is more conventional to that of Callum and Dean, where he directs the creative ideation process and uses a workflow management systems (Trello) to distribute tasks to the various creatives within

the organisation. This creative management process is then embedded within wider software development processes where their production plan is ultimately managed by project managers to adhere to the software development cycle which is coordinated in the Jira WFM system. David's situation is slightly different because although he is a midweight designer, he is the most senior member of his small start-up and has therefore taken on the role of Product Designer (and effectively the Head of Product). Because of the exceptionally small size of his firm (11 employees), David enjoyed higher degrees of autonomy which were more akin to the experiences of Colm and Ciara (in the software case). Moreover, Darren's experience was somewhat like David's, he was employed in a (very) small start-up that was moving at what he described as a relatively slow pace. Although he is a junior Digital Designer and experiences more personalised forms of control, he still had a significant amount of freedom in both what he created, how he created it and in how long.

The remaining three participants in this group (Martin, John and Eleanor) all fall into this category for different reasons. Martin works as a UI/UX Designer in a large public institution currently going through a phase of 'digital transformation', and the lack of understanding his colleagues have for what he does gives him leeway to manage that ambiguity to his advantage:

> *"I put my head down and do something in an hour that could take others a day…Yes, it can work both ways. They [management] can have ridiculous estimates and I can also say something could take to two hours when it can take 15 minutes based on the way I do something." (Martin, UI/UX Designer)*

John's story is a more collegial one. As a senior Designer in a small (15 employees) design studio owned and managed by designers themselves, he is afforded higher degrees of creative autonomy than is typically experienced by creatives within both standard digital agencies and other organisations. Finally, as a Game Writer and Designer in a small indie game development studio Eleanor enjoys significant creative autonomy in the production process, although this creative freedom comes at the costs of working in a more precarious segment of the game sector (Keogh 2021). As the above cases attest, the experience of a looser form of regulated autonomy is highly contingent for creative workers. From positions of seniority that give more creative autonomy than core creative practitioners (Callum, Dean, Glenn, and David), being a designer within a small design agency owned and run by other designers (John), to being somewhat of a lone wolf within an organisation unfamiliar to your knowledge and skills (Martin), to being one of the few working within the creative sectors that enjoy a relatively

good working environment based on your organisations genuine trust and comparatively manageable production timelines (Eleanor). These heterogenous accounts demonstrate the many ways in which creatives can, despite being firmly embedded within structures of regulated autonomy, enjoy comparatively looser forms of regulation and more autonomy than their less privileged colleagues.

Firmly Regulated

For the three participants (Saoirse, Nancy and Jenny) categorised as experiencing a firm form of regulated autonomy, their years of experience and positions provided them with more voice in the planning process of project and work delegation. However, this was hampered by the experience of professional encroachment and the lack of respect and appreciation that often followed. As core knowledge workers in the 'new economy' organisation, creatives do have "*exclusive monopolies on given tasks*" (Damarin 2006: 432), as do coders, although their occupational authority over those tasks comes under more frequent critique, scepticism and encroachment. The experiences of the creatives in this study demonstrate that this is due in large part to the comparative non-exclusivity of creative content production (whether through design, videography, copywriting etc.) as a domain of occupational knowledge whose contents and boundaries are possessed, practiced and maintained by creatives. The subjective intensity of the value and evaluation of worth of creative content means that 'outsiders' often encroach on the domain of creative practitioners because "*everyone thinks they're a designer*", producing conditions of *persisting tension* and conflict in the labour process and organisation of work. As a subjectively and culturally intensive domain, creative knowledge is not esoteric but 'fair game' for the full throttle of individual preferences. In this sense, the creative autonomy of these workers is under more persistent threat compared to traditional professions (law, medicine) and indeed software workers:

> *"I think particularly in Ireland, design is still not taken as seriously as it is in other countries. Ireland 10 years ago did not consider Graphic Design a job and it's only in the last four years at best that you can have a job in design that's not even just a graphic designer but a more specified role…I think people are going "Sure your just making the picture, it's grand, you just press the button.". I don't think they [other business stakeholders] realise how much is involved in it"* (Jenny, Digital Designer)

A core qualifying feature of the responsible autonomy awarded to professionals such as lawyers and doctors is the complete control workers have over their problem domain which include the practices of inference, diagnosis and treatment (Abbott 1988). For creatives, these essential procedures were challenged by other business stakeholders (management, colleagues and clients) which exposed them to persistent and frequent professional encroachment. This exposure to professional encroachment was largely a consequence of the lack of shelter, authority and power afforded by practicing a domain of *perceived* non-esoteric knowledge in creative content production.

Tightly Regulated

The experience of a tighter form of regulated autonomy by 9 of the participants is underpinned by one core issue within creative work, the comparative non-exclusivity of the knowledges being possessed and practiced. Despite this, some other factors such as management styles, business model, and seniority were important contingent factors in shaping the experiences of control for these workers. The lack of appreciation for creative knowledge as something esoteric is also entangled with an impression by management and other departments (namely sales and marketing) within organisations that the production of creative content is easier and faster than it actually is, and this often leads to designers being left without sufficient support and with overburdened workloads:

> *"There is a real lack in having that design support…you feel like you have the world on your shoulders and you have to deliver so much. The expectations are really high because it has been set by management. That's when I crumble, and it can be quite a toxic environment, when they put too much pressure on you and a lot to deliver, and then the personal side, you want to do a great job." (Ruth, Designer)*

> *"Designers, I feel like are looked down on. I feel, I don't know, that's just me. I don't think there's a lot of importance from wherever your coming from because it does feel at times like we're interchangeable. Because I feel like there's a lot of us out there, in the previous companies I've worked for, it does feel like they can just fire you and get someone else, like someone younger who's like crazier and willing to do the requests." (Matt, Digital Designer)*

Matt (above) here also touches on the existential pressure experienced by many of the creatives as they are aware of the presence of a large and willing 'reserve army' in the labour market. Being a junior or midweight creative also often involves working under creative direction from the leadership of Art Directors, or Heads of Creative. Working according to 'design bibles', or to 'design by committee' necessarily involves the removal of a great deal of creative autonomy for practitioners. Furthermore, in creative agencies providing B2B services, these workers are also caught between both the demands and preferences of their superiors and their clients, as Talia exclaimed:

> *"the challenge is I'm trying to interpret what my Creative Directors are expecting and what the client's expecting. If someone's just working like designer to client, it is easier, but for someone like me who's taking creative direction internally and client direction externally, it can be challenging" (Talia, Digital Designer)*

Even for the creatives in this cohort who do not work under creative direction such as Matt who is one of three designers in a FoodTech company. Despite experiencing more creative autonomy over the 'look and feel' of the content, this takes place under tighter time constraints. Matt discussed an issue with how his work is managed that touches on a common pattern across the creative case study – that a lack of understanding for the creative labour process leads to unrealistic expectations and timeframes. Under different circumstances, being subject to performance management through the quantified logics of 'engagement' data scraped from social media platforms exerts a pressure on some workers to 'perfect' the quality of the content they produce and the rate at which they produce it, as is the case for Sarah who works as Digital Content Producer and Social Media Lead.

For those creatives working in non-creative organisations, their position within the overall occupational and development structure is more precarious than it is for software workers who tend to have whole departments and institutionalised structures to coordinate their work. Furthermore, the visibility of the work creatives produce, as audiovisual 'assets' used by other departments within organisations means they can be easy targets for the underperformance of particular projects:

> *"The thing we get all the time is because what you produce is so tangible, it's there for everyone to see, sometimes they can be used as an excuse for someone else not hitting their targets. The thing I get a lot is-- It's tolerated…sales haven't met their targets, it's because we don't have this video and that video hasn't even popped up on your radar,*

it's not even on your list of projects. That could be sales, that could be marketing, that could be any department in the company. The flip side of that is there's never in my been-- In six years of being there, nobody has ever talked to me and said, "We've got this target. We've reached this because we had this video." Do you know what I mean?" (Rory, Digital Content Producer)

This experience of scapegoating is even recognised by those higher up the 'leadership' ladder - "*If sales are down, they are coming to creative!* (Callum).

The general experiences of control in the creative case represented a persisting tension where there was a lack of any quasi-resolution. As organisational professionals, creative workers are still experiencing what Abbott (1988) termed 'professional jurisdictional struggle' over their position within the organisation, problem areas, tasks, knowledge and the division of labour (Smith and McKinlay 2009). Despite the work of producing the audiovisuality of digital capitalism, creatives are yet to solidify their place within the organisational structures of the new economy or institutionalise best practice development methods such as those within software development. The reasons for this are many, although the structure of business operations within the creative sector and the pace of change in product/service markets appear to be two important factors. Creative content services (e.g., branding, advertising, content strategies etc.) are typically provided through B2B digital agencies which means that many non-creative organisations lack in-house creative departments. Moreover, the creative products/services the sectors provide experience accelerated rates of change in both their specific form and their platforms (i.e from print, to digital, to social media, to 'digital products') due to their digitalization. As such, the struggle creatives are embroiled in within and across organisations to defend their jurisdiction is currently characterised by the persistence of tension as creatives attempt to solidify their authority over problem areas and domains of their practice.

6.5   Conclusion

This chapter argues that the indeterminacy and exclusivity of knowledge, coupled with the indeterminacy of labour and the imperative of organisational control leads to a form of managerial control premised on *regulated autonomy* in software work and creative work. In software work, regulated autonomy is institutionalised through the formal embedding of agile production methodologies, while in creative work it comes about through an impromptu organisation of project work based on agile logics and practices. These findings run contrary

to the claim by Langfred and Rockmann (2016: 632) that "*the many forms of autonomy that can be found in a variety of today's workplaces are examples of how perceptions toward work have changed and reflect a gradual shift of control from the organization to the employee*". Instead, I find that the challenge of overcoming the indeterminacies and exclusivities of knowledge in software and creative work remain pertinent within organisations, but that the hybrid combinations of managerial control that persist combine to constitute a form of control that is premised on both binding the autonomy of workers to organisational goals (as in responsible autonomy) but also on constraining and bounding their autonomy to extend control over work, as is the case with regulated autonomy. As figure 12 illustrates below, the '*pull*' of control to use Langfred and Rockmann's (2016) terminology, is substantially stronger within a regime of regulated autonomy where professional/occupational autonomy over both the organisation and conduct of work is increasingly bounded through the use of organisational regulative devices.
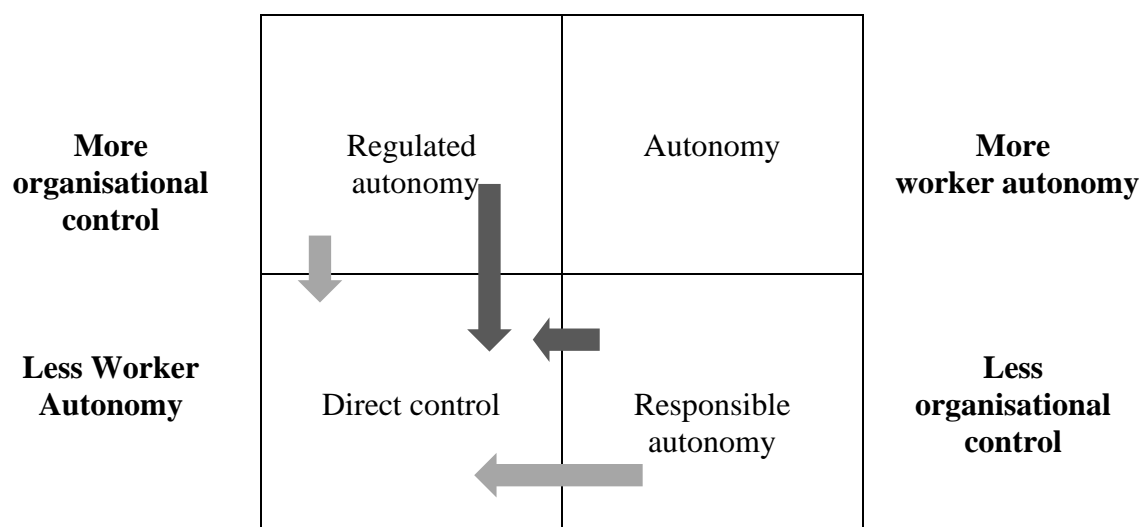
Figure 12: The 'push' and 'pull' between organisational control and worker autonomy. ▨ *= push for autonomy;* ▪ *= pull of control. Adapted from Langfred and Rockmann (2016)*

The regulated autonomy that serves as the basis of control for the software and creative workers in this study does not represent a 'panacea' (Littler and Salaman 1982) that overcomes the structured antagonisms of the capital-labour relation. Instead, it points to the continued tentative and contingent nature of workplace control where there remains no "*one best way...but only different routes to partial failure*" (Hyman 1987: 30). In this sense, regulated autonomy represents a 'quasi-resolution' (Scarbrough 1999) of the contradictions that remain

within the management of knowledge work. Indeed, the experiences of regulated autonomy across both case studies display both ends of this quasi-resolution conflict. For the creatives, the frequent experiences of occupational encroachment and work overload and the general lack of respect for those employed primarily in product-based organisations such as software companies lead to a persisting tension within the balance of control between creatives and managers. On the other end, despite the software workers enjoying higher labour market rewards (e.g., pay and mobility power) and largely consenting to regulated autonomy through the legitimisation of agile principles, procedures and structures, some tension remains over the control of work (e.g., over story pointing and the general disdain coders had towards management by non-technical superiors) which suggests that this present condition of relative equilibrium is momentary in nature.

However, it must be said that the manifestation of control over the knowledge work process of creatives and coders represents a shifting terrain of control where organisational professionals are losing autonomy while management extend their reach of control. Work in these cases has experienced an intensification and acceleration in recent years since Rasmussen and Johansen's (2004) study. The influence of Agile principles (and their convergence into new Leagile structures and procedures) in both formal and impromptu forms in software and creative work has contributed to the production of an increasingly coherent, hybridised form of control centred around the regulation of autonomy. The responsible autonomy coordinating the work of knowledge professions such as lawyers and clinicians[37] tips the balance of power towards worker autonomy and involve*d* technical and time autonomy for workers which were embedded within loose forms of strategic control through the alignment with organisational goals. Under conditions of regulated autonomy, the technical and time autonomy of workers is bounded through the introduction of regulative devices and structural (as well as strategic) control in direct, technical, bureaucratic, market and normative forms. It appears that with the blending of Agile and Lean and their many accompanying technologies in the management of knowledge work, organisations have found an emerging strategy which superseded the use of responsible autonomy (Friedman 1977) by providing the minimum necessary degrees of autonomy within increasingly elaborate assemblages of control. The emergent, contingent and 'proximal' (McCabe et al. 2021) nature of managerial control means that such strategies of

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[37] Some research suggests this balance of power is increasingly under threat (Cooke 2006) as professionals are subject to more types of control and a growing diversity of regulative devices.

control need to be continually re-invented, revised and reconfigured to meet the changing conditions of the world of work. In turn this challenges sociologists of work to continually rejuvenate their analyses of workplace control.

Chapter 7: The Contested Terrain of Work-Life Boundaries

7.1   Introduction

This chapter is the second of three where the sociomaterial exigencies examined in chapter 5 are used to reorient our understanding of a core contested terrain in contemporary knowledge work. The focus here is on the (re)shaping of boundaries between work and non-work life. The blurring of the boundaries between work and non-work life and how workers react to this process has become a major area of interest over the past two decades across the social sciences, including sociology, business and management, organisation studies and computer supported cooperative work. Contemporary work, production and consumption has become increasingly digitalized and flexibilized during this time and the implications of the wide-ranging transformations these processes involve has brought the question of where and when work takes place, and most importantly where and when it does not, back to the fore of debate. Over this period, the work-life boundaries field has developed within the framework of 'boundary theory', 'border theory' and 'boundary work' (Nippert-Eng 1996; Clark 2000; Ashforth et al. 2000). The field has focused primarily on work – life boundary preferences based on an 'integration-segmentation continuum' (Nipper-Eng 1996). The literature has provided insights into the negotiation and inconsistencies of work-life boundary preferences, the boundary work tactics of individuals, and how time, space and objects are adopted as tools for boundary work in the everyday practices of workers (Kreiner, Hollensbe, and Sheep 2009; Reissner, Izak, and Hislop 2020). As this interdisciplinary field continues to grow and advance key insights into the agentic dynamics of boundary work, there remain some unanswered questions and areas in need of empirical and conceptual unravelling. For instance, the majority of the work-life boundaries literature draws broadly on various forms of knowledge work in the professional, technical and managerial occupations (e.g. IT, Media, Academia, Engineering etc) (Perlow 1998; Sayah 2013; Mellner et al. 2015; Osnowitz and Henson 2016; Ciolfi and Lockley 2018; Reissner, Izak, and Hislop 2020; Carreri 2020), yet there is little attention paid to the primary content of the labour process (i.e knowledge as both input and output) in these forms of work and its sociomaterial implications for the boundaries between work and non-work life. Moreover, the *sources* of boundary blurring remain somewhat obscure as many studies either avoid their identification or position either (i) organisational factors and/or (ii) technological factors as the drivers.

After establishing the need for research on the sources of boundary blurring in knowledge work, this chapter applies the concept of sociomaterial exigencies to the analysis of the work-life boundary for software and creative workers. The primary aim is to identify the pressures driving boundary blurring and the channels[38] through which they emerge and intra-act in the labour processes of knowledge workers. The sociomaterial approach adopted throughout this thesis positions knowledge and its production as a sociomaterial entity and practice, and as such the emerging sociomaterializations of knowledge labour are taken as analytically and conceptually key in the analysis of work-life boundaries. Taking the sociomateriality of knowledge work seriously and using the conceptual toolkit of exigencies developed in chapter 5, this chapter identifies a sequence of intra-acting pressures that lead to boundary blurring. Moreover, the concepts of *perennial labour* and *habituation of labour* are developed to explain the outcome of these pressures for the labour process and the emerging habituating activities of knowledge workers as they deal with boundary (re)shaping[39]. This chapter in particular contributes to previous sociomaterially inspired studies of knowledge work (Wajcman and Rose 2011; Panourgias et al. 2013; Gray et al. 2020) by demonstrating how the sociomateriality of knowledge itself is a leading mechanism in work-life boundary blurring. The chapter is structured as follows: first, the findings are presented to identify the sequence of pressures leading to boundary blurring and the channels through which they emerge in the everyday experiences of workers; next, I demonstrate how this sequence means that knowledge workers are permanently susceptible to what I define as perennial labour; and finally, I consider the implications of this for the actions these workers engage in through boundary work by providing an articulation of the habituation of labour. An important methodological point must be made before continuing – the following sections and their arguments analyse both cases as one (whilst still drawing out differences) because the sources of boundary blurring, and their implications exist as a common pattern for digital knowledge workers. The chapter is designed around answering the following two questions:

RQ1.   What are the pressures leading to work-life boundary blurring in digital knowledge work?

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[38] The use of term 'channels' is described in detail in chapter 4. In summary, channels are the pathways through which mechanisms manifest as pressures (or not) and are experienced within the empirical domain of the case studies.

[39] Boundary (re)shaping occurs through the intra-acting pressures of boundary blurring and the tactics of boundary enactment employed by workers to manage or resist those pressures. Their perpetually unfolding negotiation of work-life boundaries (through b.blurring and b.work) constitutes a process of constructing habitats of labour.

RQ2. How do those pressures intra-act to shape the labour process, and what tactics do workers adopt in relation to those pressures?

7.2 Sociomaterial Attachments, Digitalization (Objectification) and Organisational and Market Demands: A Sequence of Intra-Acting Pressures.

In chapter 5, I identified a number of exigencies emerging from the unfolding process of knowledge production. These exigencies encapsulate some of the demands, actions and characteristics that are present as emergent properties in the knowledge production process, and how they sociomaterialize in the labour process and organisation of work was demonstrated through a series of channels or pathways (see figure 8., page 160). Two of these exigencies and the channels through which they emerge in the labour process have implications for the work-life boundary (re)shaping of software and creative workers. As a sociomaterial practice, the knowledge labour process necessitates a series of interactions (e.g., engaging with texts, formulas, briefs) and relations (e.g., with knowledge domains, communities of practice), and involves the use of physical entities (people, objects) to act as the bearers of the knowledges being used, maintained and produced in the practices of labour. The intra-action of those interactions and relations constitute sociomaterial attachments for the knowledge worker, and in the case of software and creative work specifically, the hardware and software of digital ICTs are the primary physical bearers in which knowledge is objectified. Therefore, the two exigencies of sociomaterial attachments and digitalization are presented here as enduring pressures on the boundaries of work and life for software and creative workers. Furthermore, taking the immediacy through which the pressures leading to boundary blurring are experienced in the working practices of knowledge workers, these appear as a sequence of intra-acting pressures where the sociomaterial attachments of knowledge work are the *driving pressure* of boundary blurring, the digitalization of work an *accelerating pressure*, and contextually specific organisational and market demands are *contingent pressures* (see figure 13 overleaf). In what follows, I demonstrate how these three sources of boundary blurring emerge in the labour processes of software and creative workers.
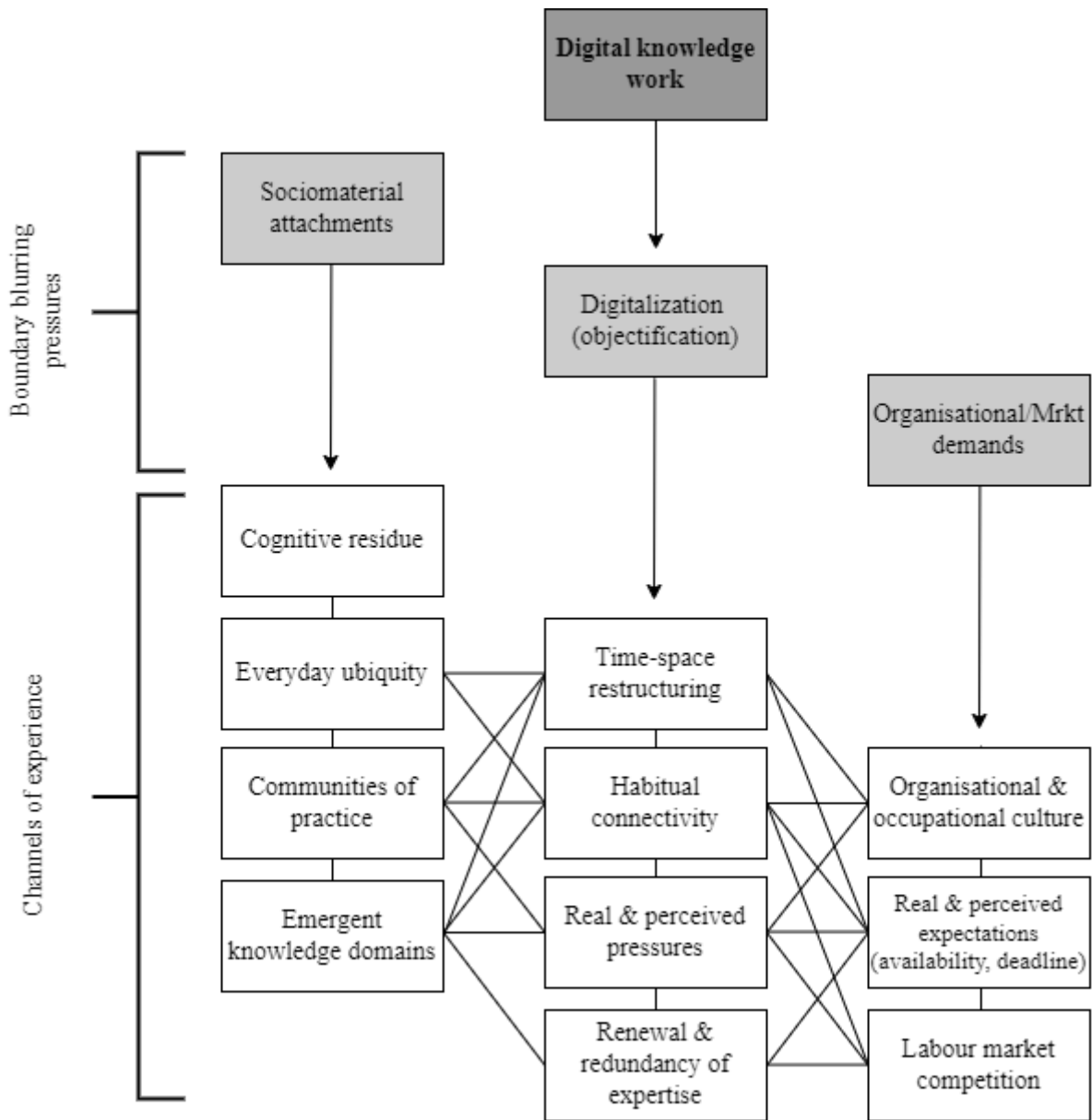
Figure 13: Work-life boundary pressures in digital knowledge work.

Software and Creative Work: Attached and Digitalized

The sociomaterializations of the boundary blurring pressures identified here surface in the labour process through a series of intra-acting channels (identified in the figure above), and these channels then become the pressure points through which work-life boundary blurring is experienced. The sociomaterial attachments weaving through knowledge work emerge as a 1st-order driving pressure, that is, they display a permanency and immediacy in how they are experienced in the labour process. The primary channels emerging from these attachments in software and creative work are the presence of (i) cognitive residue, (ii) the everyday ubiquity

of the commodities being produced, (iii) communities of practice and (iv) the emergent knowledge domains from which these workers' expertise draw and contribute. Although each of these channels are tightly intra-active *across pressures* (attachments <-> digitalization <-> Org/Mkt), they are also deeply intra-active *across channels within pressures* (cognitive residue <-> everyday ubiquity <-> communities of practice <-> emergent knowledge domains) (see previous figure). Therefore, the experiences of these pressures and the channels they surface from within the labour process are often articulated by interviewees as interconnected parts of one and the same experience. Although the sociomaterial attachments of knowledge work exist in, above and beyond the presence of digitalization as a form of objectification, the digital knowledge work of software and creative workers represents a constitute entanglement of these two and for this reason, this section discusses the implications of both exigencies together.

James is a Product Designer at a software multinational based in Dublin that provides 'human capital management solutions' through cloud-based software. In our discussion of the intellectual nature of his work and its implications for his work – life boundaries, James stated:

> *"I haven't always been able to switch off. Just when I was telling you there earlier, sometimes you take a problem your working on home with you." (James, Product Designer)*

This 'problem' James identifies from our conversation leading up to this stems from the spontaneous recurrences of socially and cognitively intensive labour where engaging in complex problem solving can leave a thread of *cognitive residue* throughout the day, inadvertently pulling James back into 'work'. Cognitive residue describes the cognitive load and thread of sociocognitive activity that people bear when switching over *domains* from work to private life or non-work time and space. As computer programmers, designers and content creators of various stripes, the participants in this study draw primarily on forms of abstract or theoretical knowledge in the application of research, analysis, design, problem-formulation and solving, strategy and idea generation. In any given day, James and the other participants engage with multiple and intersecting cognitive tasks and the residue these leave on the minds of knowledge workers can vary in form. For example, Ian, a Software Developer compares the effects of cognitive residue to an 'OCD wheel':

> *"I would find myself [outside of work] reading about [coding] stuff, and experimenting and trying to upskill, and that would always go on very late into the night which would sometimes affect my sleep and things like that. I would find that as well, if your really*

*deep in something and you've got to just drop the ball with it, that **it can leave a bit of an OCD wheel spinning in your head**. Your maybe **not 100% in the real world**, despite the fact that your purporting to be." (Ian, Software Developer)*

The reference here to the obsessive character that cognitive residue can take, particularly across the experiences of coders, signals what is referred to in psychology as the 'Zeigarnik Effect' (Zeigarnik 1938). The Zeigarnik Effect describes a situation where individuals working on a specific task are more likely to cognitively recall and engage with that task if it was uncompleted. The incomplete state creates what Zeigarnik referred to as 'cognitive tension', pulling the individual back into a state of engagement with the task. One of the issues with working in coding or creative work is that there is often no definitive end to the 'problem' these workers are focused on. Each problem usually sits within a larger conundrum in both scope and scale and its resolution often produces more challenges than it resolves. The work cycle for coders and creatives, where projects and features bring new problems and puzzles, is often described through the use of gaming metaphors which invoke a sense of compulsion as with Glenn and Brian:

*"It's [work] like **I'm always thinking**...**It's like Tetris**, trying to fit all the blocks in the best way, constantly trying to pre-empt stuff. **It's a bit like chess**." (Glenn, Product Designer)*

*"I don't think it's exclusive to tech [cognitive residue]. This is something where a lot of industries...an architect or any management could come up with an idea for a problem anytime of the day. Coding, it's funny in that a lot of **developers will go to sleep thinking of a particular problem that they can't overcome** and how to get around it." (Brian, Software Engineer)*

Although the cognitive residue experienced by software and creative workers is experienced subjectively on the level of individual cognition, their labour does not occur in an individual vacuum. Software and creative work is a sociomaterial practice where individual labour becomes constitutively entangled with existing knowledge domains, communities of practitioners and collaborators and the digital technologies applied in and produced through the production process. The digitalization of software and creative work is doubly digitalized: first of all through the use of digital technologies as the means through which labour is conducted, and secondly through the digitized form that the outputs of their labour take as digital assets and information, that is, the knowledge commodities being produced are

objectified or codified as digital objects. Digitalization in this case has significant implications for the frequency in which software and creative workers connect with the commodity forms they produce. Computer programming, design and creative content pervade our everyday lives, from the design of objects and spaces, print media and most significantly the virtual architecture and audiovisual content that we engage with through digital screen technologies which are now mobile and embedded within the everyday practices of moving, communicating, learning, consuming – living. As time and space restructure through digitalization, digital connectivity increasingly becomes a habituated aspect of living and labouring, and the *everyday ubiquity of the commodity form* intensifies as an interactional attachment driving the blurring of the boundaries between work and life. In the case of Glenn and Saoirse (below), reading as a pastime, the constant availability of Slack work chat and the use of social media, transport them both back into the "*work frame of mind*" and labouring activity:

> *"For me, there is a massive blur there, because **when I'm working on a project I get quite into it**, and I start caring a lot about it. Though, **no matter what I'm doing, if I'm reading or I'm seeing how that applies to my work, I'm always bookmarking things for work** or going into the systems like "oh, I have an idea, I've got it down now!". **I always feel like I'm switched on**, I don't really feel like there's much of a separation [between work and life]. **Even on the weekend, I might be reading something that might impact a project that I'm working on**. Then **in terms of communication, our chat is very active**. A lot of people, they're very friendly and we socialize a lot together. There's a lot of banter on it that you can get sucked into, but **then that transports you into that work frame of mind** again." (Glenn, Product Designer)*

> *"when I worked in-house I was doing some **social media** and I would try and avoid it because it **would take up all of your time**, you would be **always checking** different platforms, looking at how things are performing and things like that and you might be contacted by different parts of the business **because stuff like social is so visible and it can be updated and stuff whenever**. You kind of have to set boundaries there, like don't contact me within these times. I think sometimes people think your on email constantly, checking emails, checking social…you can fall into that trap." (Saoirse, Copywriter and Content Lead)*

Part of what makes the everyday ubiquity of the commodities they produce so influential for triggering a work frame of mind is that possessing and practicing a domain of professional

knowledge is such a deeply (sociomaterially) embedded process that it can change how some people perceive the everyday world around them:

> *"If I am looking at a totally different app on my phone and something pops up I would say oh that's a neat way of doing that, we could apply that here, or not apply that here or that's a terrible interface. I suppose **it does change the way I look at things**, I think I have kind of changed the way I look at things ever since I first started studying software, I mean when I first learned what an IF statement was I was looking at the rest of the world thinking "oh, that's a traffic light, if it's red you stop, if it's green you go.", I suppose **the logical shift in my mindset was always there but I started thinking in code from the beginning**" (Rachel, Software Developer)*

The cognitive residue experienced on an individual level by coders and creatives and the everyday ubiquity of the commodities they produce materialize through the interactional attachments implicated in knowledge production. Opening out to a more associational level, as a sociomaterial practice knowledge work produces emerging forms of relational attachments such as those developed through communities of (coding or design) practice and the ties practitioners form with the knowledge domains they enact in their labour. The participants engage with their respective communities as givers and receivers of knowledge in the form of solutions, tips, referrals, recommendations and so on. In some instances, there is a real sense that contributions help build and push the collective knowledge of the community and domain further along. For example, Liam is a Software Developer at a medium sized software company that develops insurance software systems in Ireland. Like most of the participants in this study, he works an average 40-hour week, with flexible start and finish times based around 'core hours' (typically 11am – 3pm). However, outside of his paid employment Liam frequently works on upskilling and is a heavy contributor on Stack Overflow. Stack Overflow is 'the largest, most trusted online community for developers to learn, share their programming knowledge, and build their careers.' (stackoverflow.com 2021). Liam states:

> *"I'm pretty sure **I'm in the top 30% of contributors on Stack Overflow**. I really like being able to answer people's questions. I ended up getting a good score on there just because I wanted to be able to put myself in a position where if somebody asked a question, I'm able to answer it. It is a very good growing experience while helping a lot of people too and it just challenged me to go "right, well this person's asking the*

question, let's see if we can sort it out. Let's see if our knowledge is that good." (Liam, Software Developer)

Although he also uses Stack Overflow as a resource that he can draw on for his own work, Liam exhibits a real sense of collective ownership with the community and 'their' knowledge. His engagement with the site and the wider coding community transports him back into the work domain, not in space but through time and activity. Similarly, but without the strong sense of communal attachment which is replaced by a more utilitarian approach, Simon uses a collection of contact points through which he keeps up to date with the coding community.

*"There'd be **a few newsletters** that I would keep subscribed to, industry kind of papers. There'd be a couple of dedicated ones that are just niche enough for me without being too niche or too generalized. There's a guy called Dave Voyles who does one. Then it could be **community participation in communities like Reddit** where they have subreddits for that sort of stuff where there's thousands of people discussing what they're doing. Maybe as an alternative for Reddit – **Twitter**. But I prefer Reddit over Twitter…**or Medium** or something like that." (Simon, Software Engineer)*

Simon's approach is much more calculated to the point of curation, where he carefully positions his relations with the wider software community in a manner that matches his current needs and interests, invoking a sense of the 'network sociality' described by Wittel (2001). Nonetheless, and regardless of the individual workers (subjective) orientation towards their respective communities of practice, the relational attachments these communities constitute materialise for software and creative workers as an extension of the labour process and act of labouring beyond the work domain and into private life space and time. Moreover, the digitalization of their work extends the reach, availability and activity of these communities in much the same way that social media does through the affordances of visibility, persistence, association and editability (Treem and Leonardi, 2012). This is an inherently relational labour. The knowledges which they produce are emergent properties of physical bearers (bits, screens, papers etc), itself constructed from a past pool of knowledge synthesised in the present and with implications for the future. The labour itself is relational in both the obvious sense of an individual interacting with tools and technologies, and a deeply social sense in that the work is highly collaborative in a direct and indirect way through collective production but also through relational dialogues, networking and socio-cultural assimilations. This can be seen in the processes of creative and software work with their collaborative production of knowledge

through communities of practice and strategic (and informal) networks. Networks are the vital highways upon which these workers operate, the building and maintaining of networks of practice an important part of the labour and the development of reputation, exposure, and status, crucial resources. The relational attachments necessitated in communities of practice, and the digital restructuring of space and time through which they are engaged become another pressure point for the work-life boundaries of software and creative workers.

Participation in these networks are not the only relational ties the labour of knowledge workers necessitates. In order to practice a body of knowledge on the labour market, knowledge workers must develop a familiarity and intimacy with the knowledge domains they wish to apply. Through research, analysis, revision and "*keeping their finger on the pulse*", software and creative workers cultivate relational attachments with their respective areas of expertise in computer programming, graphic design, video production and so on. In applying the sociomaterial analysis of knowledge work developed in this thesis, we can understand these bodies of knowledge as constituting a collection of distributed sociomaterialities, entangled in individuals, communities, texts and technologies. Furthermore, the production of knowledge is an emergent process in that knowledge never exists as a static state, it is always emerging, renewing and becoming. For long-established professions such as scientists, academics and lawyers, knowledge domains conventionally develop at a steady rate with ebbs and flows. In comparison, the constitutive entanglement of software and creative work with digital technology accelerates the pace in which knowledge domains change. As Michael, Kumal and Mary demonstrate below, this acceleration makes the renewal and redundancy of expertise, skills and knowledges another pressure point through which boundary blurring is experienced by coders and creatives:

> "The biggest thing about my industry is that **there's a huge expectation to continually upscale and learn. It's unbelievable the amount of time**. I've changed string teams three times in the last three and a half years and each time I've had to learn a new language, a new technology stack…it feels like I'm starting again each time to a certain extent. There is **a lot of pressure**, not pressure but **a lot of expectation** that your continually upscaling and learning and keeping ahead of what's breaking." (Michael, Software Engineer)

> "If you stop reading**, if you stop learning, then you will be obsolete very soon in the industry**. To keep your current job, if you don't want to lose the job, if you want the

*money to come into your account every month, then you have to keep in touch with the technology and keep learning. For other work, like any other desk work, if you understand the work very well, it won't demand for you to learn any further each day, but **in software it demands you to learn every day**." (Kumal, Software Developer)*

*"Part of the challenge [of working beyond worktime/place] is that **the technologies change all the time**, and they're always advancing too. Even if you were an expert database administrator 10 years ago. If you don't pay attention, your not anymore. If you just keep doing what your doing, all of a sudden your at the bottom of the list of people who are skilled." (Mary, Senior Software Engineer)*

The two sociomaterial exigencies of attachments and digitalization in software and creative work are the *driving* and *accelerating* sources of work-life boundary blurring for these workers. However, these attachments that are part and parcel of the practices of knowledge work are most important as they appear as antecedent in the sequences of boundary blurring pressures (illustrated previously in figure 13). The channels through which these attachments manifest in the everyday experiences of work (cognitive residue, everyday ubiquity of commodity form, communities of practice, and emergent knowledge domains) mean that boundary blurring for software and creative workers is a requisite to the labour process. Whether it is through the many intra-acting channels that the sociomaterial attachments of their labour are experienced, or the intensifying and accelerating effects of the channels through which the digitalization of work intra-act with these attachments, these exigencies of knowledge production in software and creative work make work-life boundary blurring necessarily implicated in the working practices of knowledge work itself.

Contingent Organisational and Market Pressures

The work-life boundaries literature has at times focused on organisational and market demands as a source of boundary blurring pressure. However, what is yet to be acknowledged is that these organisational demands are often driven primarily by the content or commodity form of the labour process. Organisational and market demands such as company culture, real and perceived expectations and demands of management, colleagues and clients are driven first and foremost by the character of the labour process which in turn inflects the organisation of work and the structuring of labour markets in those occupations. In the case of software and creative work, knowledge as the commodity form being exchanged, applied and produced in the labour

process shapes the bounds of possibility through which organisational and market pressures can emerge. If your labour primarily involves the application and production of knowledge in its various forms, or even the routine processing, recording and organisation of information, then the parameters through which organisational culture and expectations can exert pressure on your work-life boundaries extends. Furthermore, as the production of knowledge, or the processing of information requires that it becomes objectified in physical entities that will act as the bearers of those knowledges (Zukerfeld 2017), some form of technology is required in the practice of labour, whether that is a pen and paper or a computer. The content of software and creative work, therefore, makes it possible for these workers to work at any time and in any place, and the existence of these possibilities (which exist as an emergent effect of the exigencies of knowledge production) influence the expectations and demands, which invariably originate from forms of organisational control, imposed by organisations and the market. However, those demands are experienced in different ways in different contexts, unlike the sociomaterial attachments of work (or the practice objectification) they are not enduring mechanisms of knowledge work, instead they represent contingent pressures that further intensify the experience of boundary blurring for knowledge workers.

During our discussions about the spatial and temporal flexibility of knowledge work and the balance between work and life, many of the participants that identified organisational circumstances as the source of pressure on boundary blurring often did so in a manner that conflated their sociomaterial attachments of their labour and the digital mediation of their work with organisational contingencies. Nancy, as a recently promoted Head of Creative at a 'location-based marketing and advertising agency' in Dublin is responsible for the research, conception and design of the visual outputs for the companies' client campaigns. In our conversation, she told me about the difficulties she has had with the company's normative expectations that she would put in unofficial overtime in order to push projects over the line. She expressed anger and frustration that this was expected and largely unacknowledged (i.e unrewarded) by management and she described her newfound determination to refuse to bring work home. Even still, she stated:

> *"**There is that expectation [in the company], so we used to have a tagline saying, "Always on."**. It was nearly a running joke. We have to have our emails on the phone, they're like "oh, you'll answer anytime.". Your like "No!". I have taken my emails off the phone, it's not a business phone, it's mine. There was that expectation. They're [the*

company] trying to get us laptops. I thought it was more for the flexibility, but its nearly
– "Ok, well look, you can be on. We can ask you urgently to do something.".." (Nancy,
Head of Creative)

The demands put on Nancy's private time and space by her organisation are driven by an understanding that her labour is unbound by the confines of the workplace. Nancy's experience represents an organisations demands on her time and effort. Alternatively, Saoirse's previous copywriting and content production role in a 'digital product practice' agency, and Jenny's position as a digital designer made demands on their availability:

> *"**Researcher:** Is there a pressure to be always connected?*
>
> ***Interviewee:** Yea, definitely…when I worked in-house it was like you know, if you didn't look at your email even outside of work times, you know because everything is urgent, like everything is urgent and nothing is urgent. So it's like oh that's urgent, and it's like well what is actually urgent because everything is marked as urgent now so how do we prioritise things that are really urgent?" (Saoirse, Copywriter and Content Lead)*
>
> *"I worked for a big company in Dublin and in the contract, I thought it was very predatory. They work with a lot of younger people and it's their first job. In the contract was something along the lines of 'you may be expected to work extra hours if needed'. What that actually meant was no lunches, work until nine, ten o'clock in the office, bring the work home. They had given me a work phone and they wanted me to use that instead of my real phone, my manager used to get really touchy that I had two phones. I had to bring my laptop home with me every night, I was contactable at all hours. Multiple times, I get a phone call from someone at midnight saying, "This needs to be done now, why isn't this done?" I had taken work leave to go on a holiday and they still were emailing me during that and texting me on my private numb. It was just a constant, constant stress." (Jenny, Digital Designer)*

Furthermore, Brian, a Software Engineer, describes occasions where a lack of technical knowledge by management created situations where project deadlines were set at an unfeasible timeframe which often led to extreme boundary blurring by designers and developers:

> *"Working in advertising I realised was not very healthy. There's not much appreciation for technology in advertising, it's just a means to an end. I worked on products where*

the person who scoped out the project didn't really have any technical expertise, but we were held to the deadlines that they decided on. As a consequence, we were working through to, might have done all-nighters, gave up bank holidays, weekends, that sort of thing, for no extra money, other than a thank you at the end." (W32 Brain, UI Architect and Engineer)

The forms that organisational pressures take are highly varied but their experience by the studies participants most often derived from management, whether through their lack of understanding and thus unrealistic expectations as is the case with Brian or through individual managerial styles and preferences. Sarah, unfortunately, experienced the brunt of such incessant demands made on her time, effort and by extension – emotional wellbeing. Although she primarily produces digital (video) content in her role as Digital Content Producer & Social Media Lead, she is also responsible for the circulation of this content and engagement with consumers through her companies social media channels. In an explicitly exploitative manner, her employer requires her to be available and responsive 24/7, 7 days a week to match the round the clock nature of online social media platforms. In other experiences, the normative expectations and demands present in organisations can become established through the engineering of organisational culture (Kunda 1992). Colm and Jenny describe this tendency in their excerpts below:

*"depending on what company or what part of the industry that you are in, **there are demands made on your time**…in fact **there are demands made on your emotions** you know, it's like 'god, don't you feel passion for you work?' and I'm like 'no, I don't, I feel passionate about providing a home for my family, I don't particularly feel passion for like…what design I use for a time-series database or something like that'…but **there is that narrative there and that demand is made on people**. I think it's mostly coming out of the **Valley kind of culture** of like 'don't you feel passionate about your work? don't you want to work every hour that god gives you to change the world?'…it's like no, come on man, relax, your not changing the world your just building a company to sell to VCs! I mean it does make demands on people and I think **those demands trickle down through the culture of the industry**." (Colm, Senior Programmer and Systems Architect)*

"they [her previous employer] had this whole idea of you were a family and you didn't want to let the family down. You had to work together. Everyone in work was who you were to hang out with outside of work as well, they tried to encourage you to hang out with each other constantly. It became this big pressure of 'I don't want to let anyone on the team down because we're all friends and I'm letting my friends down, I'm letting my work family down', blah, blah, blah. It became a whole mess. As far as I know, they're still doing that. I know that other companies do that as well." (Jenny, Digital Designer)

Beyond direct and normative organisational demands on the effort and time of knowledge workers, the emerging characteristics of the software and creative commodities being produced by coders and creatives produce new market pressures which are felt in the labour process and organisation of work. Increasingly so, and this is typified in the proliferation of user interface and user experience positions across the digital economy, digital knowledge commodities (such as software applications and creative content) intensify the links between labour and the market. Spurred by the ongoing digitalization of work, production and consumption, or what is most recently referred to as 'digital transformation', the digital knowledge commodities being produced by software and creative workers take on a new level of performativity. This can be described as a broad shift from the production of *static commodities* like print media or early software systems towards increasingly *intra-active commodities* like apps and digital content. Static commodities are conventionally produced and exchanged as a static, end product which implies and often involves a severing of the link between the producer, product and client/consumer[40]. On the other hand, intra-active commodities such as mobile applications are produced and exchanged as intra-active, evolving products which imply and involve an extension of the links or relations between the producer, product and client or consumer. These developments can cause further pressures originating from the market for the work-life boundaries of software and creative workers. Suddenly, newly available market signals can result in more organisational demands and expectations on workers from management, peers, clients and consumers. For example, the changes around what software workers refer to as 'site availability' lead to organisational pressures on coders to be 'on-call' either officially as part of a shift rotation or unofficially as a general expectation. Similarly, the digital assets being produced by creatives increasingly take on an intra-active character through the datafication of

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[40] In the case of static commodities, the producer – product – consumer link is typically formed around consumer protection policies such a guarantees.

the commodities 'performance', whether that is an animation or piece of copy content. The monitoring and measurement of the consumers engagement with the commodity is now a constant and instantaneous relation that reverberates back through to the labour process and organisation of work for software and creative workers; sometimes in the form of expectations to monitor "*consumer sentiment*", other times for constant availability to mirror sites and systems, and at times by intensifying deadline pressures through the emergence of bugs.

As the experiences of Nancy, Saoirse, Brian, Sarah and Colm demonstrate, the presence and effects of organisational demands and their implications for boundary blurring are made possible by the sociomaterial exigencies of knowledge production in software and creative work. Furthermore, organisational pressures are contextually contingent in that they are often ephemeral and cyclical in nature compared to the enduring characteristics of the sociomaterial attachments within software and creative work. In other words, organisational and market demands such as organisational culture, and real and perceived organisational expectations (which are derived from strategies of organisational control such as regulated autonomy) are contingent because they may or may not impact an individual's work-life boundary. Most importantly, although organisational and market dynamics can exert pressure on the work-life boundaries of knowledge workers, the pressures driving boundary blurring and the channels through which they surface appear in the labour process as a sequence of intra-acting pressures. These pressures then become constitutively entangled in the everyday practices of labour and production as they trigger and shape one another. The impact these pressures have on the labour process of software and creative workers and the efficacy of their boundary work tactics is presented in the following section.

7.3   Perennial Labour as a Permanent Susceptibility in Knowledge Work

RQ2: How do those pressures intra-act to shape the labour process, and what tactics do workers adopt in relation to those pressures?

The previous section identified the sociomaterial exigencies of attachments and digitalization that are implicated in practices of knowledge work, and organisational and market dynamics as a sequence of intra-acting pressures producing work-life boundary blurring for software and creative workers. To build on this, this section is concerned with how those intra-acting pressures shape the labour process, the boundary work practices of these knowledge workers

and the efficacy of those practices. I advance the concept of *perennial labour*[41] to explain the outcome of these pressures for the labour processes of digital knowledge workers.

Perennial labour is that labour which remains residually attached, persistent and omnipresent as knowledge production stretches across space-time and defies regulation by the industrial clock and the boundary of the 'workplace'. It comprises those practices of contemplation, problem-solving, analysing, planning, evaluating, learning etc. The word 'perennial' originates from the Latin word prennis meaning lasting throughout the year. Perennial is defined as '*lasting, enduring or continually recurring*', '*apparently permanently engaged in a specified role or way of life*' (Google, 2020; and '*to describe situations or states that keep occurring or which seem to exist all the time; used especially to describe problems or difficulties*' (Colloinsdictionary.com). Perennial labour then is a state experienced by (digital) knowledge workers through the sociomaterial attachments of the commodification of knowledge where labouring activity can occur (sometimes spontaneously) at any place or time. The permanent susceptibility to perennial labour is generated through the practices of knowledge work itself, it primarily emerges spontaneously and unintentionally, and it involves activities directly related to the production of value in the labour process. For these software and creative workers, it happens when they experience the mental load of cognitive residue, are triggered by everyday interactions with the things they produce, are engaged with networked communities of practice and are compelled to keep up with the "*intellectual firehose*" of their knowledge domains.

Activities such as engaging in labour take on a renewed significance when that labour is primarily directed at commodifying knowledges through its inputs and outputs. For those workers engaged in knowledge work, such as the coders and creatives in this study, the residual attachments of socially and cognitively intensive labour heighten the need for the boundary management of labouring as an activity as well as a spatially and temporally specific domain (i.e the 'workplace') to avoid perennial labour. The concept of perennial labour brings into

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[41] Chapter 5 describes perennial labour as that labour which remains residually attached, persistent and omnipresent as knowledge production stretches across space-time and defies regulation by the industrial clock and the notion of the 'workplace'. Perennial, from the latin word prennis meaning lasting throughout the year. Perennial is defined as 'lasting, enduring or continually recurring' and 'apparently permanently engaged in a specified role or way of life' (Google, 2020). Perennial labour then is a state experienced by (digital) knowledge workers through the sociomaterial attachments of the commodification of knowledge where labouring activity can occur (sometimes spontaneously) at any place or time.

question the capability of knowledge workers to achieve a segmentation of work and life. In her description of these positions, Nippert-Eng (1996:5) describes segmentation as:

> "*[work – life] conceived of and experienced as completely separate, "segmented" worlds. Here, the mental boundary between realms is clear and impregnable…with no conceptual overlap between realms and their contents, there is no physical or temporal overlap between them, either*".

Of course, Nippert-Eng advances the 'integration-segmentation continuum' as an ideal type. In practice, she acknowledges that most people fall somewhere between a configuration of the two. What is important for the purposes of this section is that the nature of the pressures driving boundary blurring in knowledge work expose knowledge workers to the *permanent susceptibility to perennial labour*, in effect making segmentation more difficult and practically impossible. One of the benefits of drawing on such a heterogenous sample of knowledge workers (based on sector, company, employment relationship and social demographics) is that the range of experiences and preferences span the work-life boundary continuums identified in the literature. However, and most importantly, the susceptibility to perennial labour remains as a common patterns across the cases and even the most ardent 'segmentators' cannot overcome the attachments that make perennial labour an enduring feature of knowledge work. To capture some of this heterogeneity, this section uses a series of worker cameos to explore how perennial labour surfaces across software and creative work. Following Moore (2020), these qualitative cameos draw on semi-structured interview data to present a collection of the participants experiences to achieve a 'thick description' (Geertz 1973).

Mary

Mary is a Senior Software Engineer at a small MedTech company based in Dublin. She works as part of a team of three (which includes a quality assurance analyst and a developer) on the design and development of a next-generation blood pressure monitoring software system. As the senior developer at MedTech, Mary's role provides a relatively high level of autonomy which in her own words means "I'm able to decide what I want to work on, what technology I want to use, how best to structure that, how to test it, how to build it, and everything." (P.2).

Mary is an excellent example of the perennial nature of knowledge work, and this is demonstrated in the following exchanges:

> "*Researcher:* *How do you think the digital mediation of your work impacts the boundary between work and non-work?*
>
> *Mary:* *My current company has really, really rigid boundaries. I suspect its more to do with medical data, and healthcare data is really, really scary from a security perspective, you don't want that information out…I feel it's really the first company that I've worked for in a long time where I when I go home, I'm totally clocked out. I'm not thinking about it or feeling like I need to check something. It depends on two things; it depends on the product itself and it depends on the company culture.*
>
> *Researcher:* *Because your work is knowledge-intensive, do you find yourself working on problems outside of your work hours?*
>
> *Mary:* *All the time, all the time. Part of the challenge is that the technologies change all the time, and they're all always advancing too…It is something where you feel you need to keep learning and re-skilling yourself…For example, I often spend my commute watching videos or reading tech books. They might be related to the problem that I'm solving at the minute or they might be related to something I find is an interesting technology and I think I might have to incorporate it later."*

In our discussion of the boundaries between work and non-work, Mary recalls some of her previous roles where "*the boundaries are way more blurred*", working as part of an international team at a tech MNC meant she could be called into 11pm meetings and the constant flow of the teams' Slack channels in her previous companies meant everyone could be reached around the clock. When turning to her current position though, she tells me with a sense of quiet joy and relief that this is one of the first companies where it is possible to "*switch off*" after leaving work. This is primarily due to the sensitive healthcare data that she works with where organisational policies and GDPR restrict off-site access. However, despite what seems like an ideal organisational situation which in effect prevents Mary from working on product development outside of her workplace, the exchange above depicts how the intra-acting pressures of sociomaterial attachments and digitalization keep perennial labour as a constant in Mary's worklife. Being a software engineer requires that Mary develops, applies

and maintains expertise in computer programming. Moreover, computer programming as a relatively new knowledge domain which is constitutively entangled with the digital technologies it develops produces a situation where the emergent nature of the domain (as a constantly growing body of knowledge) is accelerated through the renewal and redundancy of expertise as software and hardware advance. This "*moving target*" requires that practitioners keep up as both a material necessity and expectation of being a software worker.

Darragh

Darragh is a Digital Designer working primarily in graphics, animation and video production. He has worked with multiple digital agencies across Dublin for the past 10 years and has recently founded his own creative studio where he now works as a freelancer/independent contractor. In our discussion about his labour process and the boundaries between his work and non-work life, Darragh's experience expressed the persistence of the sociomaterial attachments and digitalization of knowledge work:

> "*Researcher:* *Do you work a regular 9-5, or is your working time more dispersed and flexible?*
>
> *Darragh:* *I try to! I'm really bad at working from home so I make a point of getting a workspace [rented workspace] whenever I am working. The trickier part is obviously the bringing your laptop home in the evening and the weekends, thinking I can get an early start on the week or I can do one or two things here, it'll take an hour. Just trying to maintain that separation between work-life balance.*
>
> *Researcher:* *What does that boundary look like for you?*
>
> *Darragh:* *I'm trying to be strict on it. But at the same time your thinking – "if I can get this job done quicker then I can move on to the next one", but it's just taking into consideration that there are only so many hours in the day. Your mind needs, it needs time to rest. You need to step away from things.*

> *Researcher:* How do you think that the digital mediation of your work impacts on the boundary between work and life?
>
> *Darragh:* It's definitely tricky, even when I'm 100% sure in my own mind that I've switched off, if I'm on the internet and I see something I like the look of I'll put it on Pinterest, and it's not working per se but it's still work-related. I feel like your mind, it always has it in the back burner. I think a lot of that is because it's also passion as well, then it also means that we carry that across into a lot of other aspects of our life."
>
> *Researcher:* Because your work is intellectual, your conceptualising, researching and designing original content, how does that impact your ability to switch off?
>
> *Darragh:* I feel like it really doesn't turn off…

Darragh's private contracting gives him a high level of control over his time, location and method of work. Because of this and his belief that there should be a healthy balance between work and private life, he consciously tries to achieve a segmentation between the two domains. However, despite Darragh's intentions and his work-life boundary preferences, the susceptibility and experience of perennial labour are an enduring feature of his work. Even if Darragh manages to physically distance himself from his laptop by leaving it in the office workspace he rents, the everyday ubiquity of the commodity forms he produces in his labour and the embedding of digital devices in everyday life trigger perennial labour as is the case when he's saving content to curated Pinterest boards for future use. Moreover, the attachments of his labour are evident as another lasting feature as cognitive residue leaves him in a situation where it's difficult to switch off and his mind "*always has [work] in the back burner*".

Rachna, Gerard and James

Rachna (Software Engineer), Gerard (Software Engineer) and Noel's (Product Manager) experiences all attest to the persistence of perennial labour in their lives. During our conversation about the boundaries between her work and life, Rachna was adamant and explicit in stating her preference for a clear separation between her work and non-work life. To add

context to this, she begins describing her organisational environment. Rachna has recently moved to a new team, and she identified "*clocking out*" at 5pm as their normal practice, while also emphasising their "*support*" for maintaining that boundary. Despite a lack of organisational pressure to work beyond a 9-5 workday, she described engaging in practices that defied her preference for the segmentation of work-life. As she states, "*we programmers cannot switch off!*". The cognitive intensity of her work emerges from the necessity to clarify, formulate and solve problems, and to crystalize those resolutions through coding within the language stack used by her development team. The cognitive residue leftover from engaging in these tasks means that Rachna is "*always thinking about work*" beyond the spatial and temporal cage of the workplace. Furthermore, she describes this early period of her career as "*ramping up*": a time for heavy learning and developing a diversity in skills and knowledges. She does this in part through working on personal programming projects that allow her to explore and develop practical experience in a particular language, technology or method. She identified this period of ramping up as essential to both her work and progression as a coder. Finally, this practice of upskilling is supported by the communities of practice in which she is embedded. Through online platforms such as StackOverflow and GitHub, Rachna gauges what areas might be worth ramping up, finds both guidance and review for her work, and catalogue's her development and diversification as a developer through her online profiles and code repositories.

Gerard is what the work-life boundaries literature would describe as an archetypically intentional segmentor, who prefers a strict separation between work and private life. Gerard is a midweight Software Engineer in a large software multinational corporation with headquarters in Dublin that provides enterprise software solutions. In his own words, "*I have a strict rule, once you've finished work then its time to chill out, relax and rest your brain for the next day…you can burn yourself out if your constantly working on these things, constantly thinking about them*". In order to maintain this preference for the 'strict' segmentation of work and life, Gerard has 'banned' Microsoft Teams and work email from his phone and leaves his laptop in the office when he goes home. Despite his efforts to enact boundaries to achieve his preference for segmentation, he continued to describe how "*you can leave the office and your head is still buzzing with the mental effort. It's still going on in the background, in the back of your head, that buzzing when you leave the office. It's a real physical sensation, you can feel it…It does affect your ability to switch off 100%.* ". This 'mental effort' Gerard describes is the cognitive

residue of engaging in the sociomaterial practice of knowledge work as the process of ideation and problem-solving is carried beyond 'work' throughout the day.

Noel works as a Product Manager for a software company producing services for the global games industry and he according to him "*that means that my job, as I say to people, is to make sure that the product we deliver is delivered on time and has the right stuff in it*". My discussion with Noel touched on an important aspect of the perenniality of labour for knowledge workers – its 'invisibility' to both them and their employers as a form of labour. We begin our discussion about what his work-life boundary looks like, and for a period of about 5 minutes Noel is at pains to describe how his employment "*does not in any way encourage people to be blurring that boundary*" and that for him specifically "*I have personally never wanted to and I don't. I don't have for example work email on my phone or chat*". He goes on to say that his company is "*a mature company, people realise that a healthy work-life balance really is important. There are no demands I feel for me to blur those boundaries*" despite those, as he describes them rare "*occasions when the alarm goes off and something time critical comes up*". In this extensive description of his organisational context, he clearly felt that he had provided assurance that he does not experience boundary blurring. After this, I asked what effect the cognitive and intellectual aspect of his work had on his ability to maintain that separation and his (again lengthy) response unravelled multiple experiences of perennial labour and perpetual boundary blurring, although their extent has eased in recent years as his work has moved from coding to more operational tasks. The following extract captures some of this:

> "*Back in the day when we first started when we were a young start-up, and I was writing code it was super exciting and everything was very blurred. There was no switching off, really. I would wake up and I'd be thinking about, "Oh yes, I could do this. I could probably project that onto that. Yes, I think that would be faster if we do it that way," and then again as I was walking into work, and as I was walking home from work…It can be difficult to know when to stop. Your like, "The code's almost working. Oh, no wait, there's a bug there. Hang on, it's almost working." You don't notice, and the clock ticks, and you stay on late. **Even when you go home, you haven't fully disengaged from that**. What I carry home with me can be exhausting. I do get tired because of the mental rigors of having to think to do things very carefully during the day…I remember at one point just walking either to or from work and just looking at the fabric and flows of this woman's long coat. My friend was working on motion graphics at the time and*

*as she was walking, I was watching the ripples on the back of the coat form and deform. I was looking at it thinking - "You want to capture that level of detail" and I was thinking about what we could do to achieve that. **It's always stuck with me. It's like there was just no getting away from it. It was in my head all the time**. We were working terrible hours. We were working long hours. Occasionally, very occasionally I remember working all night. I remember walking home from work as everybody else was walking in going - "Ha! everybody's going into work, and I'm walking out." (Noel, Product Manager)*

Part of the reason why the use of worker cameos are so effective in qualitative research is that it allows for a comparison of in-depth cases. More specifically, the cameos allow for the comparative analysis of heterogenous cases where commonalities and patterns can be identified across the experiences of participants. The above cases cover a diverse range of interview participants, taking account of work-life boundary preferences, gender, level of seniority, and company size and type. What is evident as a pattern *across* the experiences of both software and creative workers is that the sociomaterial exigencies emerging from the commodification of knowledge in the labour process produce circumstances that subject knowledge workers to the permanent susceptibility to perennial labour. The attachments that bind coders and creatives to the commodity forms they produce, and the intensifying and accelerating effects of the digitalization of those attachments establishes perennial labour as a spontaneous, enduring and continually recurring feature of the digital knowledge work they practice. This characteristic of their work leads software and creative workers to engage in specific boundary work tactics where the purpose is to avoid and manage perennial labour, two such tactics are demonstrated in the following excerpts.

Physically Distracting

"It's very difficult to switch your brain off. For me, it's a little bit like the flipside of someone who comes home from a very physical job and they want to lie on the couch and look at Netflix or whatever. I really want to get away from screens when I come home. I took up distance running when I started to get really into the UX side of my career on the more intense sides, that problem-solving aspect…Marathon running for the last five, six years has been a big outlet for me. I wouldn't say it switches off my

brain, but it definitely puts me into a more passive mode…It really helps me reset my brain and I do find that if you don't do some other kind of break, be it that really intense exercise or just more of a walk, you brain can be very geared up and spinning when it's time to sleep. " (David, Product Designer)

In this passage above, David expresses the need to disengage from work in his private time as a sort of mechanical, computational process where his mind is something to be "*switched off*", "*put into passive mode*" and "*reset*" so that it doesn't remain "*geared up*". Approaching knowledge work as a sociomaterial practice has the advantage of highlighting the physicality of engaging in sociocognitive labour. As is the case with David, the software and creative workers in this study adopted *physical distraction* as a boundary work tactic to manage the pressures of perennial labour in their private life domains. These same tactics were enacted by Ieva, Liam and Darragh and the excerpts below detail their preferred method and their justifications for doing so:

"A little distraction [from cognitive residue] helps. At home, when I come home I would do some activity. I'd go for a walk or I do Yoga. Those things help me switch off, just to get out of the mindset, I guess." (Ieva, Software Engineer)

"I think that's the main reason [complex problems leading to cognitive residue] why it's hard to switch off. Once I finish [work], I go to the gym, I just drink a cup of tea or I just sometimes take a nap for 10/20 minutes to switch myself off, which I wish I didn't have to do. I wish I could go "I'm done" and not have to unwind myself. Yes, it's tough, I think its more so a mental thing." (Liam, Software Developer)

*"I feel like it [cognitive labour] really doesn't turn off. But **one thing that I found helps massively is exercise** and just getting away from the screen…**to trick your mind into focusing on something else**…I found that **Yoga** works really well. Again, another physical activity where you basically have to be focused on what your doing or your going to fall on your face. I know **your mind might still be tricking in with thoughts about the project, but if you know that you cannot access your laptop to continue working, then it helps to build a bit of separation**." (Darragh, Digital Designer)*

"no, no I don't think I really can [switch off from work]. I mean by the end of the time I was on maternity leave [6 months] I had managed to switch off but even if I'm just on holiday, if I have a week holiday I'm thinking 'oh yeah, we need to do this and we need

*to do that", so no. That might be just the way my brain is as opposed to work; I do find it hard to stop thoughts constantly running through my head. **I try to meditate now and again, and it rarely works**. In general, thoughts tend to spin through my brain, I don't know if that's specific to software work or not. I might be exactly the same if I was a Doctor or something." (Rachel, Software Developer)*

The adoption of physical distraction is a boundary work tactic to unwind from the *activity* of labour. The participants in the study engaged in this tactic primarily through various form of physical exercise, from running and training in the gym, to yoga and mediatation. These activities were consciously employed to combat the fatigue of perennial labour and to avoid its triggering in the non-work domain, in effect pushing the susceptibility to perennial labour down the line. In practice, engaging in alternative forms of physical activity helped these workers to manage the 'weight' of the cognitive residue that they carried from their labour processes. This tactic therefore provided a means of distraction not because it erased the experiences of cognitive residue or the lingering presence of perennial labour, but because it did what it says on the tin – it distracted from them. Importantly, although these physical activities served as a distraction, they were only ever such because they were not capable of erasing the susceptibility to perennial labour, such tactics are therefore temporary by necessity of the fact that perennial labour exists as a permanent feature of the work.

Removing and Narrowing

The use of physical activities to distract from the attachments of labour were the most common tactics adopted by the participants, and the efficacy of these practices to effectively remove perennial labour was shown to be largely temporary, often lasting for the duration of the activity in question or shortly thereafter. In comparison and in recognition of the permanency of the sociomaterial attachments of knowledge work, some participants engaged in boundary work to *remove* and *narrow* the scale, scope and volume of labouring activities they carried around through cognitive residue. For example, James and Rachel (below) try to remove any remnants of work each day when they come home by objectifying the ideas, solutions etc. into physical bearers to free their mind of the cognitive residue:

*"There have been a couple of occasions where I get an idea in my head or I try and clarify some thought I had in my head and **I just jot down something at home out of***

236

working hours, just on a piece of paper, just to crystallize something in my mind and be like – "Oh, maybe I can try this approach.". I acknowledge that its not something I actually want to do much of. I think work should generally be left in the office in the interests of your own mental health. Everybody benefits from their time off in the evening or the weekend." (James, Product Designer)

"I'm quite a list writer so I will write out my to-do list and I will add to it and I will mark things off because to me once somethings written down, I am not going to forget about it. I will write it down and then park it and then come back to it the next day so I tend not to worry too much…and then if I do forget to write things down I spend the day worrying that I might forget to do them, but then once things are written down I'm not going to forget about them so I can close the notebook" (Rachel, Software Developer)

The boundary work practice of removing is not just applied to the cognitive residue of knowledge work. Many of the participants described purposely avoiding and/or deleting work-related applications from their personal laptop and smartphones (MS Teams, Slack etc.), and even using ad blocking plugins to avoid notifications all with the aim removing of connectivity in a sort of digital detox. These tactics of removal that were directed at the digital interfaces of their work served to resist and circumvent what Wajcman and Rose (2011) identified as the 'constant connectivity' afforded by digital ICTs. In the same tactic but with a different angle, Brian prefers to *narrow* the scale and scope of the cognitive workload he carries home through what he refers to as "*blinkering*", where he focuses on a narrow set of problems and tasks to avoid being overwhelmed by the pressure of perennial labour:

"I actually was talking about this [boundary work tactics] at lunch with the other developers. The other senior was saying he really struggles to switch off, he'll think about the [work] problems he's having and find that he gets overwhelmed. Personally, what I tend to do is I will concentrate on a very small problem that I'm having. It might be small in scope, but it might have implications which are broad. I'll spend the weekend thinking about this really small thing that I want to make better or I want to fix. Ironically enough, I find that quite relaxing because I can concentrate on a very small thing that I know I can beat, I know I can get around this…I just find being very blinkered and thinking about the smallest problem possible and working on that in my

free time is much more healthy than trying to think of all the [coding] problems I'm having and getting overwhelmed." (Brian, Software Engineer)

Brian's description of narrowing as a boundary work tactic provides an excellent insight into the sociomateriality of the knowledge work these people are engaged in. The presence of cognitive residue and the reality of perennial labour as a inherent feature of work is evident through his description of the discussions he has had with his colleagues about not being able switch off from thinking and doing work. Brian then goes on to detail how he manages this accepted exigency of knowledge work by blinkering (i.e narrowing) the scope of work-based problems and thoughts that he carries home on a daily basis. By engaging in a tactic to both remove and narrow the sociomateriality of knowledge work, these participants all implicitly recognised the cognitive load and perenniality of their labour by consciously employing efforts to store, reduce and manage the volume of work.

This section has demonstrated how the sociomaterial attachments of knowledge work expose workers to perennial labour as a permanent susceptibility. Central to this is the identification of the distinction between the sources (what I have referred to as pressures) of boundary blurring as constituting a *sequence* of intra-acting pressures, identified in the figure below.
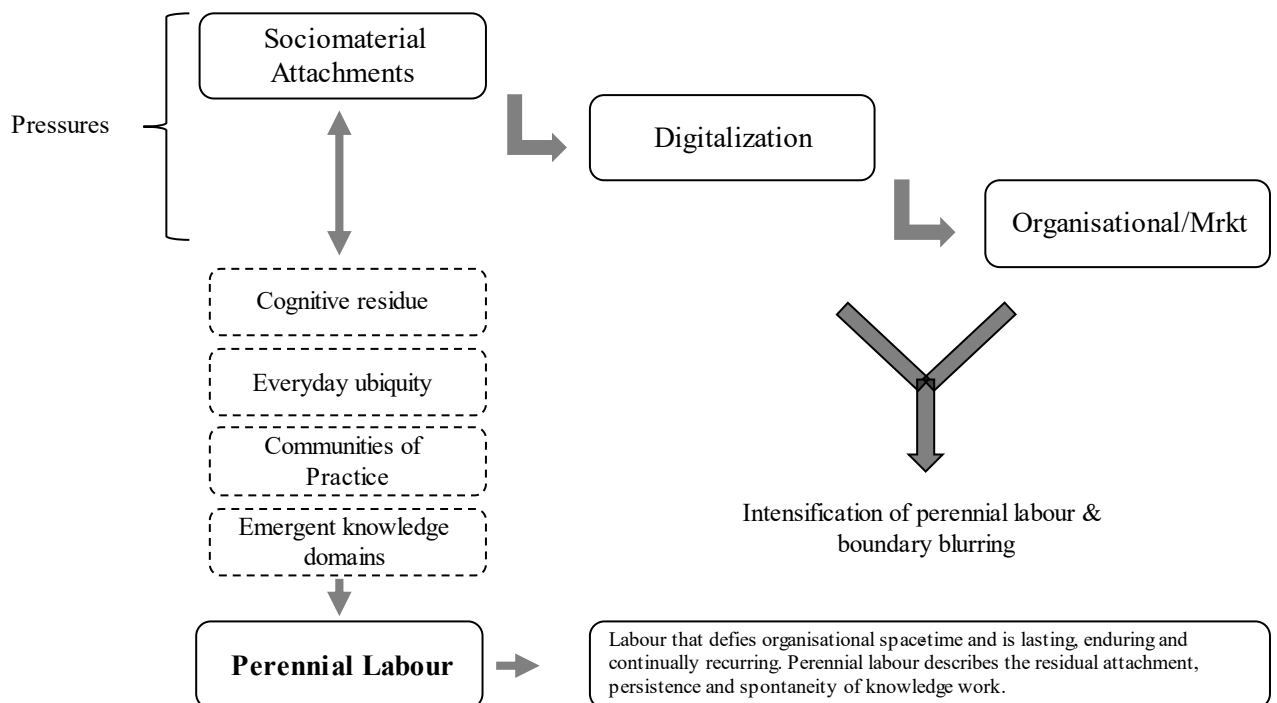

Figure 14: Perennial labour in digital knowledge work.

The enduring characteristic of sociomaterial attachments locate them as the *driving pressure* of boundary blurring, while the ongoing digitalization of work acts as an *accelerating pressure* and the contextual organisational and market demands experienced by workers are *contingent pressures*. Moreover, the sequence through which these manifest for workers means that the pressures of digitalization and organisational and market demands serve to intensify the frequency and scope of the perennial labour experienced by these workers. These conceptual qualifiers are key for the effective application of the concept and another useful method for illustrating this is through differentiating them based on the necessary and sufficient conditions for perennial labour, demonstrated in the table below. Importantly, perennial labour is *not* that work which occurs under *contingent* organisational pressures such as demands for overwork to meet deadlines, and which can often be carried and intensified by the digitalization of work. Those contingent pressures to blur the boundaries between work and life are only ever contextual, coming and going with the ebbs and flows of project development cycles, managerial preferences, organisational policies and so on. Perennial labour *is* an enduring feature of the practice of knowledge work itself constituted through the emergent exigent attachments of the labour process. In other words, it exists as a sociomaterial fact of knowledge work.

Pressures	Necessary condition	Sufficient condition	Perennial Labour
Sociomaterial attachments	✓	✓	✓
Digitalization (of work)	X	X	↑
Organisational & market pressures	X	X	Intensification of perennial labour

Table 19: The necessary and sufficient conditions producing perennial labour in digital knowledge work.

Moreover, the presence of perennial labour has implications for how we understand and thus must analyse the shifting work-life boundaries of knowledge workers and the tactics they enact

in the management of those boundaries. The combination of this and the fact that perennial labour is unacknowledged by organisations and legislation (i.e there are no policies to help workers deal with it) raises the question: if the segmentation of work and life is largely unachievable for knowledge workers who always experience a practical form of integration through the exigencies of their labour, then what is it that knowledge workers are doing when the pressures of boundary blurring meet with their boundary work tactics? In the following passages, I argue that we could best perceive this boundary (re)shaping as a process of *habituating labour* or constructing *habitats of labour*. The boundary work tactics of *physically distancing* and *removing/narrowing* are identified as specific techniques enacted by software and creative workers to manage the pressures of perennial labour in their everyday lives. However, these tactics are only ever temporary measures to manage the pressures of boundary blurring and their efficacy relies in their continual re-enactment in the everyday practices of workers, the practice of which contributes to the habituation of labour (a process discussed in the following section).

7.4   Boundary (Re)Shaping and the Construction of Habitats of Labour

Past research on work-life boundaries has demonstrated how boundaries are socially shaped, co-constructed and shared (Nipper-Eng 1996; Perlow 1998; Kreiner et al. 2009). Different domains (home, work) come with different interpretations and expectations, and these become institutionalised through their social embedding (Kreiner et al. 2009). However, the commodification of knowledges in software and creative work intensifies the individualisation of work, increasing the need for individuals to maintain occupational competencies, skills and knowledges despite the collective nature of knowledge production. The combination of shifting commodity forms towards more knowledge-intensive services, the digitalization of production and consumption and changing imperatives in work organisation practices towards more flexible forms of production and work require that we extend our focus of domains to include both the role (worker/employee) and activities (leisure, labour) involved in socially constructed domains. Working in these core knowledge occupations produces a form of collective individualism where the wider knowledge practicing community is tied into the spiralling process of knowledge domain emergence and its acceleration through digitalization. Furthermore, the lack of cultural, organisational and institutional acknowledgement of this process and the permanent susceptibility to perennial labour individualises the responsibilities

and risks of "keeping up" as workers shoulder the burden of the demands of knowledge work under an expansive capitalist system.

Mellner et al. (2015) concluded from their study of employees in knowledge-intensive work at a Swedish telecom company that self-regulation is a key factor in the boundary management tactics of knowledge workers. The analysis of knowledge work as a sociomaterial practice demonstrates that perennial labour, and the self-management of it, are necessary implications of the working practices themselves. Transformations to work organisation in knowledge-intensive production and services through digitalization and flexibilization (of production and work practices) such as that in the software and creative sectors appears to have intensified the (partial) onus for the organisation of work from employers/organisations towards the individual worker who is increasingly expected and required to self-regulate their work, expertise and career. Moreover, the implications of perennial labour are likely to have more pronounced effects on women and carers, as the demands made of their effort and time in the home can be extensive and the experience of boundary blurring different (Carerri 2020; Gray et al. 2020), contributing to the (re)production of already persistent social inequalities in software (Adam et al. 2006) and creative work (Conor et al. 2015). Digital knowledge workers such as coders and creatives find themselves in labour relations where they can work anywhere and anytime, where the sociomaterial attachments of their labour restricts them from switching off and establishing clear non-work domains, where they are compelled by need and expectation to stay connected to the "intellectual firehose" which accelerates with technology, where the organisational and institutional norms and policies that inflect and shape their work fail to adequately account for the pressures they experience and where that subsequent lack of protection and support offloads the responsibility and risks associated with knowledge work and knowledge-intensive production and services on to individuals. In this context, knowledge workers like the software and creatives in this study are perpetually engaged in what I refer to as the *habituation of labour* and the construction of *habitats of labour*.

The sociomaterial attachments of commodifying knowledge become amplified through the digitalization of work and the spatial and temporal fixes of labouring - living become more contingent on the agentic practices of individuals as they form habitats of labour. Habitats of labour are emergent fields of labouring activity that transcend the spatiotemporality of the 'workplace' through the sociomaterial and habitual practices of knowledge work. Furthermore, habitats of labour defy homogeneity as the process of habituation involves adjustments and

adaptations that are specific to the individual and contextually contingent (on employer, home-life, boundary preferences etc.). The intra-actions of boundary blurring, the realities of perennial labour and the responding boundary work tactics produce conflicts and accommodations in the lives of software and creative workers, and the outcomes of their negotiation form emerging habitats of labouring activity. Consequentially, this intensifies the individualisation of work as the responsibility, costs and benefits of managing labouring activity are borne by individual workers (and their families). In contradistinction to existing literature highlighting boundary blurring in both the work-life boundaries field (Nippert-Eng 1996; Kreiner et al. 2009; Reissner et al. 2020) and the literature on software work (Perlow 1998; 2014; Scholarios and Marks 2004) and creative work (McRobbie 2002; Hardt and Negri 2000; Gill and Pratt 2008), this analysis demonstrates the necessary permanency of work-life boundary blurring for software and creative workers. Although the integration of digital technologies in work, organisational pressures such as managerial demands, and even subjective attachments to work such as passion *can* contribute to boundary blurring, they do so as in the case of knowledge workers as either accelerating or contingent factors. The permanent susceptibility of knowledge workers to perennial labour means that what they are actually engaged in their everyday lives is the management of this sociomaterial fact of the practice of work itself. It is in managing the sociomateriality of knowledge work that software and creative workers engage in the habituation of labour as they attempt to construct habitats of labour that best relieve the pressures they experience. Despite 'work' moving out of the home conceptually through cultural norms and expectation, and structurally through organisational and institutional policies, practically, the sociomateriality of knowledge work means that the domain of work and home cannot be completely separated, although with considered institutional, organisational and normative accommodations its negative effects could be mitigated.

The practice of working in a job involves a process of socialization and habituation where the worker becomes embedded and accustomed to the rules, norms and rhythms of both the organisation and the occupational role. For most workers, becoming habituated to a job takes place over time as they enter the labour process which is organisationally structured to provide details on the range of work tasks, duties and responsibilities that the role involves. Perhaps most importantly, the role and labour process are bound by organisational space and time and the domains of work and life are demarcated organisationally, institutionally, normatively and practically. In contrast to this standard working relationship, the digital knowledge workers in

this study practice labour processes that are spatiotemporally fluid and although the domains of work and life remain organisationally and institutionally demarcated (i.e through formal working hours and employment legislation), practically they are embroiled in a process of perpetual work-life boundary (re)shaping. The effective realisation of the coder and creative labour process involves continuous engagement in perennial labour and this sociomaterial reality tends to sit uneasy with societal norms of work and private life as separate domains. What emerges as digital knowledge workers engage in boundary work in their attempts to manage boundary blurring and perennial labour is a habituating process of boundary (re)shaping where the action of labouring needs to be regulated and managed by the individual worker in the constant construction of habitats of labour. In this sense, the habituation of labour becomes a means of practically managing the domains of work and life for digital knowledge workers due to their permanent blurring.

7.5   Conclusion

This chapter applies the concept of sociomaterial exigencies in the analysis of the work-life boundaries of software and creative workers. Within the work-life boundaries literature, there is a need to provide conceptual and empirical insight into the before and after of boundary work by examining the sources of the pressures leading to boundary blurring and their implications for the labour processes of knowledge workers. The analysis presented here identifies sociomaterial attachments, digitalization and organisational and market dynamics as a sequence of intra-acting pressures leading to boundary blurring in knowledge work. Attachments are the *driving pressure* because they are the enduring mechanism on knowledge work and production, digitalization (as the primary form of objectification) is an *accelerating pressure* because it serves to extend and intensify the boundary blurring generated by the sociomaterial attachments of knowledge work, and organisational/market dynamics are a *contingent pressure* because they are either present or not and they depend on the context of work. How these pressures intra-act and sociomaterialize in the labour processes of coders and creatives through different channels is demonstrated and the implications of these intra-actions for the labour process is conceptualised through the advancement of the concept of perennial labour, which exists as a permanent susceptibility in knowledge work. These circumstances therefore bring into question the ability of knowledge workers to effectively segment their work and private life domains, and their ceaseless engagement in boundary (re)shaping is framed as

a process of constructing habitats of labour. Gray et al.'s (2020) recent sociomaterial analysis of mobile knowledge workers effectively demonstrated the placemaking practices of 'everyday worklife placing' as these workers engage in what the authors termed 'corollary work' to weave together everyday spaces and places until they are 'made to work'. This chapter compliments Gray et al.'s (2020) analysis by demonstrating how the sociomateriality of knowledge itself exposes these workers to the permanent susceptibility to perennial labour and implicates them in a perpetual process of habituating labour throughout their 'worklives'. Despite claims of immaterial labour (Lazzarato 1996; Hardt and Negri 2000), the work of software and creative workers, the vanguards of the 'new economy', is as material as any other and this sociomateriality has implications for the pressures experienced by these workers and their abilities to engage in boundary work to manage the contested terrain of the work-life boundary.

Chapter 8: The Contested Terrain of Subjectivity

8.1   Introduction

This is the final empirical section of the thesis where the sociomaterial exigencies identified in chapter 5 are used to problematise, build and strengthen our understanding of a core contested terrain in contemporary knowledge work. Here the focus shifts 'inwards' to the subject – the realm of subjectification and performativity. A longstanding position of a large body of scholarship on work in the New Economy, and in particular knowledge work within the high-technology and creative industries, is that contemporary knowledge workers are driven by an 'entrepreneurial' subjectivity (Foucault 2008) and 'productivity quest' (Gray et al. 2020) for ultimate work efficiency. In doing so, knowledge workers adopt and develop a productive subjectivity that idealises self-promotion and an entrepreneurial spirit to create, innovate and succeed in the new economy. Crucially, these perspectives are premised on subjective notions of intentionality, calculation and desire. The analysis in this chapter articulates a different account of the mechanisms shaping subject formation for software and creative workers by shifting the focus away from neoliberal governmentality and towards the emergent sociomaterializations of these forms of knowledge work. To be more specific, the purpose of the chapter is *not* to demonstrate how these workers construct subjecthoods through identity work and subjective rationalisations, but rather to argue that the sociomaterial practice of knowledge work (explored in chapters 5 and 7) within these increasingly agile production environments (explored in chapter 6) generate a sociomaterial enactment of a subject role, one that I refer to as an *agile agent*. The construct of the agile agent thus emerges from the intra-action of these knowledge workers with the practices of their labour processes and is extended and intensified by their organisational and labour market contexts.

The sociomaterial approach developed here emphasises a 'fifth way' (Musílek, Jamie, and McKie 2020) that personal attachment to work can be understood in the contemporary economy. By building on the analyses in chapter 5, 6 and 7, this approach demonstrates the *sociomaterial embeddedness* of knowledge work and the implications for the activities and characteristics that workers are pressured to engage in and enact through both material need and expectation. Being sociomaterially embedded for the software and creative worker involves attachments to their labour regardless of the personal or subjective intention, desire or satisfaction of such attachments. This brings into question the generalisability of the 'entrepreneurial self' and other neo-governmentality narratives that have pervaded scholarship

on contemporary workers' subjects and identities by instead asking what the social and material manifestations of the labour process entail for the actions and roles of workers. In doing so, this chapter answers the call by labour process researchers to develop more materialist readings of subject formation (Marks and Thompson 2010). The chapter is structured as follows: first, the findings of the previous empirical chapters are integrated with the literature to illustrate the sociomaterial embeddedness of software and creative work and to differentiate it from approaches to work attachment based on neogovernmentality; second, the implications of this embeddedness for the workers' subject are examined by identifying two 'perverse virtues'(Gregory and Sadowski 2021) that they are required to enact; finally, the potential rewards and penalties implicated in the different degrees of embeddedness and performativity of the agile agent subject are explored. The chapter is designed around answering the following two questions:

RQ1.   What generates personal attachment to work for software and creative workers?

RQ2.   How does this process shape the workers subject, and what tactics do they adopt in relation to it?

8.2   Software and Creative Work as Sociomaterially Embedded

What constitutes personal attachment to work and how can it be understood? Personal attachment to work is understood here as a phenomenon comprising a series of entangled ties that intensify and extend the interactions and relationships that workers have with their work, and the effects those ties have on the actions and roles played by those workers. In the preceding chapters, I demonstrated how the exigencies of knowledge work shape both the organisation and conduct of work (chapter 5), how control is achieved over coders and creatives through regulated autonomy and the demands of agile structures and logics (chapter 6), and the perpetual work-life boundary (re)shaping caused by the permanent susceptibility to perennial labour in knowledge work. This section builds on these findings and positions them within the literature on work attachment and subject formation to argue that attachment to work is produced first and foremost for these workers through the *sociomaterial embeddedness* of work. In this approach, although the subjective orientation of the worker remains a key mechanism shaping the *contours* of attachment, it is argued that in the case of the digital knowledge work of software and creative workers the primary forces producing attachments to work are the sociomaterial practices and structures these workers are embedded within.

As detailed in chapter 3, the 'subjective-turn' that occurred across social scientific research on work looked to Foucault's scholarship on subjectification as a theoretical frame through which to understand attachment to work in contemporary capitalism. What emerged were narratives of the entrepreneurial self or 'entreployee' (Voß and Pongratz 2002; 2003; Foucault 2008) which depicted characteristics that were commonly discussed across managerial, psychological and career texts (Boltanski and Chiapello 2005; Rose 1999; Vallas and Hill 2018). This scholarship identifies the recent ideological-discursive shift in the understandings of economic action and the individual subject and demonstrates its prevalence (and preferences) across the managerial and psychological professions. Most recently, the four approaches to the study of personal attachment to work that Musílek, Jamie, and McKie (2020) identified (see Figure 2, page 83 for an illustration of these approaches), are all founded upon a lineage of Foucauldian neogovernmentality analyses. In contrast and addition to these accounts, this chapter builds on the empirical chapters that precede it and identifies a more enduring mechanism shaping the attachment that people have to their work.

In particular, the examination in chapters 5 and 7 of the sociomaterial attachments that bind software and creative workers to their work through cognitive residue, the everyday ubiquity of the subject of their labour, networked communities of practice and emergent knowledge domains point to a more *enduring* basis for work attachment. Here, personal attachments to work exist in, above and beyond individual subjective attachments which imply the presence of rational calculation, desire, passion, ambition etc. Indeed, passionate connections to 'craft' are present in this sample of workers, however, what emerges as the most interesting finding is the common pattern of *sociomaterial* attachment across all participants with or without the presence of strong subjective orientations. These sociomaterial attachments that are emergent through the practice of labour, and which are intensified by digitalization, organisational and labour market pressures, constitute a form of sociomaterial embeddedness for workers.

The concept of embeddedness has proven a useful tool in the social sciences for analysing the emerging consequences or becoming's, of the relations of societal actors. Hess's (2004: 173) heuristic demonstrates how different disciplines have understood and applied the concept based on who the embedded actors are, what they are embedded within, and on which (geographical) scale the analysis is focused. Recently, Wood et al. (2019) demonstrated the benefits of adopting such an approach in their examination of the (dis)embeddedness of digital labourers in the platform economy. They develop a Polanyian analysis based on viewing commodification as "*the degree of exposure to market exchange*" (Wood et al. 2019: 945); an

approach similar in scale to Polanyi's original emphasis on marketisation as a societal process with emphasis on the state (Hess 2004) and later readings of Polanyi's work (Burawoy 2012). Elsewhere, Schwartz (2018) developed a 'socially embedded' approach to the study of occupational communities as an attempt to rectify research which is built on an under-socialized perspective of the labour process, demonstrating their key role in supporting crowdsources workers. The sociomaterial attachments identified in the preceding chapters, and their effects on both the experiences and actions of workers constitute a form of embeddedness that is based on the sociomateriality of the practice of labour. Commodification remains centred, however, the 'scale' shifts from an emphasis on the role of the market and nation state towards what Huws (2014) has called the 'engine of commodification'. Prioritising a focus on commodification as a micro-practice implicated in and transforming the labour process that involves the extraction, application, exchange and exploitation of resources and persons pushes us to ask - in what are these workers embedded and to what effects?

Software and creative workers are sociomaterially embedded in three ways (see figure 15 overleaf), and in a similar manner to the pressures leading to boundary blurring (ch.7) these appear as a sequence of factors shaping the embeddedness and thus actions of workers: first, the *practices of the labour process* itself, which the preceding chapters have demonstrated are characterised by sociomaterial exigencies, most notable of which for this analysis are the sociomaterial attachments of work and their entanglements through digitalization; second, the *organisational contexts* within which labour processes are always embedded, and which for these workers are characterised by forms of agile production (ch.6); finally, the *labour market contexts* within which workers are always embedded, and which for these workers are characterised by high-demand and high levels of mobility (software) and low-demand, high levels of competition and informality (creative).
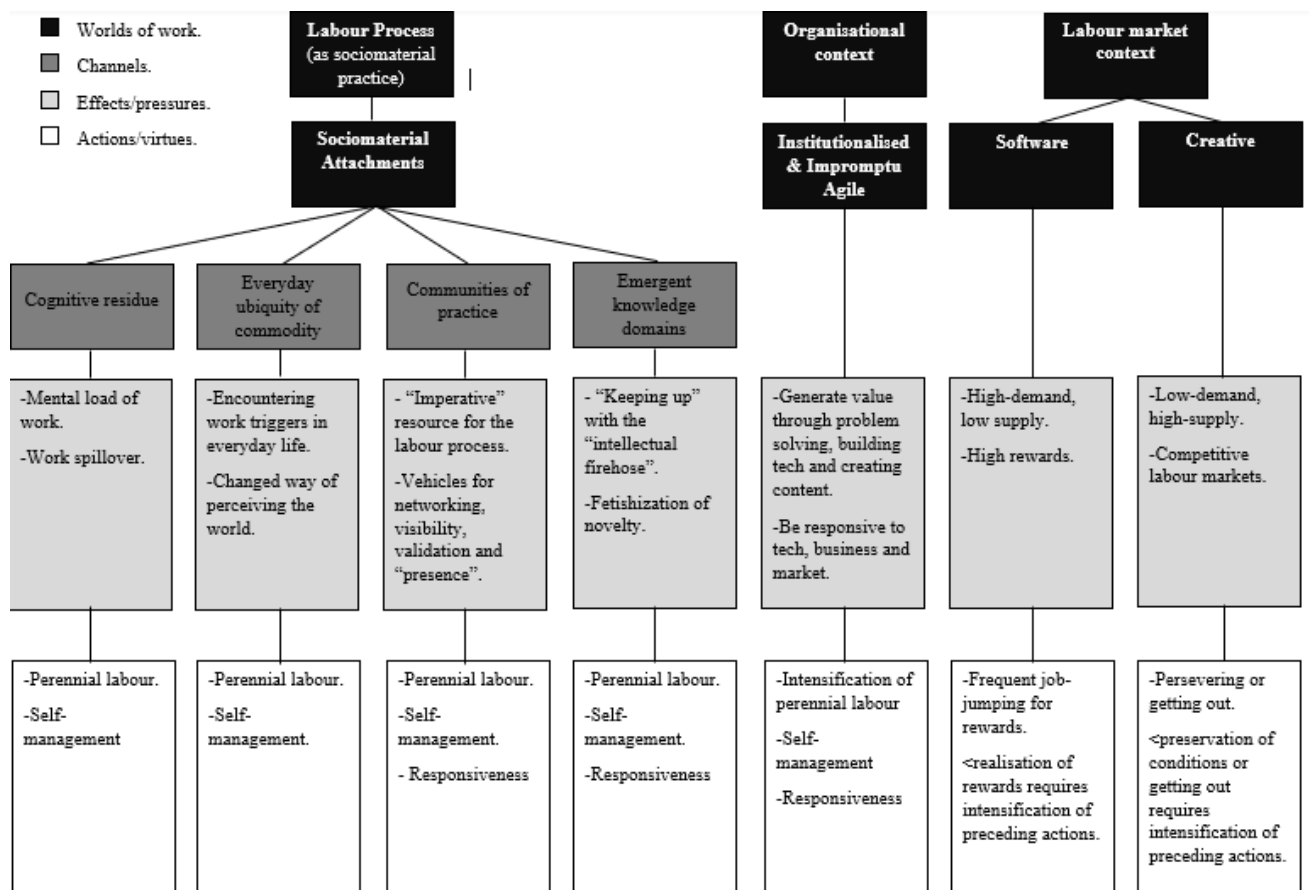
Figure 15: Sociomaterial embeddedness of software and creative workers.

These three factors (labour process as sociomaterial practice; organisational context; labour market context) of course can all be articulated as sociomaterial. For example, organisations and labour markets as social structures necessarily constituted through the intra-actions of peoples, organisations, technologies, and social processes are indeed sociomaterial in the sense that they are comprised of the constitutive entanglement of socialities and materialities. However, it is important to highlight that the first factor within which these workers are embedded (the practices of work) represents the most significant for the analysis. It could be said that the sociomaterial practices of work itself represent a first-order mechanism that is integral to the shaping of subject formation. As a factor it represents what George and Bennett (2005) would call a mechanism of 'causal priority' and 'causal depth'. It is through an analysis of knowledge work as a sociomaterial practice that implicates emergent exigencies whereby the actions and experiences of the knowledge worker are necessarily shaped by the sociomateriality of work itself, that we can re-orient our understanding of subject formation in the world of work. Software and creative workers are sociomaterially embedded with work

through the attachments of knowledge work itself, and then further embedded within their organisational and labour market structural contexts which may at times intensify the demands and expectations experienced by workers. These sociomaterialities shape the actions, characteristics and relations that these knowledge workers enact, and they represent both a necessary and sufficient condition for work attachment. In contrast, the role of subjective factors in the generation of work attachment *emerge after* the fact of the embeddedness of these workers within their worlds of work, and despite playing an important role in shaping the *contours* of work attachment they represent a sufficient condition for work attachment to exist, but not a necessary one.

	Necessary	**Sufficient**	**Personal Attachment to Work**
Sociomaterial Embeddedness	✓	✓	✓
(Neo-governmental) Subjectivity	**X**	✓	✓

Table 20: The necessary and sufficient conditions for work attachment.

The following diagram (fig. 16) represents a more visual way of illustrating this difference in the sequential role of such mechanisms for shaping subject formation. If E is the outcome or phenomenon in question (work attachment), and the literature of attachment to work has been primarily concerned with C (subjective attachment) as a causal factor, it has missed the antecedent factor of Z (sociomaterial practice of work) as both a necessary and sufficient condition to bring about E (work attachment). Analysing the labour process as a sociomaterial practice thus helps us to define the sequence of mechanisms shaping work attachment and subject formation in the world of work, an important endeavour in the examination of the forces shaping work (McGovern 2020). Although subjective attachments to work (C) are sufficient for workers to exhibit work attachment, as a contingent factor they always exists with and through the sociomateriality of work itself.

Work attachment   = E   ———— = Enduring factor

Sociomaterial practice of work   = Z   – – = Contingent factor

Organisational context   = X

Labour market context   = Y
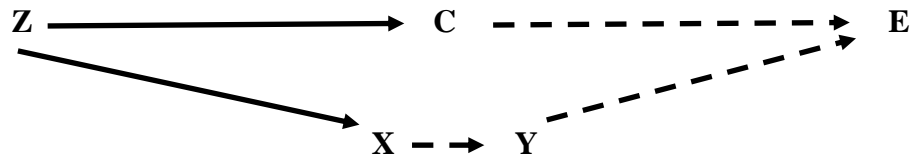
Subjective attachment   = C

Figure 16: Causal priority and causal depth of the mechanisms producing work attachment.

Furthermore, it could be said that both phenomenon E (work attachment) and C (subjective attachment to work) are both necessarily generated by the enduring presence of Z (the sociomateriality of working practices) as a requisite mechanism (i.e of causal priority) shaping the actions and subjects of workers. In other words, both the phenomenon of work attachments subjective attachments to work are emergent factors from the sociomaterial embeddedness of work itself (see figure X below). It is important to note that subjective orientations to work (e.g., passion, 'love', entrepreneurial drive etc.) are important for shaping the contours of work attachment, indicated by the arrows in the figure overlreaf. Indeed, the literature has effectively illustrated this to be the case (Neff et al. 2005; Cockayne 2016; Kerr and Kelleher 2017; Cote and Harris 2020; Musílek et al. 2020; DePalma 2021). However, despite the fact that such subjective attachments to work are important factors, in the case of software and creative workers they nonetheless appear after the fact of sociomaterial attachment and are thus sufficient for work attachment but not necessary.
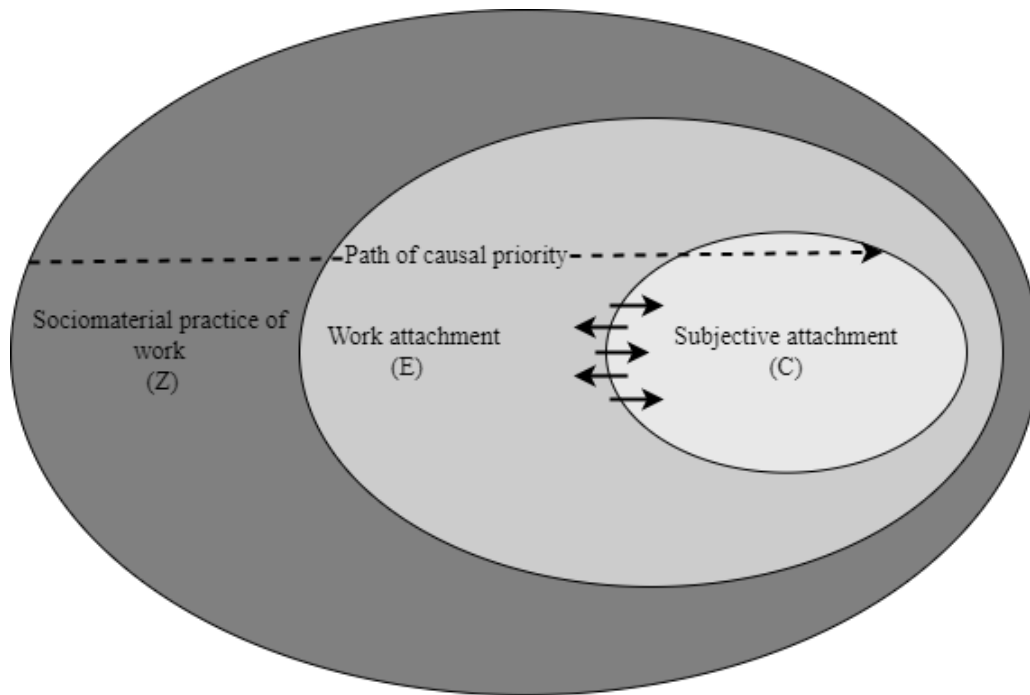
Figure 17: Subjective attachment to work as a (contingent) emergent factor of the sociomateriality of working practices.

Furthermore, subjective attachments to work, much the same as subjective attachments to any form of situated, sustained action by people (whether that is working, playing sport, music, cooking and so on) are an emergent property of the entanglement of people within those situated practices as a sociomaterial requisite. Subjects emerge from intra-actions with the material world as constitutively entangled, but the materiality of the world exists in, above and beyond our subjective knowledge and/or experiences of it. Furthermore, the antecedence of the materiality of the world itself exhibits elements of affordance and path-dependence, for example, most biological organisms by virtue of their material constitution require oxygen to survive and grow; this enduring material fact of life thus directly shapes (non-determinately) the evolutionary and behavioural characteristics of organisms. Similarly, the production of knowledge (and knowledge work) as a necessarily material practice implicates a number of sociomaterial exigencies that are requisites for knowledges to be produced by human subjects. This thesis has developed a way of theorising, conceptualising and identifying these emergent exigencies and their implications for shaping the organisation of work, the practices of the labour process and their experiences by workers.

This approach is intended to provide the first step in an analysis of work attachment where the sociomaterializations of labour are taken seriously as mechanisms coordinating the actions and shaping the subjects of workers. Importantly, this analysis does not attempt to advance an all-

encompassing narrative of *subjective* attachment, instead it positions the sociomaterial embeddedness of work as a pivotal analytical foundation which intra-acts and emerges through and with "*complex combinations of influences, values and conflicts in contemporary working life*" (Musílek, Jamie, and McKie 2020: 10). Indeed, the personal attachments to work that emerge through the sociomaterially embedded labour of software and creative workers can also be imbued with individualised subjective orientations which align with some of the neo-governmentality approaches. For example, Simon, one of the software engineers working in a tech start-up described the many ways in which he is embedded and attached to work through his labour process, yet he instils his actions with a sense of entrepreneurial drive. Similarly, many of the creatives interviewed expressed orientations to their work such as passion, commitment and a sense of craft and authenticity towards oneself, merging elements of the biocracy, lack, desire and affect, and 'ethics of the self' approaches identified in Musílek, Jamie, and McKie's (2020) heuristic. It is important to note that the point is not to advance an exclusive explanation of personal attachment to work but to demonstrate how all explanations must account for the real sociomaterializations of the labour process and wider working life if they are to avoid subjective fetishization and over-emphases of the power of discourse in shaping working subjects. The actions that these knowledge workers take and the roles that they enact in their working lives do not necessarily need to be driven by passion or entrepreneurial pursuits, or indeed any subjectively driven pursuit beyond mere subsistence, but are *always* embedded within and shaped by the effects of the sociomateriality of their work.

8.3   The Performativity of Sociomaterially Embedded Work and the Constitution of Agile Agents

RQ2.   How does this process shape the workers subject, and what tactics do they adopt in relation to it?

The previous section illustrated how the sociomaterially embedded nature of software and creative work produces common patterns of attachment to work as a sociomaterial requisite of the labour process, regardless of the subjective orientation of the workers themselves. To build on this, this section is concerned with how those conditions of embeddedness shape the actions that software and creative workers engage in, the organisational roles they inhabit through their labour processes and their meaning for the workers' subject. Following Gregory and Sadowski

(2021), I define these actions, characteristics and roles as 'perverse virtues[42]'. Importantly, these virtues are perverse because they are geared towards the productive generation of value for systems of capital accumulation. I build on Moore's (2019) recent work on the influence of agility management systems on the organisation and conduct of work while applying the concept of performativity (Butler 1990; Barad 2007) to examine how the sociomateriality of software and creative work shapes the actions and subjects of these workers. In doing so, I enter dialogue with the proliferating field of research on work attachment, identity and subjectification (Butler 1990; Rose 1990; McRobbie 2002; Voß and Pongratz 2003; Boltanski and Chiapello 2005; Gregg 2011; Vallas and Hill 2018; Gray et al. 2020; Musílek, Jamie, and McKie 2020; Neely 2020; Gregory and Sadowski 2021) although my intention is to focus on the ways in which the materialities of the practice of work itself generate a specific form of performativity. This focus differs from much of the research on the working subject which tend to centre either the construction of identities through identity work or the engineering of subjecthoods through ideological and discursive constructs.

I advance the concept of the *Agile Agent* to describe the dominant role that these workers are required and expected to enact in their working lives. As a concept, the agile agent subject is constituted through two distinct features: first, being 'agile' involves the enactment of the two perverse virtues of self-management and responsiveness, both of which are a sociomaterial necessity of the working practices of knowledge work; second, being an 'agent' involves a distinct role played by knowledge workers as organisational professionals who are hired with varying degrees of *possessed knowledge* to enter organisational labour processes, but where effective enactment of these labour processes require those workers to operate as agile, adaptive and responsive agents who act as nodes and intermediaries, sociomaterially embedded within their domain of knowledge production and whose *practiced knowledge* (Amin and Cohendet 2004) secures the organisation of both knowledge in the head and in the world (Norman 1988). Gregory and Sadowski (2021) define perverse virtues as both components and consequences of the platform companies they studied. The virtues of the agile agent that I identify here are both components and consequences of digital knowledge work in the software and creative sectors (and likely beyond). For these workers, the sociomaterial practices of their labour and the organisational and labour market contexts within which they are embedded encourage and require the performance of the perverse virtues of self-management and

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[42] The authors adopt the phrase perverse virtues to emphasise the perverse nature of the actions, characteristics and roles expected and encouraged by systems of capital accumulation and which are geared towards the productive generation of value for that system.

responsiveness in the service of capital. The following three sections explore how these virtues manifested for these workers, and the key intermediary role played by these organisational professionals.

Self-Management as a Virtue of Software and Creative Work

Depictions of entrepreneurial subjects are often derived from identifying a number of common characteristics displayed by workers. The three characteristics (self-control, self-commercialisation and self-rationalisation) identified by Voß and Pongratz's (2002) as constituting the new 'entreployee' are the primary ones invoked throughout the literature, and here I unite these under the virtue of self-management. In analysing digital knowledge work as a sociomaterial practice, this thesis has throughout the preceding chapters demonstrated how these sociomaterialities shape both the labour process (ch.5, ch.7) and the organisation of work (ch.5, ch.6). In particular, the sociomaterial attachments identified throughout the empirical chapters up until this point have demonstrated how software and creative workers are permanently susceptible to perennial labour and in constant (re)negotiation of the boundaries of their work time, space and activity through the habituation of labour. Furthermore, these attachments, which represent real material ties that connect these individuals to their work, constitute a form of sociomaterial embeddedness for the worker. However, as the previous section has demonstrated these workers are not only embedded within the sociomaterial practices of their labour, but also the organisational and labour market contexts within which they operate.

Self-management for digital knowledge workers involves dealing with the perenniality of labour; engaging with communities of practice to effectively enact labour processes, keeping up with knowledge domains to adhere to best practice and the most pertinent (technological) developments, and constructing and curating digital profiles to secure visibility as a competent professional and enhance employability on the labour market. As the previous chapter already explored in detail the requirement for software and creative workers to manage perennial labour and its implications for the porosity of the boundaries of work, the discussion that follows will focus on the importance of communities of practice, digital profiles and "*keeping up*" as features of this work that keep these workers in a mode of perpetual self-management.

An integral part of what distinguishes professionals from other occupations is that they have domain over the possession, construction and practicing of a body of knowledge which they

apply to solve problems, create products and provide services. As a tapestry of distributed knowledges, these domains of knowledge are embedded throughout professional communities of practice. For software and creative workers in particular, as new cohorts of organisational professionals (Scarbrough 1999), engaging with these external communities of practice is essential in the practice of work itself. For creatives, these communities are dispersed primarily throughout social media (Twitter, Instagram) and creative content platforms (Dribble, Behance, Pinterest), and these are drawn on during the labour process as sources of information, inspiration and technique:

> *"For me, at the moment it's Twitter, Instagram, LinkedIn and my Behance website. It's just to get my name out there…**Pinterest is very important in looking for inspiration, Instagram and Twitter also. I use these pretty much to follow specific accounts or specific hashtags that I can get ideas off of**. Instagram and Twitter are very good for them. They're good sources for information" (Matt, Digital Designer)*

> *"Pinterest I use all the time. It's how I collect visual research, just pieces of design that I can use for a mood board. I get really a ton of visual inspiration from Pinterest. Social media, obviously, it's important…A lot of creatives would use it in place of a personal website, almost like just a way to showcase your work. Yes, places like Behance and community-driven places, like Skillshare is one that I've been using a lot, it's a great community, it's a great way to learn. It's like going to school really and getting that sense of learning from your peers and from your teachers." (Talia, Digital Designer)*

Drawing on such communities of knowledge as a professional is nothing new, what has changed though is that now these communities store and share their knowledge online through digital ICTs. One of the designers, Darren described the use of these online CoP and creating digital profiles to interact with them as constructing a personal library of knowledge:

> *"the same way an old graphic designer would have always had books and stuff that they would have gone to for references and ideas on what works, especially when it comes to a certain design because you'd look at fonts and different things for letterpress. Having a library of stuff, it's just a case of going [to online CoP] and seeing what the stuff is like and keeping stuff that you like and you've used before, and reusing ideas. **It's nearly like your creating your own library for yourself**." (Darren, Digital Designer)*

The movement of CoP to the internet amplifies their utility as tools within and for the labour process by allowing workers to collect and curate essential resources that they can use to help or complete their work. These communities are just as integral to the labour processes of software workers, although rather than providing inspiration they mainly act as sources of technical knowledge that coders can tap into to help solve problems or even to speed up the process of creating routine coding assets (button and search strings etc.). Many of the coders were very clear and adamant about the role these played in assisting them to do their work:

> *"They are imperative! Seriously developers wouldn't function as professionals. I mean, to be honest, developers, or not just developers, engineers in general, they rely on the community a lot. We need resources and they don't come from the corporations or company, they come from the community. I think it's huge. Seriously, I cannot imagine not having those platforms." (Rachna, Software Engineer)*

By far the most common community that coders rely on for the effective enactment of their labour process is StackOverflow, an online platform and repository of computer programming knowledge. StackOverflow is essentially structured through a series of question and answer forums divided across specific programming topics and languages, furthermore, the platform is governed by a 'reputation reward process' (StackOverflow 2022) that evaluates members of the community through a points based system. These systems embed workers within the platformisation of professional identities by generating a metrification of reputation and competence through these upvoting and reward processes. Beyond this external network of the evaluation of worth and professional competence, the platform also serves a much more practical purpose in helping these workers complete their tasks by providing information to help solve problems or through speeding up the coding process by providing template code strings for specific assets:

> *"I don't know a developer in the world who could survive without Stack Overflow. The ability to use Google is half the job of a software developer, because no one knows how to do everything in the world...Because software development is typically still rapidly changing, no one knows what the right answer is, I guess the ability to have a community there to pull ideas from…like StackOverflow rarely gives you the answer, but we'll give you five kinds of answers and you can make your answer out of that. They're integral to development. (Adam, Software Developer)*

As organisational professionals, software and creative workers must navigate the labour market within the software sector and the Cultural and Creative Industries. The hiring process and operation of labour markets through intermediaries and platforms has become increasingly digitalized over the past decade, and the finding of work and workers has therefore become increasingly dependent on digital profiles. Digital profiles are online representations of individuals uploaded to various websites and platforms that allow users to navigate these sites/platforms, customise their details and share information. In this context, the websites and platforms (LinkedIn, Twitter, Instagram, Behance, Dribble, StackOverflow etc.) that these workers constructed and curated digital profiles through were typically used to create visibility and cultivate a sense of professional competence in their respective fields. These platforms tended to converge around three general types: professional platforms such as LinkedIn, platformised communities of practice (StackOverflow, Reddit, Dribble, Behance etc.), and platforms used primarily for communications (Slack, Twitter etc.). Maintaining an online digital profile "*at least requires a small but consistent effort*" *(Alex)* because *"If people are not on social platforms, it can be very hard to have awareness of them." (John)*. However, oftentimes the amount of work involved in this is significant:

> *"There is a lot of effort that is required to maintain a professional profile…Design work is consistently improving so that even in 6 months to 1 year from now, it's likely projects will not be at your current level. Each portfolio piece should really have a detailed case study which can be time consuming to write… Social platforms can be good at showing snippets of your design work, but when applying at companies, a website of some sort is typically preferred." (Louise)*

> *"I'm getting my voice out there. If I hadn't had these platforms, I don't think I would be given the opportunities I have now without them. I think you would be at such a disadvantage, because otherwise your on the other way to get yourself out there is maybe…I think online platforms are really important for designers regardless because we just don't have that much voice out there. I think it is an important part of us to be out there because when your looking for a job, you don't just send a CV over, you have to have your website, you have to have your, again, your digital platforms, just like who you are, the work you've done. I think it is very vital." (Matt, Digital Designer)*

Both coders and creatives mentioned the need to have personal websites which in effect act as digital portfolios displaying their knowledge and skills in programming, web development and

design, and for creatives in particular for displaying the content they have produced. The purpose of building these digital profiles however extends beyond the practical need to display your work by operating as important markers for the evaluation of professional competence, status and reputability:

> *"You need to be 'seen' and interact so others see you as somewhat an 'expert' or knowledgeable in what you do...You need to almost create an online persona that interacts and shows the best of you and that takes a LOT of time, effort and planning." (Luis, UI Designer)*

For the software workers, although the visibility afforded by digital profiles is still important for generating a type of presence on the labour market and across digital communities of practice, it does not play as pivotal a part as it does for creatives. This is largely due to the visual, aesthetic nature of what creatives do which means their work is ultimately judged (by their communities, consumers/clients, organisations, labour market intermediaries) through the evaluation of the (primarily digital) content they have produced, most often through its curation in portfolios. In comparison, the programmes software workers create are protected by their regulation as the private intellectual property of their employers, meaning that software workers most often cannot openly share the work they have produced. Despite this, there are still expectations in the sector (constituted as it is through the interaction of organisations and the labour markets they draw from) that workers construct profiles of professional competence. For example, Julia mentioned that:

> *"I participated in a couple of conferences. Then, **I started speaking at conferences and I got some extra points from there**. Then, **I started writing articles**, but I stopped doing that because I didn't like that much." (Julia, Software Engineer)*

Her reason for engaging in these "*extra-curricular*" activities, as one of the other participants (Ian) calls them, is that some companies actively expect their organisational professionals to build professional profiles through things like public speaking at conferences in order to receive rewards like promotions:

> *"I remember that in the first company that I worked for, in order to get a promotion, you would have to tick a number of things off a checklist amongst which was to do public speaking...They instilled in us the feeling that you need to do these things in order to be perceived well. If you just did your job, it was not enough for a promotion. It was enough to keep you around, but not to get more. (Julia, Software Engineer)*

259

Moreover, coders are aware through their networks within the industry and through their memberships of online communities on Reddit and Slack that some companies have internal policies that require that developers continue to work towards promotion in order to keep their jobs:

> "*In Connect [pseudonym for Tech MNC] you have to get promoted every two years otherwise there's a chance they could actually throw you out of the company. I hope that doesn't happen to other people. I've read a bunch of Reddit threads and comments implying about that. People [coders] always stress out about it because they have to get promoted otherwise they lose their job." (Rachna, Software Engineer)*

Such expectations can be driven by the fact that digital profiles, and their potential for generating reputation, are not just a requirement for organisational knowledge workers to display professional competence on the labour market but they can also provide a veneer of reputation and status to companies themselves:

> "*social media I think has two drivers – to be seen as being modern and also the impact a Dev [Software Developer] can create by having a social media profile – your career can take off if its seen that you have influence in a particular area and more companies are looking at boosting their own profiles by having employees with strong social media presence." ((Michael, Software Engineer)*

For these software and creative workers, self-management as a sociomaterial implication of work is driven by the real and perceived need to "*keep up*" in an accelerating and competitive world of work. As organisational professionals, these workers need to keep up with the demands of their knowledge domains and their employers. As digital knowledge domains, computer programming, design and digital content production are in constant flux as new best practices, tools and technological capabilities shape what these workers can do, how they can do it, and with what tools. Although this keeping up is a sociomaterial imperative for doing this work and it therefore exists as a common pressure for all of these workers, the demands it places on the effort and time of these people will have implications for the (re)production of social inequalities. In particular, women are likely to be effected most acutely due to the persistent inequalities in domestic labour (Edgell and Granter 2019), and Rachel's experience (in the section to follow) points to this. Even for the minority of participants who took a more relaxed approach to managing their professional profile and employability, the need to keep up with continuous change in their fields was a common pattern of experience:

I think your constantly just trying to keep up with yourself…your constantly developing and your following up with the new trend, trends are pretty much like something new is coming out and you want to be good at that, that's pretty important because you want to be ahead of the curve in terms of what's out there. You want to stand out from the crowd. There's a lot of like you have to come up with good ideas, something that's different especially for work. You don't want to be the same as everyone else. That's always the problem, and you do always end up just like someone else. The issue is separating yourself from the crowd, especially from your competitors" (Matt, Digital Designer)

"I don't put a lot of work into it [self-managing my digital profiles] besides ensuring my job description and tech used is up to date. I used to do more here, I tried blogging and spent a lot of time helping on StackOverflow in order to add some "extra curricular" sheen to my CV. These days, I rather work on my own skills, so I do read a lot of blogs, watch YouTube videos and listen to podcasts – especially if they relate to the language I am involved with now." (Ian, Software Developer)

Ian's account here echoes that of most of the participants where they describe engaging in perennial labour through contributing and searching CoP such as StackOverflow, ITC Slack and IrelandDesigns; watching skills and technique tutorials; reading the work of other practitioners through online blogs/websites; and learning new software packages. These "*extra-curricular*" practices as Ian calls them all constitute a form of perennial labour as they are performed in order to be able to effectively do their work within their organisations. Furthermore, the frequency and extent to which these workers need to engage in such activities is intensifying as organisational expectations soar:

"Currently there is a drive that engineers are all singing and all dancing. Our team looks after our own testing, build & deploy pipelines, total cost of ownership, threat modelling and security. Devs are expected to be proficient in all of these as well as the actual code stack on top." (Michael, Software Engineer)

Although the importance of keeping up with current technologies and professional practices remains core to the work of both software and creative workers, and this exigency requires constant self-management, some of the participants also take a much more utilitarian approach to what Rachna described as "*ramping up*" (i.e spending bursts of time upskilling in particular skills/technologies for work). For example, one of the senior developers Brian, was very clear

about how he approaches ramping up as he described leaning particular technology stacks based on their labour market demand and the trading of his personal time and effort as a commodity on the market:

> *"Having seen what I've seen, I've said this before to a few other people that it feels very much like trading-- like a stock market where you can choose to invest your time in learning a particular technology and that investment might pay dividends if that career path that you choose gains demand. I chose a few years ago to invest my time in learning Angular. That paid off. I got a job where I was using Angular for three years, and I was very well paid for it. I could have equally chosen to stay with Java or chose to stay with jQuery or something like that, saying all those "Don't worry, there's going to be continuous demand for jQuery." I would probably be in a lot of trouble now. It's interesting with technology that you have to almost think what is the market going to be doing in a few years' time. If I'm going to decide to learn something new, I need to make sure that I invest in something where I think there will be a demand. It is like playing the stock market [chuckles] that way where I try to invest-- where my commodity is my time and my effort and the market is demand for that effort." (Brian, Software Engineer)*

The virtue of self-management is emergent from the sociomaterial practices of digital knowledge work itself, rather than a collection of characteristics *derived from* an entrepreneurial subjectivity and orientation. The self-management which agile agents are required to perform emerges from their navigation of the exigencies of knowledge commodification and their organisational and labour market contexts. In order to effectively engage in, maintain, and excel in the digital knowledge work of software and creative work, these workers need to manage the perennial labour produced by the sociomaterial attachments of work, its acceleration through digitalization, and its intensification through organisational and labour market pressures to be "*all singing and all dancing*" *(Michael)* and for the "*need to be 'seen' and interact so others see you as somewhat an 'expert' or knowledgeable in what you do" (Luis)*. In other words, their need to self-manage as a virtue directly emerges from the navigation of their sociomaterial embeddings as a material implication of what needs to be done to do these jobs.

Responsiveness as a Virtue of Software and Creative Work

The second virtue needed and expected of these digital knowledge workers and which is integral to the subject formation of the agile agent is responsiveness. Coders and creatives are indeed expected to be increasingly agile within their organisational environments that are largely managed on the principles of agility management systems or logics (Moore 2019), however, the expectation to be agile extends out beyond those demands of the organisation to include the need to be connected to the "*intellectual firehose*" of professional, digital domains of knowledge and practice. It is through this expanded consideration of knowledge work as a sociomaterial practice that we can see that there is an urgency in the need for these workers to be responsive to (i) their knowledge domains, (ii) technology (as both tool and product) and (iii) organisational stakeholders, which include management, colleagues, clients, consumers and/or users.

The sociomaterial attachments of knowledge work implicate a type of attentiveness to the emergence of knowledge domains, and the digitalization of these domains accelerates this process and therefore intensifies the demand on workers to be responsive to the continuous change within their fields. As a creative, there is an *"expectation to have a good understanding of best practices and current industry standards, so being aware of new software is expected." (John)*, and keeping up with these developments is a multifaceted process that involves a lot of time and effort and that can be experienced differentially depending on how much experience someone has:

> *"In my view, to 'keep up' is to **update yourself** on the latest news, 'keep up' with the latest software, 'keep up' with the latest tools. To me this idea of 'keeping up' is definitely harder when your starting out as a junior as you do not know where to look or who to talk to to get 'up to speed' in industry standards." (Luis, UI Designer)*

> *"The amount of additional hours to keep up with new trends and new forms of design while working lots of overtime is very hard to maintain...There's UI [User Interface], web design and coding, video production, you name it, they [organisations] want it so you have to constantly be upskilling." (Nancy, Head of Creative)*

As Ieva (Software Engineer) mentioned, there is a great deal of effort involved in being responsive as a software worker "*as you always have to be updating your knowledge, your skills and mindset. You must always keep learning and being involved in new technologies that are coming out in order to stand out." (Ieva).* Similarly, one of the senior software workers in

the case (Colm) was particularly explicit in identifying both self-management and responsiveness (to knowledge and tech) as essential virtues for software workers. When I asked him to describe the most important things that a worker needs in order for them to be a software worker in the industry, he said the following:

> *"No.1 – the ability, or the knowledge that you must manage yourself and your own career, that's number one right…Other than that, the wish and the ability to constantly learn, because you actually cant…like it would be nice to be able to stand still and just sort of like rest on your laurels a little bit but unfortunately you cant because the industry is changing crazy, too crazy…I mean it doesn't change that fast…things that were true fifteen years ago are still true now but the technology is different…but I do think that being willing to learn all of the time and not rest on your laurels and…I mean take a rest every now and then, absolutely, but be aware that you are going to have to dig back in an reconnect to the intellectual firehose on a regular basis in order to grow." (Colm, Senior Programmer and Systems Architect)*

One thing in particular became apparent when speaking with all of the participants across both the software sector and the creative sectors: there exists a strong tendency towards the fetishization of novelty within both professions. Whether within computer programming or design, these fields are not only emergent in the sense that they are constantly expanding but this expansion is oftentimes driven by new trends, fads and ideals circulating throughout the professions. Jenny (Digital Designer) and Michael (Software Engineer) describe this situation below for creatives and coders:

> *"First of all, it's hard to keep up with stuff for the sole purpose of you have to try and figure out what's going to last and what's the fad. For me, a lot of it is trying to keep on top of things, but also making sure that I'm keeping on top of the right things. I would read books, or I follow a lot of graphic designers on YouTube who would be in big art studios in California, who would probably have a better and quicker understanding of what's sticking around than some random BuzzFeed article that's like a year or two behind the scene. I would also then go on design websites. **Years ago, things moved slower because you could define the '60s, or the '70s, or the '80s' graphic design, or design in general by a decade, but now I would define it by every year**. Even like 10 years ago, you could probably define it by every couple of years, but it's because it's [design, creative content] everywhere, and everyone's always trying to move with*

whatever the fads are, that you get really sick of it really quickly." (Jenny, Digital Designer)

*"If given a bit of space sometimes we'll extoll solutions that aren't really the ultimate one for the problem that we're solving. **We're wanting to play with the newest and shiniest technology** instead of being pragmatic and saying, "This is our problem. This technology is perfectly adequate for us to deliver in that." People want to use the shiniest things." (Michael, Software Engineer)*

What's more, because these knowledge domains are either entirely digital (computer programming) or increasingly digitalizing (creative production), this process of churn is accelerated and intensified by this constitutive entanglement through the digitalization of both the process of work and the products and services being produced and provided. For the creatives in the study, this was mainly experienced through the rapid obsolescence of the software applications they use to create their work. These digital tools require a huge amount of effort and time to learn and to gain proficiency, yet their use is typically short lived:

"Researcher: What exactly do creatives need to "keep up with"?

Louise: Design trends and everchanging software and tools. Software is something that changes so frequently so there is a consistent need to upskill. Software that was common even a few years ago is already outdated. In the past 4 years or so, I have changed my key software for designing 3 times. There is a need to read articles and watch key designers to ensure you are not getting left behind. In terms of trends, every year there are a whole new set of ideals on what style is popular. This is another area that designers in particular need to keep an eye on to stay relevant."

Keeping up with developments in the software sector does not necessarily mean keeping up with what's important. As Ian detailed in our discussion of what we came to call the fetishization of novelty, many new developments in software are driven by fads and what are really important over time are the 'core' developments in the technologies. One of the other coders (Michael) provided an excellent example of this when he spoke about keeping up with the evolution of JavaScript:

"I keep up with the tools and languages I use most. It's worth pointing out that keeping up is not a universal truth — ecosystems like JavaScript are enormous and fast-moving, and there has been an incredible amount of change. A great deal of it has been fad

driven and this has clearly resulted in a lot of churn and reinventing the wheel. I'm not a big fan of this and in the JS world I prefer tools like Vue, that clearly focus on a certain simplicity and developer happiness. It's most important to keep up to date with "core" JS language developments as this is where the most permanent change originates. Frameworks come and go." (Michael, Software Engineer)

Another source of pressure for software and creative workers to be responsive originates from their roles as organisational professionals who are embedded and employed within companies and are thus subject to the demands of management, colleagues, clients and consumers. In demonstrating how control was achieved over the work of creatives, and their experiences of the regulation of their autonomy, chapter 5 detailed the professional encroachment that these workers were subject to due to the largely subjective, non-exclusive nature of their fields. However, another common pattern experienced by the creatives in the study was the organisational expectation that they be "*Jacks of all trades*" who are capable of responding to all of the digital needs of the business in one, often under supported and relatively cheap (in comparison to coders) creative package:

"One side would be, a lot of designers will talk about how we're expected to be a jack of all trades. We're expected to know how to animate and to know how to illustrate and to know how to design websites. There are so many aspects of design, and I think some designers probably feel we're expected to know how to do all of those." (Talia, Digital Designer)

"Design constantly moves at a rapid rate and people are currently doing courses and trying to meet the trends and meet the expectations. You feel that pressure constantly, to have the new skills, being able to be completely digitally focused while still having the standard designer qualities that your expected to have. Your expected to have a lot of tools, as well as a lot of people would expect you…Especially the smaller agencies, your expected to do basically everything from managing projects to being able to do web design, print design, signage, animation, absolutely everything. There's a lot of pressure there to deliver." (Ruth, Designer)

Within software companies this need for responsiveness is felt in similar ways, although central to the experiences of the coders in this study was the implementation of agile production systems which were premised on the principles of responding to constant change in technological and market demands. Rachel, one of the Senior Software Engineers, provided an

excellent account of how this responsiveness manifested for coders within the workplace, and also contributed to building a form of status:

> "we always planned on being Agile anyway because Waterfall just doesn't suit anybody, by the time you have developed something its too late to say "I don't want that, I wanted something different", and the world is full of changing requirements and customers don't know what they want anyway! Our two founders were very energetic and had great ideas and we were constantly bouncing ideas off each other but as a result we might have decided on something one day and then somebody has a brainwave that night and we decide to change it the next day and it just makes it very hard to plan what you are doing and do the detailed tasks like structuring the database…before we were acquired by a bigger company and when we were just acquired, we had developed a reputation as being a team that could get stuff out really quickly and respond to those changing requirements really quickly and it did wonders for our reputation." (Rachel, Software Developer)

Rachel then went on to explain to whom and to what software workers need to responsive:

> "Yeah, you have to be [responsive], there are two different parts to that: Responsive to whom, there are your stakeholders whether that's your boss or customers of whoever you are developing for, you do have to be conscious that they are going to change their requirements and then also your competitors are going to do something and then suddenly you are behind or maybe you have a better idea and to keep ahead of them you just keep having to make it better or maybe go in a different direction if that's what the needs be. The other thing is the technology, I don't know how many times we have got caught on the backfoot of something needs to be updated and this can't be updated because we rely on a library that hasn't been updated yet and yeah, you can get caught in a complete mind loop of what to update and what not to update. Trying to code for those changes is hard and lots of it only comes from experience" (Rachel, Software Developer)

As a virtue, responsiveness is not only a material need for software workers in order to get the job done but is also a social expectation by organisational stakeholders and labour market intermediaries.

> "Because the industry moves at an unrelenting pace, keeping up with latest trends and developments requires a lot of effort. Ridiculously, our industry uses terms like '10x

> *Developer' or 'code ninja' which creates a sense that all IT workers have to be brilliant at what they do." (Martin, UI/UX Designer)*

What is particularly interesting about the software case is that the responsiveness is institutionalised through agile management practices. The current "*cutting edge*" as Michael describes it, is 'CICD' development (a form of Agile), which stands for continuous integration and continuous delivery/deployment. These new software development methodologies embody the nature of *intra-active* commodities (described in chapter 5) that preserve the connection between producers and consumers/users and which require continuous refinement through the intra-actions of users and the responsive adaptations of workers.

The virtue of responsiveness for the agile agent is a direct consequence of the commodification of knowledge as it exposes workers to the accelerating and competitive pressures of the market. As digital knowledge workers, software and creative workers must be increasingly responsive to the knowledge domains they possess and practice and which are either entirely digital as is the case with software or rapidly digitizing like creative content production. Moreover, the constitutive entanglement of these knowledges with digital technology, as both the primary tools of their labour processes and the types of commodities they produce, accelerate this demand for responsiveness; and finally, organisational stakeholders (management, colleagues, clients, consumers and/or users) increasingly expect that software and creative workers embody responsiveness as a core virtue.

Putting the 'Agent' in Agile Agent

Agile agents are like intermediaries, firmly embedded within organisational strategies and structures, yet operating at the intersection of the workplace and the distributed networks and embodied practices implicated in the knowledge production process. As one of the coders - Rachna stated "*we need resources and they don't come from the corporations they come from the community*", she went on to detail the "*imperative*" role external communities of practice play for software workers and the importance of bridging those links between the organisation and the wider professional ecosystem:

> *"They [communities of practice] are definitely very helpful and you need it. 90% of the times you need the community because obviously, nobody knows everything. As a developer, your in an [organisational] environment where you have to come up with*

the solution to problems and it's expected out of you. Your the one who's going to solve it. How are you going to solve it if your not engaging with the ecosystem and things like that? The community is going to help you do that. To be honest, that's the only place you'd get your answers. Even if you don't get your answers, you would find somebody who would lead you in the right direction. That's imperative again." (Rachna, Software Engineer)

Although preserving this link between the organisation and the wider professional community is central to the working practices of creatives too, for those creatives employed within organisations outside of the Cultural and Creative Industries they also serve to maintain social and cultural relations between creatives and their communities:

"I think if you aren't based in a creative studio and rather surrounded by people who are more business work related then having a community external to it can help. It's somewhere that people can express themselves and offer and gain help with a creative problem. It's also a source of inspiration when looking at others work." (Nancy, Head of Creative)

Ultimately though, being an organisational professional requires that software and creative workers apply the knowledges and skills they possess in combination with the cultivation and practicing of the knowledges distributed throughout their professional communities and mediated through these various online communities of practice. One of the software workers was quite clear when he said:

"[communities of practice] relate to tools and key knowledge. Obviously, tools are important and the job couldn't be done without them. Knowledge exchanges like StackOverflow are crucial as although a programmer can retain the thinking style for understanding a complicated problem and breaking it down into a number of smaller tasks; it's impossible to remember how to write a regular expression to validate an email address, that is the difference between thought process and implementation." (Brian, Software Engineer)

Amin and Cohendet (2004: 2) describe the modern knowledge-based organisation as "*repositories of competences, knowledge and creativity, as sites of innovation, invention and learning.*". The contemporary company in the software and creative sector is indeed a locus of innovation in production, however, they are not only repositories of knowledge and creativity. Perceiving them as such privileges the activities that occur within organisational space and

time at the expense of the perennial labour that knowledge workers engage in beyond the domain of the organisation. Companies such as those where the coders and creatives in this study were employed can be viewed as commodifying the labour of knowledge workers two-fold. Once through the direct exchange of labour for work-delegated tasks and duties that occur within working time and then again through the perennial labour these workers engage in throughout their everyday lives which is critical to the effective realisation of software and creative work. Furthermore, the role of software and creative workers within these organisations is not just that of a labour power containing embodied, embrained and possessed knowledges and competences (Blackler 1995; Amin and Cohendet 2004) that are employed to create and innovate. The participants in this study were indeed employed to be creators and innovators within their organisations, however the manner in which they realised that expectation and role mirrored that of an agent. These workers were hired with varying degrees of possessed knowledges that they were required to put to effective use, but their labour process also involved the practice of knowledge 'out there' in the world as an essential aspect to the work. The practicing of this knowledge occurred both within and beyond the domain of the organisation and depended on the sociomaterially embedded nature of the coder and creative labour process, in effect extending the reach of the company (and its commodification of labour and knowledge) beyond organisational time and space (see figure 18 below).

Figure 18: Possessing and practicing knowledge on behalf of the organisation.

In his articulation of knowledge workers as organisational professionals, Scarbrough (1999) discusses the organisational conflicts that arise from their dual-roles as 'inward-facing' employees and 'outward-facing' knowledge professionals that rely on external networks of practice. It is through this conception of the dual-role enacted by knowledge workers in Scarbrough (1999) that I identify the routes that generate what I refer to as the *agile agent*. Agile agents are like 'brokers' in Barley's (1996) use of the term, although I move one step further by employing the term 'agent' to denote their (knowledge workers) firm embedding within organisational structures and means of control as opposed to Barley's (1996:36) view that brokers "*operate largely independently of an organisation's hierarchy*". Indeed, the literature on communities of practice, which I articulate as an integral sociomaterial attachment in the case studies, points to the reshaping of organisational boundaries amid workers relying on and confiding in these external networks of practitioners (Ó'Riain 2002). The organisations reach of commodification is thus extended through the employment of agile agents. In this sense, the organisations acted as vantage points through which knowledge could be extracted, practiced and commodified from both the head and the world (Norman 1989) through their sociomaterially embedded workforce.

Conclusion

Wider cultural depictions and ideals of entrepreneurial selves are indeed in circulation throughout the neoliberal period; however, their centrality within academic literature and managerial discourse has contributed to an impression that these are most influential in shaping subject formation. This typically occurs through the association of entrepreneurial subjectivity with a number of what we could call 'perverse virtues' (Gregory and Sadowski 2021) that describe the primary behaviours, characteristics and relations that workers should develop and enact in their working lives. These virtues typically map onto Voß and Pongratz's (2002) three characteristics of self-control, self-commercialisation and self-rationalization – what are collectively referred to here as the virtue of self-management. However, what discursively based accounts seem to miss is that the practices implicated in digital knowledge work itself in fact require workers to perform these virtues as a sociomaterial exigency rather than some ideological, cultural subjectivity. In other words, the directionality of the entrepreneurial subject literature misses the starting point - which invariably is the practice of work itself. This is not to say that *some* workers do not exhibit forms of entrepreneurial subjectivity (for they

do), but that the sociomaterial practice of knowledge work itself requires that *all* these workers adopt such virtues in order to effectively enact their labour and thus value on the capitalist labour market.

Agile agents are thus constituted through the sociomaterial practices and embeddings of digital knowledge work itself, which demand that these workers self-manage, be responsive and generate value for their organisations through the extraction and practice of knowledge in and beyond organisational space and time. Despite both software and creative workers exhibiting different characteristics of their agile agent role, their perverse virtues of self-management and responsiveness originated from the same practices and contexts, as the table below outlines.

	What do they self-manage?	**What/Whom are they responsive to?**	**What are the main characteristics of their role?**

Software Workers	(i)Perennial labour.
	
	   -Cognitive residue.
	   -Digital profile
	   -Knowledge & skills.
		(i)Digital knowledge domain.
		(ii)Technology.
		(iii)Stakeholders.
			(i)Problem-hunters & solvers.
			
			(ii)Technological generalists & language specialists.

Creative Workers	(i)Perennial labour.
	
	   -Cognitive residue.
	   -Digital profile
	   -Knowledge & skills.
		(i)Digitalizing knowledge domain.
		(ii)Technology.
		(iii)Stakeholders.
			(i)Cultural chameleons.
			
			(ii)"Jacks of all trades".
			
			(iii)Consumer/cultural savviness.
			
			(iv)Trendsetters & follows.

Table 21: What are the differences and commonalities across software and creative workers as agile agents?

It is important to note that despite the endogenous requirement to adopt these virtues of the agile agent, workers still exercise their subjective agency in the management of their *degrees* of embeddedness and thus enactment of these virtues and the agile agent subject. The following section turns to an examination of how different degrees of embeddedness and differential

enactments of the agile agent subject have implications for the risks and rewards afforded to these workers within their worlds of work.

8.4   Managing the Risks and Rewards of Embeddedness

These workers can be embedded within their worlds of work to a *deep* or *shallow* degree, and their degrees of embeddedness shape the resources they possess and have access to, the opportunities that they encounter and their capacities to realise them, and in many ways the 'value' of their labour power in both practice and on the labour market. Deep and shallow sociomaterial embeddedness is best understood as operating on a continuum much like that of regulated autonomy, where the differential enactment of the agile agent role by individuals positions them closer to one end or the other, and thus shapes their risks and rewards in the world of work. It is important to note that the sociomateriality of software and creative work necessarily implicates these workers within the enactment of the agile agent subject, however, there were variations in the extent to which some software and creative workers consented to such demands on their time, effort and selves. For these (few) workers, they embody a sense of ambivalence towards the sociomaterial demands of digital knowledge work.

Deeply Embedded Agile Agents: The Default Condition for the Possibility of Reaping Rewards

Deep sociomaterial embeddedness is the default state for these digital knowledge workers. The permanent susceptibility to perennial labour and its consequences for the constant habituation of labour that software and creative workers engage in already engrosses them within their worlds of work to a degree significantly deeper than those employed in other forms of work (knowledgeable as they might be). This basic exigency of knowledge work, however, experiences an intensification through its entanglement with organisational and labour market dynamics and demands. It is the combination of these three embeddings (sociomaterial practice of work; organisational context; labour market context) that generate and accelerate the need for these workers to perform the role of agile agents, and it is this deeply embedded condition of working life that provides the *possibility* of reaping rewards within the world of software and creative work. All of the participants across both case studies generally understood their requirement to enact the virtues of self-management and responsiveness in/for their

workplaces; to engage to varying degrees in perennial labour in everyday life; and to partake in net-working (Batt et al. 2001; Ó'Riain 2004; Kennedy 2010) through digital and physical platforms in order to establish visibility (in the labour market and communities of practice) as a practitioner and a skilled and knowledgeable labouring subject.

All of the participants within the case studies were employed in labour markets characterised by relatively high levels of turnover, where many are moving jobs every 2-4 years. For both the software and creative workers, these high levels of job turnover are mainly due to their pursuit of increased rewards on the labour market. The software workers have been enjoying and continue to enjoy what many would describe as a buoyant labour market where there is high demand for skills, knowledge and labour and an increasingly competitive sector characterised by the growing presence (and competition) of multinational companies providing large compensation packages. The developers and product managers I spoke with therefore experienced no problems in finding new roles. The creatives however were working within sectors that were indeed growing yet were still relatively small compared to other more established industries (including software). For these participants, high turnover levels were still common, although creatives typically occupied a position with less power on the labour market than their software counterparts partly due to the highly competitive nature of their labour market which intensified the need to go above and beyond in self-promotional and networking activities. Despite these differences though, maintaining a constant online presence that presented professional competence was essential to both cases in order for the possibility to reap rewards on the labour market:

> *"in terms of getting your work out there, it's really important to have a presence. Because if your looking for a job, I think a lot of companies are going to look you up on Instagram. They're going to definitely want a website link. I think that's because of the nature of what we do, so much of the work that we create is going to end up in those digital spaces." (Talia, Digital Designer)*

> *"a lot of [job] progression isn't in house, a lot of progression is like, you spend two years at one job, and then you go on to the next one. In that sense, you definitely would have to [manage digital profiles], because who's going to hire you? The marketing, or the commercial, or the creative side of things? Who does actually follow all this stuff? You do still have to if you want to, like for progression sake" (Jenny, Digital Designer)*

"100% sure [there is a pressure to be engaged with CoP & professional platforms], I think so. In Interviews, it's nearly as important that you can use online tutorials nowadays as being able to code itself. Then especially like the likes of BitBucket and HackerRank and all of them. It's like just having a degree in being a software developer isn't good enough. You need to also have done projects in your own time. In interviews and stuff, you need to have gone beyond the minimum requirements." (Adam, Software Developer)

"Reputation is definitely important. You need to definitely make a name for yourself, and you can't just hide in the dark and just keep away. You need to be in some way involved, whether your the person who's the expert and who's making these new, I don't know, new patterns, new code, new whatever. Even the people who are just trying to learn, they need to make a name for themselves as well." (Liam, Software Developer)

Reaping rewards on the labour market is one thing, however, there are still practical and immediate pressures to maintain a deep degree of embeddedness with both communities of practice and the constant flux of professional domains of knowledge. This pressure was experienced as a necessary aspect of the labour process and one that needed to be carefully managed in order to continue to do the job effectively as both Rachna and Adam describe below:

"The real pressure, I just spoke about. Seriously, if your working on a problem and there is a tight deadline, you need the community. That's the only way you'll be able to- - It's a way of brainstorming sometimes. You may not know the answer, your raising a question, somebody would think about it, they'd formulate the answer, they guide you to the right directions. It's brainstorming, but your not doing it physically, your doing it on the internet." (Rachna, Software Engineer)

"your keeping up with technology, which is changing every hour every day, especially even obviously you look at AI and stiffness is changing every minute of the day, then more basic web development. It's like the codes updating, the libraries are getting newer and quicker and better. Then your competing with the younger people who are 10 times smarter than you who have high technology in their hand. I'm not that old, but I didn't have a phone when I was four. It has changed since then. That's who your competing with" (Adam, Software Developer)

Because comparatively favourable employment conditions and opportunities on the labour market are more likely to appear for workers who are deeply embedded in the enactment of agile agent subjects, there are implications for how different cohorts experience work and employment within these sectors. For example, many participants across both cases mentioned how these pressures are heightened for entry level and junior employees "because you kind of feel like you have to be always on" *(Saoirse)* in order to display commitment, availability and dedication to the organisation's stakeholders. Moreover, *their lack of experience needs to be bolstered by more active online engagement and curation in order to increase their visibility and opportunities:*

> *"Juniors I would say would be the ones who would be very active on the professional networks. I mean, seriously, they don't have a lot to show for it, so they try as much as they can and I think that really helps. I mean, I have friends who are actually very good at coding, but then they do not represent themselves very well and with the social presence that they have they would not be able to…They wouldn't appear…I don't know, very proficient if you were to go through their profiles, go through any of these professional networks for them. It [job opportunities] backfires most of the time. The number of opportunities that these people would get is relatively very low as compared to somebody who's out there." (Rachna, Software Engineering)*

Furthermore, these pressures are often heightened for women working within these sectors as they combine with pre-existing gender biases, pre-existing inequalities in household divisions of labour (Edgell and Granter 2019) and the added normative expectations put on women which can increase their responsibilities and workloads and hamper their ability to have their voices heard within the organisation:

> *"As a woman, I do think we have different pressures in order to succeed in a creative industry. I feel it is harder to be heard for your opinions and ideas. You have to work harder at everything and still it can never be enough. There is a difference between me and my fellow male colleague where even though I've worked there longer, I know that he can get away with more stuff or less pressure will be applied if something has gone wrong." (Nancy, Head of Creative)*

This experience Nancy describes of having to work harder as a women to be heard as a professional echoes Ciara's detailing of the gendered pedantry that she experiences throughout her career, where male colleagues provide excessive criticisms on trivial matters. Not only are

women, and those with caring responsibilities, unequally impacted by the pressures to keep up with constantly evolving knowledge domains, they are embroiled in more implicit and structural struggles within their organisations. One particular issue for creatives is the need to find positions that offer paid maternity policies that provide effective support for women to leave and re-enter the workplace, something Saoirse described as currently lacking within the creative sector. Furthermore, on top of the additional difficulties these cohorts can experience, another practical barrier to both entry into these worlds of work and to reaping just rewards from it is the cost of attending some of these professional conferences. In the game sector in particular, Eleanor described how these can negatively impact those aspiring to enter the sector:

> *"One thing that a lot of people talk about especially to students when they're learning is to go to the Game Developers Conference in San Francisco. Which is insanely expensive for a student! If you go as cheap as possible, it's going to be a thousand to fly there and back, another thousand for accommodation staying there, and then it's two thousand for full access tickets." (Eleanor, Game Writer and Designer)*

However, these barriers to entry, progression and reward also exist for those primarily responsible for care in the home, working class coders and creatives and in particular lone parents who may not have the time nor resources to 'keep up' in this sense. The same can be said for the various forms of informal networking that often takes place throughout these sectors, those casual 'pints and pizza' nights after work where rapport is built, and knowledge (of opportunities) shared are mainly advantage those with enough free time to engage and disadvantage those who do not. Being deeply embedded brings with it the *potential* for organisational and labour market rewards (e.g., increased visibility and opportunities; higher prestige/renown/compensation, most up to date skills and knowledge of tech, trends and techniques etc.), but it also has implications for how different cohorts experience work and employment within the software sector and the Cultural and Creative Industries.

Shallowly Embedded Agile Agents: The Risks, Inequalities and Ambivalence (1000-1500w)

Working in software or in creative content production in the contemporary economy is a demanding and at times all-consuming activity where these workers are required to juggle the perenniality of knowledge work, the increasing pressures of organisational expectations, and what seems to be an ever-expanding list of 'requirements' on the labour market. In juggling these pressures, software and creative workers perform their roles as organisational

professionals through the enactment of an agile agent subject, constantly engaged in an intermediary role and a worklife that necessitates self-management and responsiveness. Just as the default state of being deeply embedded is a necessity for the possibility to reap rewards in software and creative sectors, failing to maintain this juggling performance consequently brings risks for those workers who slip (or dive) towards a shallower degree of embeddedness.

In terms of the organisational and labour market contexts these workers are embedded within and dependent upon, failing to perform the agile agent subject by not effectively managing employability and "*digital personas*" is likely to leave workers at a disadvantage. As one of the digital designers stated, "*if in this day and age you don't show or have your work online…or if you don't have an online portfolio/persona, you don't exist." (Luis).* The operation of contemporary labour markets is largely mediated through digital platforms, and this is particularly the case for the participants of this study. Professional platforms like LinkedIn were the primary formal means of signalling availability or interest for work opportunities on the part of the workers, and for searching and recruiting prospective employees for organisations and labour market intermediaries such as recruitment agencies. Moreover, both of the main Slack communities of practice that these workers used (ITC Slack and IrelandDesigns) were important resources for the communication of job opportunities within these sectors. However, there were slight variations in which other platforms were used by both cases for the display of their work. For software workers, online repositories such as GitHub and BitBucket were the primary platforms through which they could display their work, however this was hampered by the fact that most software programmes are protected by intellectual property rights. This seemed to heighten the role played by online engagement and "*points building*" on platforms like StackOverflow and by completing and collecting certificates for specific skills and technologies. The creatives on the other hand produce content whose primary purpose is to be visible and to garner attention, and this amplified the pressure for these workers to curate their online profiles with a great deal of persistence and effort. Any failure to effectively self-manage presence on these various platforms increased the risks that these workers took by potentially rendering them 'invisible' to key stakeholders. As many of the participants in both cases alluded to, the disproportionate pressure experienced by juniors were particularly prevalent in this aspect, and for some participants (such as Matt below), the digital profiles they constructed across these platforms were an important means of giving them "*voice*":

*"these platforms were very important for me starting off because they were the only voices I really had, having a digital presence, even getting a job. Yes, like in terms of the importance I see these platforms are more important when your an upcoming designer…*If I hadn't had these platforms, I don't think I would be given the opportunities I have now without them…I think you would be at such a disadvantage…I think it is an important part of us to be out there because when your looking for a job, you don't just send a CV over, you have to have your website, you have to have your, again, your digital platforms, just like who you are, the work you've done. I think it is very vital."   *(Matt, Digital Designer)*

One of the most immediate risks of failing to adequately perform as an agile agent is the practical implications of falling behind within your professional field in terms of skills, knowledge and technique. "*Keeping up*" is a constant pressure for both software and creative workers as they try to continue to meet the demands of organisations, which many described as being increasingly unrealistic. As one of the creatives mentioned, "*everyone seems to be judged by what [online] accounts they have and if you can do it all!" (Nancy)*, an account echoed in many account by other participants who described the need to be a "*jack of all trades*" (Saoirse, Callum, Rory, Ruth) and "*all singing and all dancing*" (Michael). Keeping on top of and connected to what Colm so vividly described as the "*intellectual firehose*", is essential in order to maintain status and reputation as a valuable worker:

"I try to keep up, like obviously doing this course… Technology or skills, in general. I think if you don't keep on learning, your just going to-- Not that you'll become redundant, but you won't be seen as the person to hire, or the person to have on a team." (Ruth, Designer)

…100% [you are at a disadvantage if you do not keep up]. I don't think I could argue against that. I feel it's absolutely essential, you have to be on top of everything, or your just not valuable to a company otherwise." (Adam, Software Developer)

The virtues that are expected of software and creative workers, and the pressures to maintain their careers as organisational professionals are experienced to different degrees by those workers who have other responsibilities beyond their employment. In a similar way to the occupational encroachment experienced by Saoirse (Copywriter and Content Lead) and the gendered pedantry experienced by Ciara (Head of Development) which were described in chapter 5, Rachel (Software Developer) found herself at a disadvantage because her family

circumstances meant that she had little time, effort or desire to engage in any extra-curricular work:

> *"I find that a problem and I think that would affect me if I were to try and move jobs. I would say if I had a load of extra time, I would love to spend my evening doing more courses on Udemy or something or even just do side projects in different languages to keep up to speed but I have chosen not to do that. Partly because I have a family life that takes up my time and then partly because after spending the day looking at the laptop, I don't want to look at it anymore. I think that really would affect me if I go to do an interview for another company, its going to stand against me that I haven't spent more of my spare time working on projects. I know just off the top of my head that one of my colleagues who changed jobs and as part of their interview they had to do a sample project and if I had gone for that job, I just wouldn't have had the time to do it, to create it! I don't know whether that's partly a barrier to women in the industry or maybe it's just because I choose to spend my downtime doing slightly more active things, staying active and probably doing the laundry and going for a walk. I think it is really important and will be one of my downfalls." (Rachel, Software Developer)*

Being shallowly embedded brings with it organisational and labour market risks and penalties (e.g., less visibility and labour market opportunities; lower potential for promotion and pay rewards; lower capacity to upskill and adapt according to the expected pace), and these risks are often borne disproportionately by early career workers, women and those with caring responsibilities. For early career workers, the pressures to "*ramp up*" and be visible within the world of software and creative work is amplified by their lack of experience and networks within the industries. For women and those with caring responsibilities, the extensive "*extra-curricular*" work involved in being an agile agent is much more difficult to engage in when these workers most often bare disproportionate responsibilities in the home.

Beyond the need to avoid the risks of inadequately performing as an agile agent, a few of the participants resisted or displayed ambivalence towards being so deeply embedded, and the demands it places on their time and effort. For example, Alex, one of the junior software developers was very clear on his lack of enthusiasm for the profession and his reluctance to engage in perennial labour and the extra-curricular work that came with being a coder. The following quotes highlight the lack of subjective attachment Alex feels towards his work.

"Being programmer is not an important part of my identity" (Alex, Software Developer)

"I would say its quite common for developers to be very enthusiastic about their work, which is an attitude which prevails in the industry...I feel I am on the low end of enthusiasm for software engineering." (Alex, Software Developer)

"I don't like learning outside the job and keeping up with anything unless it's on company time." (Alex, Software Developer)

Although Alex effectively communicated his ambivalent stance towards the all-consuming demands of the sociomaterial embeddedness of software work, he still described engaging in perennial labour in much the same ways as the other participants by learning new technologies and skills through online tutorials. In the same way that some of the participants actively and deeply embraced the embeddedness of their work (such as Dean, the Head of Creative who is "*obsessed*" with youth culture and content) there were others who explicitly rejected some of the normative expectations circulating throughout industry cultures. For example, Martin, one of the UI/UX Designers, spoke of his disdain for the corporate trope of being a 'work family' and Colm, one of the most senior coders in the study was very clear about his rejection of the demands placed upon software worker by the industry:

"There are demands made on your time, in fact there are demands made on your emotions, you know, it's like "god, don't you feel passion for you work?" and I'm like "no, I don't! I feel passionate about providing a home for my family, I don't particularly feel passion for like...what design I use for a time-series database or something like that"...but there is that narrative there and that demand is made on people. I think it's mostly coming out of the Valley kind of culture of like "don't you feel passionate about your work? don't you want to work every hour that god gives you to change the world?"...it's like no, come on man, relax, your not changing the world your just building a company to sell to VC's." (Colm, Senior Programmer and Systems Architect)

"you know there's this idea that 'hey, work is part of life and it should all be this holistic thing' and it's like 'fuck you...', I experience work as hard and I don't like it, that's why we call it work...I mean I enjoy my work and I enjoy being good at it but I mean it's hard and its unpleasant, don't tell me it's just like this wonderful part of life. I do think those pressures are there." (Colm, Senior Programmer and Systems Architect)

281

However, the ability to adopt such an ambivalent stance towards the normative expectations placed on workers across the software sector and the Cultural and Creative Industries is likely effected by whether those workers occupy a positions of relative power, privilege and security within their employment. This is indeed the case for Colm, but those employed within more precarious conditions are exposed to disproportionate risks if they fail to live up to the perverse virtues of the agile agent.

8.5   Conclusion

Through this labour process analysis of the contested terrain of subjectivity, this chapter demonstrates the sociomaterially embedded nature of the coder and creative labour process where workers are attached to their labour through the sociomaterial exigencies of knowledge production, and their organisational and labour market contexts. This sociomaterial approach to the analysis of work adds new light to scholarship on personal attachment to work and subject formation in the contemporary economy. Building on Musílek et al. (2020), this analysis represents a 'fifth way' to understand attachment to work. Furthermore, contributing to recent analyses of how material structures of production are directly implicated in subject formation (Gregory and Sadowski 2021), this chapter identifies the 'perverse virtues' that constitute the agile agent subject and which originate in the sociomateriality of work itself. The analysis demonstrates that a key factor shaping work attachment is the content, or as Marx put it – 'the subject' of the labour process. That is, the commodity form being exchanged and produced in specific labour processes, in this case knowledge. When the study of work is approached as a sociomaterial practice where particular commodity forms are produced, the sociomaterial exigencies of labour processes emerge as a core mechanism shaping both the labour process, organisation of work and the individual worker. The approaches outlined in Musílek, Jamie, and McKie's (2020) heuristic focus on the ideological and discursive forces *contingently* shaping worker subjectivity. However, the sociomaterial embeddedness approach advanced here shifts the focus towards the 'extra-discursive' (Thompson 2012) forces, or exigencies, shaping the labour process, attachments to work and subject formation (see table 22 overleaf).

	Neo-governmentality Approaches				Sociomaterial Embeddedness
	Entrepreneurial self	'Biocracy'	Lack, desire and affect	Normative and Ethics of Self	
Actions (virtues)	Maximising human capital; productivity.	Merging work with personal life.	Develop affective characters attuned to business needs.	Adopting normative constructs; pursuit of 'authentic self'.	Self-management; responsiveness
Choice	Passion, desire, ambition.		Passion, desire, ambivalence.		Sociomaterial Need and expectation.
Resistance	Underexplored.	Dis-identification, cynical commitment.	Underexplored.	Underexplored.	From *deep* to *shallow* degrees of embeddedness.
Causal Mechanism **Directionality**	Discourse, ideology. Top-down (societal, managerial & org to worker)	Discourse, ideology. Top-down (managerial & org to worker)	Discourse, ideology. Top-down (managerial & org to worker)	Discourse, ideology. Top-down (societal, managerial & org to worker)	Sociomaterial exigencies of k.work. Relational & Intra-active (the practices of knowledge work)
Emerging Narrative	Based on individual subjectivity and identity.	Based on individual subjectivity and identity.	Based on individual subjectivity and identity.	Based on individual subjectivity and identity.	Based on the emergent sociomaterial conditions of work.

Table 22: Sociomaterial embeddedness and neo-governmentality approaches to work attachment. Source: adapted from Musílek, Jamie, and McKie (2020).

There is a tendency in the literature on contemporary work to generalise the subjective orientations of workers in the New Economy (in particular coders and creatives) as being entrepreneurial or driven by passion, but this can serve to legitimise those ideologies and discourses that originate from mainly managerial, business and psychological fields. Based on these narratives, the 'new' worker is different from those that inhabited the past and is driven (to engage in actions of self-management) by passionate commitment to new ideas, products and the quest for self-actualization and productivity. Instead of potentially falling into a trap of subjective fetishization, adopting a sociomaterial analysis of work pushes us to ask what the sociomaterial conditions of work in the new economy are and what implications these have for the actions workers *need* to and are *expected* to engage in in order to gain employment in these areas and most importantly, perform and maintain it. What such an analysis demonstrates is that it is not a novel neoliberal subjecthood that produces these characteristics, but rather the

real sociomaterializations of work in the new economy. It follows that instead of propagating narratives of the entrepreneurial subject that can serve to idealise, legitimise and *at times materialise (some workers do exhibit these notions)* neoliberal ideology, it is helpful to shift the focus to examining, acknowledging and most importantly addressing how the sociomaterial demands of contemporary forms of work precede modes of subjectification while still at times being shaped by them. This analysis therefore answers the call by labour process researchers to combine theoretical resources towards more materialist analyses of the drivers of subject formation (Marks and Thompson 2010).

Recent important studies have demonstrated how (mobile) knowledge workers can have an orientation towards cultivating a 'productive subjectivity' (Gray et al. 2020) in their worklives as they pursue an idealised quest for ultimate work efficiency. In addition, Ciccone's (2022) excellent study of software workers illustrated the ways in which discourses of productivity can serve to generate consent by knowledge workers. In contradistinction and compliment to these account of the actions of knowledge workers, my research depicts a different narrative where software and creative workers are more concerned with the practical and preventative measures needed to maintain the value of their labour through renewing knowledge, skills and expertise. Many of the participants were largely (reluctantly) driven to engage in perennial labour to keep up to date and upskill by the acceleration of market demands, technological change and the development of knowledge domains. These software and creative workers experience perennial labour primarily through a constant pressure to keep up by staying connected to the "*intellectual firehose*" in order to effectively perform their work. The emerging narrative then is not one of a 'creative class', driven by the entrepreneurial spirit and desire to innovate. On the contrary, these workers experience pressure to enact perverse virtues through the prism of necessity and expectation. A necessity to engage in perennial labour to develop, maintain and legitimate expertise as their emerging knowledge domains grow and change. The expectations mediating their employment or work relation where their labour power is hired to conceive, reinvent and (re)produce knowledge to drive innovation, and the expectation that they themselves are both capable and responsible for keeping up to date with advancements or trends in their area of expertise. This chapter therefore adds to our understanding of subject formation in knowledge workers (Gray et al. 2020; Ciccone 2022) by illustrating how the sociomateriality of knowledge work itself requires them to enact the perverse virtues of self-management and responsiveness in the performance of the agile agent.

As Hesmondhalgh and Baker (2011) note, the shift by researchers of work to neogovernmentality inspired accounts of worker consent was partly driven by a focus on individualisation and individual activity as opposed to collective activity. The literature argued that neoliberalisation involved an intensification of individualism which, many would come to claim, leads to the construction of subjecthoods premised on an entrepreneurial subjectivity. However, in shifting the focus away from collective activity towards the individual, and from the sociomateriality of working practices towards the discursive mediation of work and ideologies of work ethics, the collective, sociomaterial antecedents of subject formation were missed. It is not that subjective attachments to work do not shape the actions of workers for indeed they do, but that these represent *contingent* factors and as such they are a sufficient condition for a form of work attachment, but not a necessary one. In contrast, the sociomaterial attachments which exist as exigencies in software and creative work, demonstrate that practices of the work itself constitute both a necessary and sufficient condition for work attachment and subject formation. For these digital knowledge workers, the exigencies of their work, and organisational and labour market contexts required that they adopt the perverse virtues of an agile agent, perpetually responsive to the demands of capital and engaged in the self-management of their labour. Despite these virtues being both components and consequences of software and creative work, their enactment is still non-determinate and shaped by the agentic capacities of the workers themselves. However, the opportunity and ability to effectively deal with these pressures of knowledge work are likely to further intensify the (re)production of inequalities, in particular gendered inequalities which research has shown is a persistent issue both within these case studies but also across the world of work more widely (Greco 2005; Taylor 2011; Conor et al. 2015; Hesmondhalgh and Baker 2015; O'Brien 2014; 2015). Here we see the differential rewards and penalties that come with the different degrees of embeddedness and performativity that workers adopt, and its implications for the (re)production of inequalities in the world of work.

Chapter 9: Conclusion

Grounding this study within a pursuit of actually existing capitalisms (Thompson and Briken 2017) encouraged me to identify and demonstrate the realities of actually existing knowledge work. This thesis has developed a theoretical and conceptual framework and toolkit that problematises depictions of knowledge work as novel, weightless and lacking materiality. It argues that the key to unlocking alternative ways of knowing knowledge work is to recognise knowledge itself as material.

In analysing knowledge as a material entity (Zukerfeld 2017) and knowledge work as a sociomaterial practice, the ambiguity, intangibility and 'in-betweenness' of intellectual labour can be analytically threaded together by bringing new tools to bear on the analysis of knowledge work that are capable of identifying and tracing those threads between 'knowledge' and 'labour'. The thesis argues that examining these threads through a lens of sociomaterial practice allows us to add to existing studies of 'knowledge work' by clarifying the mechanisms that link that work back to the commodification of knowledge.

To bring the thesis to a conclusion, this chapter begins by presenting a brief synthesis of each chapter's contribution through a series of contribution statements. Next, in my discussion of the study's theoretical, conceptual and empirical contributions, I link back to the research design framework detailed in the introduction (section 1.2) to illustrate how these contributions map onto those empirical puzzles and research questions that motivated the research. Finally, the chapter ends with a discussion of how the findings can contribute to how we understand, discuss and struggle over knowledge work in both the practice of the labour process itself and through workplace policy.

9.1   Chapter Contribution Statements

In the interests of clarity, I include below a series of what I call *chapter contribution statements* that summarise the core contribution of each chapter.

Chapter 2 Lit Review: Prominent debates regarding the digital knowledge economy are best characterised as imagined futures (Beckert 2016) constructed through fictional expectations. Rather than

representing the future of work, knowledge workers such as software and creative workers are a new core of an old cohort of intellectual workers tasked with driving innovation under capitalism.

Chapter 3 Lit. Review: Bringing sociomateriality to bear on the analysis of knowledge work as a necessarily material practice allows us to build new theoretical, conceptual and analytical tools capable of analysing knowledge work.

Chapter 4 SCR Framework: By building upon critical realist social science and materialisms (broadly defined), their complimentary convergence has informed this thesis' *sociomaterialist critical realist* framework that provides effective support to analyses of knowledge work and the world of work more widely. This broad framework is brought to bear on the topic through a comparative research design that uses interviews with workers to analyse the organisation of knowledge work activities in two sectors, Software and Cultural and Creative Industries.

Chapter 5 Exigencies: Knowledge work is characterised by four core *sociomaterial exigencies*: indeterminacy, exclusivity, sociomaterial attachments, and objectification (through digitalization). These exigencies are emergent mechanisms of the process of knowledge production, they necessitate prompt action on the part of workers and organisations, and in turn shape the conduct of work, its boundaries, experiences, organisation and pressures. Through the analysis of these exigencies, we are able to link the labour process to the commodification of knowledge.

Chapter 6 Control: Organisational control over coders and creatives is achieved through *regulated autonomy*, a hybrid strategy of control within these agile production environments. Regulated autonomy combines organisational forms of direct, technical, bureaucratic, market and normative control while acceding the minimum necessary degrees of autonomy to workers, therefore extending

organisational control and partially managing the ambiguity of knowledge work. For software workers, this results in conditions of momentary equilibrium, while for creatives it results in conditions of persisting tension.

Chapter 7 Boundaries: Work-life boundary blurring is driven by the sociomaterial attachments of the practices of knowledge work itself and can be subsequently intensified through the accelerating pressure of digitalization and the contingent pressures of organisational and market dynamics. These attachments expose workers to a permanent susceptibility to *perennial labour*, the irremovable presence of labouring activity, therefore making work-life boundary (re)shaping a continually unfolding process for knowledge workers. This permanent process of boundary (re)shaping through the intra-actions of perennial labour and the boundary work tactics of individuals constitutes a process that is best understood as the *habituation of labour*.

Chapter 8 Subjectivity: The organisational contexts of agile production (chapter 6), the realities of perennial labour (chapter 7), the sociomaterial attachments of knowledge work (chapter 5 and 7), and the labour market contexts of software and creative workers all constitute a form of *sociomaterial embeddedness* for these workers. Being sociomaterially embedded within the world of software and creative work requires that these workers enact the role of the *agile agent* within/for their employers. Agile agents embody the virtues of self-management and responsiveness in the service of capital, and they act as organisational intermediaries that secure their employers both knowledge in the head and 'out there' in the world.

9.2   Research Design and Contributions

This research was designed around a framework of empirical puzzles and research questions (detailed in section 1.2) and a corresponding theoretical, conceptual and empirical framework configured to answer them. The diagram in Figure 19 illustrates how each contribution tackles its corresponding research question, culminating in a series of findings that combine to resolve the original empirical puzzles that guided the study.
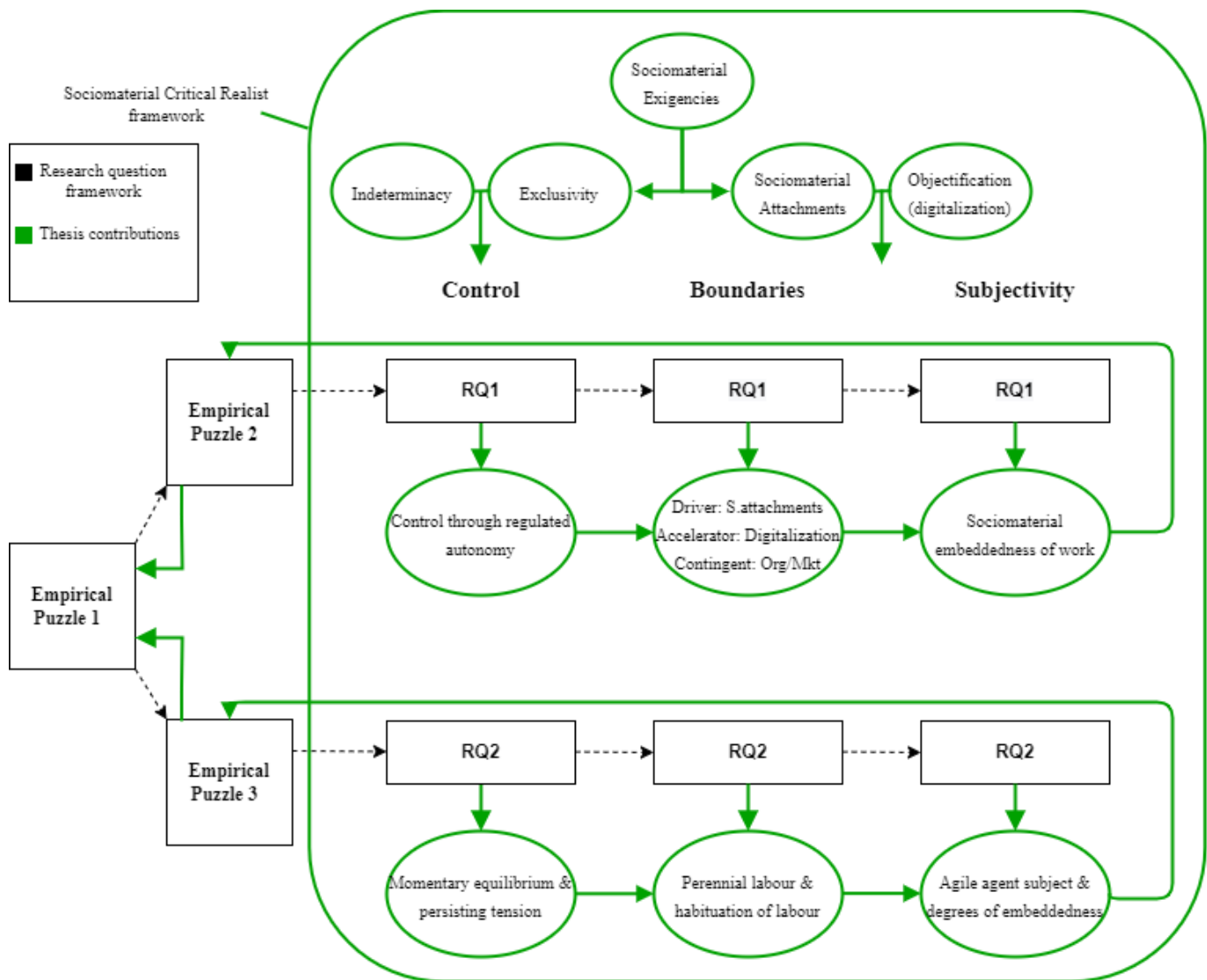

Figure 19: Research design and contributions diagram.

Overall, the contributions of the thesis converge around three areas: (i) the framework, (ii) the empirical design and (iii) the core findings and concepts. First, the integration of diverse but complimentary literatures and the development of a sociomaterialist critical realist framework

and labour process analysis provided the foundation upon which knowledge (work) could be analysed as a necessarily sociomaterial practice. Second, the comparative case studies and the sampling strategy ensured that the data collected originated from two of the most qualitatively significant cohorts of knowledge workers, and primarily included participants who were organisational employees (as opposed to outsourcing arrangements like freelance, contracting etc.). Third and most importantly, the thesis has applied this framework in a sociomaterial labour process analysis of software and creative work. In doing so, the empirical chapters identify the primary pressures experienced by these workers, their implications for the conduct and conditions of work, and how these workers attempt to manage these pressures and conditions in their working lives. These contributions are threaded together from chapter 3 where I bring sociomateriality to bear on analyses of knowledge work, to chapter 4 where I develop the sociomaterialist critical realist foundation of the study, in to chapter 5 where the sociomaterial exigencies of knowledge work are unpacked and their implications for shaping work revealed, all the way through chapter 6, 7 and 8 where this framework and toolkit are 'put to work' in the analysis of the contested terrains of control, work-life boundaries and subjectivity. In the remaining sections of this conclusion, I highlight the significance of these contributions across theoretical, conceptual and empirical lines.

Theoretical Contributions

This thesis makes contributions to three theoretical areas, the first relates to the labour process theory tradition, the second to the meta-theoretical foundations of social science and the third to the study of knowledge work more generally.

This thesis suggests that it would be worthwhile considering the integration of a new proposition to the labour process 'core theory'. In his original articulation of the labour process under capitalism, Marx defined labour as comprising of three elemental factors: "*(1) the personal activity of man, i.e., work itself, (2) the subject of that work [i.e the commodity form], and (3) its instruments*" (1867/2015: 127). In other words, work under capitalism involves three elements: labour, commodity forms and technology. Labour process analysis has developed around (and in debate with) the 'core theory' identified by Thompson (1990) and subsequently established within the labour process tradition (Thompson and Smith 2010). Core labour process theory is based on the following principles:

1.   The centrality of labour power as a commodity.

2. The indeterminacy of labour.

3. The transformation of the labour process, organisation of work and labour power as central to capital accumulation.

4. The existence of a control imperative to reduce the indeterminacy of labour.

5. The above dynamics generate conditions for resistance, compliance and consent.

As it stood, core LPT was premised primarily on one of the three elements identified by Marx – labour (although its practical application in the literature often involved analyses of labour and its 'instruments' or tools and technologies). The centrality of labour in the analysis of the world of work is key, however, the elemental role of the subject of work (i.e commodity form) and its instruments (i.e technology) need to be accounted for within the foundational principles of a core theory. Hall (2010) makes an important contribution towards rectifying this absence by adding the principles of technology to the core theory. Although the subject of work, or the commodity form that labour is put to work[43] on, has been *a component* within most labour process research, it tends to be either side lined or factored as the least important with the capital-labour relation and the role of technology taking primacy. However, recent years have seen a renewed appreciation for the (socio) materiality of practices, of which the labour process is one of the most central in contemporary societies. It is in this space that this thesis contributes to LPT by extending the principles of the 'core theory' to include the final elemental factor of work – commodity form:

6. The subject of work, as a material factor in the labour process, implicate exigencies that are consequential for the conduct, organisation, tools and experience of labour.

The reasons for proposing the integration of this new principle are evident throughout the empirical chapters: it extends LPT's materialist focus by demonstrating how the production of commodity forms implicates a series of exigencies that have sociomaterial consequences for the labour process, organisation of work and beyond, and links these to "*specific agential*

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[43] Of course, the subject of work includes everything above and beyond commodities produced for sale on the market, including gifts, domestic and social reproduction and volunteering. However, the production of commodity goods and services is the dominant subject of work under capitalism and the focus of this analysis and therefore these terms are sometimes used interchangeably.

tendencies at the level of the workplace" (Thompson and Vincent 2010) through analyses of control, work-life boundary (re)shaping and the actions and roles of workers.

Moving to the significance of the thesis' contributions to the meta-theoretical foundations of social science. The sociomaterialist critical realist framework developed in chapter 4 laid the groundwork for the design and analysis of case studies of software and creative work that followed. By building upon literatures on critical realism and materialisms (Bhaskar 1975; Sayer 2000; Orlikowski 2005; Barad 2007; Elder-Vass 2010; Leonardi 2013; Zukerfeld 2017), four methodological premises were identified: (i) the fallibility of knowledge, (ii) a stratified ontology that is spatiotemporally confluent, (iii) matter constitutes reality and (iv) reality is emergent and generated by causal mechanisms. This sociomaterialist critical realist framework supported the research in identifying the primary mechanisms implicated in the knowledge production (and work) process. These primary mechanisms are the sociomaterial exigencies that chapter 5 illustrated, and their activation or triggering (Mingers and Standing 2017) in the world of knowledge work generates a series of intra-acting pressures the shape work. The development and application of this framework provided an analytical tool that allowed me to identify 'real' mechanisms experienced by interviewees, how they became 'actuated' in the world of work, and how they manifested in the empirical experiences of workers through different channels.

In relation to the theoretical implications for the study of knowledge work more widely, the identification of exigencies in the process of knowledge production suggests that these are key mechanisms of other forms of knowledge work. The production of knowledge as a necessarily sociomaterial practice embeds workers within the sociomaterial attachments that are requisites to the knowledge production process itself. Moreover, these attachments are further shaped by the specific character of the primary modes through which these knowledges are objectified within physical bearers. In the (increasingly typical) case of digital technologies, the sociomaterial attachments of knowledge work are effected by the affordances of these technologies. Furthermore, knowledge is always already characterised by its fallibility and indeterminacy, and people fundamentally relate to it (knowledge) based on its exclusivity, or their access to it, and its intelligibility to them. In other words, these sociomaterial exigencies of knowledge production, although illustrated here in the cases of software and creative workers, are not confined to these cases but are applicable to all forms of knowledge work under capitalism. . However, the exigencies also operate in socially contested and contingent ways and may be mediated through and even reshaped by institutional and political struggles

– for example, through various 'knowledge work' political projects such as professionalisation, public sector employment, academic capitalism, and more. The analysis and contributions of this thesis therefore have implications for our understanding of knowledge capitalism and go some way towards adding empirical, qualitatively grounded case studies to reorient some of the issues encountered by the digital knowledge economy imaginaries discussed in chapter 2.

Conceptual and Empirical Contributions

The conceptual and empirical contributions of the thesis converge around the four substantive empirical chapters (5-8). Each of these chapters make a number of contributions to our understanding of software and creative work, the contested terrains of control, the work-life boundary and subjectivity, and to the character of knowledge work itself.

Beginning with the identification and explication of the key mechanisms shaping knowledge work in chapter 5. The concept of ***sociomaterial exigencies*** was developed in order to articulate how ***indeterminacy***, ***exclusivity***, ***sociomaterial attachments*** and ***objectification*** are all necessarily implicated in the process of knowledge production, and in their activation (as causal mechanisms) in the labour process, become key mechanisms shaping the conduct, organisation and experience of work. The value of the concept of sociomaterial exigencies to the literature comes from its articulation of the emergent sociomaterial consequences of commodity forms as the subject of work. In this thesis, the concept has provided an analytical means of encapsulating four of the core mechanisms shaping the knowledge production (and work) process. By successfully 'locating' and 'isolating' these mechanisms, the thesis was able to illustrate the channels through which they activated in the labour process and organisation of work for the case studies. In moving down those channels to the experiences of the workers themselves, chapter 5 helped illuminate the many ways in which these exigencies manifested in the work of these participants, and it described some of these through the articulation of concepts such a cognitive residue, crude calculability and occupational encroachment to name a few. In summary, as well as the chapters main conceptual contribution it provides a detailed empirical account of a diversity of mechanisms and their implications for the conduct, organisation and experiences of software and creative work, and points towards these mechanisms being central other forms of knowledge work in similar ways.

The primary conceptual contribution of chapter 6 is ***regulated autonomy***. By building on Friedman's (1977) concept of responsible autonomy, labour process research on control, and the sociomaterial exigencies of knowledge work, the concept of regulated autonomy provides an updated articulation of how control is achieved over knowledge workers. The concept contributes to the field of labour process analysis and the distributed communities studying creative work, but also more specifically to a number of authors whose work it builds upon such as Andrew Friedman (1977) Phoebe Moore (2019), Langfred and Rockman (2016), Rowena Barrett (2001; 2004; 2005), Ursula Huws (2010) and David Hesmondhalgh and Sarah Baker (2011). The analysis of regulated autonomy demonstrated the hybridisation of multiple intra-acting types of control (direct, technical, bureaucratic, normative, market) in software and creative work through various regulative devices employed throughout the work process to extend organisational control and manage the ambiguities of knowledge work. Beyond the chapters conceptual contributions, it provided a cross-case comparison of the different conditions that software and creative workers currently experience under regulated autonomy by describing situations of momentary equilibrium for software workers and persisting tension for creatives.

The development of the concept of ***perennial labour*** is perhaps one of the most significant conceptual contributions of the thesis. The literature on knowledge work has always in many ways recognised that it is characterised by some uniqueness, although the literature became side-tracked by (important) debates on what counted as knowledge work and what did not. The concept of perennial labour refers to the irremovable sociomaterial presence of labouring activity. It captures the specificity of knowledge work, its primary characteristics (spatio-temporally fluid and material) and experiences by those engaged in it. For the work-life boundaries literature in particular, it allows us to re-articulate how we know knowledge work by recognising it as always necessarily blurring the boundary between work and life. In this sense knowledge workers cannot ever practically achieve a 'segmentation' of work-life, but only ever momentary fixes because the perenniality of their labour means they are perpetually engaging in the ***habituation of labour*** and the construction of habitats of labour in their everyday lives. By identifying the sources leading to boundary blurring in knowledge work, the thesis also clarifies and corrects some of the heavy emphasis placed on what I have described as digital factors and organisational factors in the production of boundary blurring, re-articulating these instead as accelerating pressures and contingent pressures.

Finally, the culmination of the preceding findings and their conceptual and empirical contributions provide the foundation for analysing the knowledge work of software and creative workers as **sociomaterially embedded**. Advanced in a similar way (yet on a different level, or scale as Hess (2004) calls it) to other authors applying the concept of embeddedness to the word of work (Schwartz 2017; Wood et al. 2019), sociomaterial embeddedness describes the micro (working practices) and meso (organisational and labour market contexts) embeddings of knowledge work that implicate attachments to work that exist in, through and beyond subjective attachments to work. The concept contributes to the proliferating literature on subjectification and subject formation in the contemporary world of work by providing a 'first-step' or antecedent factor that must be included in any such analyses. Moreover, being sociomaterially embedded has consequences for the actions, behaviours and characteristics of workers as they navigate their labour processes and careers. For both software and creative workers, their work implicates the enactment of an **agile agent** subject. The agile agent subject builds upon Phoebe Moore's (2019) research on the implications of agility management systems specifically, and wider research on the role of knowledge workers within contemporary worlds of work (Scarbrough 1999), the subjectivity of knowledge workers (Pongratz and Voß 2003; Marks and Thompson 2010; Morgan and Nelligan 2015; 2017; Gray et al. 2020) and work attachment (Musílek et al. 2020; Cockayne 2016; Neff et al. 2005; Neely 2020). It contributes to these literatures by conceptualising and demonstrating the sociomaterial antecedents of subject formation.

9.3   Concluding Remarks

One of the great positives that I have been left with following the completion of this study is the newfound appreciation for the often-intangible materiality of the practices that help construct our lives and society. Furthermore, this recognition and appreciation is accompanied by an interest in finding and developing new methodological tools and techniques to 'see' the sociomaterial entanglements that thread our ways of living together. As well as the theoretical, conceptual and empirical contributions detailed throughout the thesis and in the previous sections, applying this sociomaterialist analysis of work also yields more 'practical' value for how we recognise and understand work, and for the ways in which workplace and employment policies need to be expanded to account for the missing materialities of working. Specifically, the research highlights the need for institutional, organisational and normative

acknowledgement and accommodation for the realities of perennial labour for knowledge workers. This calls for organisational policies and managerial accommodations for the value that these workers bring to companies but also for the effective and complete support of their professional learning and development which at present is individualised and outsourced to the worker. The introduction of perennial labour into the discourse on knowledge work may also serve to reorient our normative understandings of such work, in for example familial relations.

Although this research was focused on identifying the primary mechanisms shaping knowledge work, and their implications for the conditions and experiences of work thereafter, the findings did point to some of the ways in which these can be differentially experienced based on age and gender. The permanent susceptibility to perennial labour no doubt will have more acute consequences for carers and women who tend to shoulder the responsibility of care and domestic labour in the home. Furthermore, the agile agent subject, which is both a material need and a social expectation for these workers, places extensive demands on these people in its requirement for them to self-manage their labour, expertise, careers and become responsive to capital in all of its guises.

The pressures to enact the agile agent subject is likely to be felt more intensely by women due to the unequal division of responsibilities in the home, and the pre-existing barriers and gender biases that they experience in the world of work (Crowley 2013; Huppatz and Ross-Smith 2017). Future research is needed to uncover how these sociomaterial exigencies of knowledge work, the lingering presence of perennial labour, and the pressure to be agile agents impact people differentially based on their class, gender, age, ethnicity and sexuality. Such research is essential if we are to make connections between the sociomaterialities of working life and their implications for the (re)production of social inequalities in employment, on the labour market and society itself.

On a more general note, the findings of this thesis suggest that these exigencies and their emergent implications are applicable to all forms of knowledge work under capitalism. For example, as academics and researchers we know and have certainly experienced some of these sociomaterial exigencies. The sociomaterial attachments of commodifying knowledge are evident when the development of research (ideas, projects, programmes etc.) stretches across space-time and defies regulation by the industrial clock and the notion of the 'workplace'. The indeterminacy of producing knowledges in a capitalistic academic labour process is apparent when researcher's produce new texts (journal articles etc.) under the quantitative and evaluative

pressures of 'research impact', only to be potentially rejected by publishers or largely ignored by scholars. The varying degrees of access, intelligibility and exclusivity (and the power afforded from them) are perfectly personified in the rationalised, technical monolith which is economics. Much of neoclassical theory and the analytical techniques of economics are shrouded in 'laws' and technicality, and those whose expertise lie within this knowledge domain are attributed high degrees of (real sociomaterial) power within society, organisations and institutions. Moreover, future research seeking to examine the 'connective tissue' that binds the political economy to the labour process will benefit from analysing how these sociomaterial exigencies of knowledge work converge with and are shaped by wider processes of financialization (Cushen 2013; Cushen and Thompson 2016), platformisation (Nieborg and Poell 2018; Poell et al. 2019; Vallas and Schor 2020), datafication (Van Dijck 2014; Couldry and Mejias 2019; Sadowski 2019; 2020; Birch et al. 2021).

Finally, the accelerating rate of change in the knowledges and skills demanded by organisations, sectors, industries and political economies to maintain competitive advantage and profitability calls for a recognition for the need to shift away from individualised notions of self-responsibilisation of risks and towards more collectively grounded approaches that provide effective support and real, material rewards to workers for serving the demands of capital.

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Appendices

Appendix 1:   Information and Consent Form

Coders, Creatives and the Production of Knowledge in a Digitalizing, Flexibilizing World (of Work), Maynooth University

Researcher: Joshua Moody

Interview Information Sheet

Dear Participant,

Thank you for taking the time to consider your participation in an interview as part of the Coders, Creative and the Commodification of Knowledge in a Digitalizing, Flexibilizing World (of Work) project. The project is funded by the Irish Research Council and is based at Maynooth University. The principal researcher is Joshua Moody, a doctoral researcher and Irish Research Council Scholar. It is important for you to know that your participation in the research is entirely voluntary, and that you may withdraw your consent to participate at any time. In the following you will be provided with the main details of the research and how the information provided by you will be used.

The study seeks to gain an understanding of work in the digital economy, with a focus on the high-technology software sector and cultural-creative sector. In undertaking this research, semi-structured interviews will take place with workers in both sectors in Ireland. Interviews will be approximately 45mins and will take place at a time and space most suited to you. The purpose of the interview with you is to explore work and employment in a dynamic, digital sector, with a focus on the role of knowledge, creativity and the work process. The research seeks to understand the dynamics and challenges of the ways of working in these advanced areas. Topics of discussion will include:

- Organisation of work.
- Tasks and activities of work.
- Skills, knowledges, and aptitudes/abilities.
- Work pressures and pleasures.
- Worker perceptions of work, working conditions and industry environment/dynamics.
- Personal drivers of work and career (values, ambitions, hopes, expectations etc)

With your permission, the interview will be audio-recorded and transcribed afterwards. All data gathered from the interviews will be anonymised to ensure that no participants can be identified, this will assure you of the confidentiality of your participation. No transcripts or identifiable details will be made available to your employer or colleagues. Your name, date of birth, and personal email address will be collected for research and contact purposes only. All data gathered for research will be encrypted and stored on a password protected server at Maynooth University. Research findings will be published in academic journals, books, and conferences. Any identifiable references to people, places, events etc will be anonymised with pseudonyms. A copy of the research findings can be made available to you upon request. The Irish Research Council and Maynooth University strive for research integrity and validity, as such, they actively encourage the use of national research data archives such as the Irish Qualitative Data Archive (IQDA). If you wish to take part, you will be given an opportunity, in the consent form overleaf, to indicate whether you would agree to archiving your interview data with the IQDA.

It must be recognised that, in some circumstances, confidentiality of research data and records may be overridden by courts in the event of litigation or in the course of investigation by lawful authority. In such circumstances the University will take all reasonable steps within law to ensure that confidentiality is maintained to the greatest possible extent.

Please sign below and feel free to contact the researcher for any further information.

Signature……………………………………

Joshua Moody,

Josh.Moody@mu.ie

Irish Research Council Scholar,

John and Pat Hume Doctoral Scholar,

29 Auxilia House,

Maynooth University,

Maynooth Social Sciences Institute,

Maynooth, Co Kildare,

Ireland.

Having read this information sheet, if you agree to take part in the research, please read and sign the consent form overleaf.

Consent Form

Project Title: Coders, Creative and the Production of Knowledge in a Digitalizing, Flexibilizing World (of Work)

Researcher: Joshua Moody [e: Josh.Moody@mu.ie]

Supervisory Team: Prof. Seán Ó'Riain [e: Sean.oriain@mu.ie] & Dr. Aphra Kerr [e:Aphra.kerr@mu.ie]

Please answer each statement bellow (circle as 'Yes' or 'No' as appropriate).

1	I confirm that the purpose of the study has been explained to me and that I have been given the opportunity to ask questions, which were answered satisfactorily.	Yes	No
2	I agree to the interview being audio-recorded and then transcribed and used for research purposes.	Yes	No
3	I understand that I can withdraw from the research at any time or withdraw pieces of information upon request, without any consequences or having to provide an explanation.	Yes	No

The statements below relate to how your interview will be managed.

4	It has been explained to me how my data will be managed and that I may access it at any time upon request.	Yes	No
5	I agree for my interview materials, once anonymized, to be included in the Irish Qualitative Data Archive (IQDA).	Yes	No
6	I agree to be contacted for follow-up research purposes, and that I am aware that when contacted I can choose not to participate without having to give an explanation.	Yes	No

Signed…………………………………….   Date……………….

Participant Name in block capitals …………………………………………..

Declaration of Principal Researcher:

I the undersigned have taken the time to fully explain to the above participant the nature and purpose of this study in a manner that they could understand. I have explained the risks involved (in the event of court

overrides, confidentiality cannot be guaranteed) as well as the possible benefits. I have invited them to ask questions on any aspect of the study that concerned them.

Signed……… *[signature]* …………………………. Date…20/01/2020

Researcher Name in block capitals …………JOSHUA MOODY……………………………………..

If during your participation in this study you feel the information and guidelines that you were given have been neglected or disregarded in any way, or if you are unhappy about the process, please contact the Secretary of the Maynooth University Ethics Committee at research.ethics@mu.ie or +353 (0)1 708 6019. Please be assured that your concerns will be dealt with in a sensitive manner.

For your information the Data Controller for this research project is Maynooth University, Maynooth, Co. Kildare. Maynooth University Data Protection officer is Ann McKeon in Humanity house, room 17, who can be contacted at ann.mckeon@mu.ie. Maynooth University Data Privacy policies can be found at https://www.maynoothuniversity.ie/data-protection.

Supervisory Team

Prof Seán Ó'Riain,

Sean.oriain@mu.ie,

3.6 Auxilia House,

Department of Sociology,

Maynooth University,

Ireland.

Dr. Aphra Kerr,

Aphra.kerr@mu.ie

3.5 Auxilia House,

Department of Sociology,

Maynooth University,

Ireland.

Appendix 2: Participant Profile

Coders, Creatives and the Production of Knowledge

Researcher: Joshua Moody

Interview Participant Profile

Participant Profile		
Interviewee:	ID: (*To be filled by researcher)	
Gender:		
Year of Birth:		
Location of Birth:		
Self-Identified Ethnicity:	(e.g Caucasian, Black, Asian, Mixed etc)	
Highest Educational Attainment (and year completed):	(e.g Level 8 Bachelors Degree, 2005)	
Subject of Award:	(e.g Computer Science; Business and Innovation etc)	
Member of Trade Union or Professional Association:	(e.g Yes, SIPTU Trade Union)	
Current Occupational Title:		
Previous Occupational Titles:	1.	2.
	3.	4.
Contract Type (please tick relevant box):	☐ Permanent	☐ Fixed-Term
	☐ Temporary	☐ Casual
	☐ No Contract	☐ Internship/Training
	☐ Other (please indicate): _____	

Employment Contract:	☐ Full-Time		☐ Part-Time	
Annual Income from Primary Employment (in Euros, optional):	☐ Under 20k	☐ 20 − 30k	☐ 31 − 40k	
	☐ 41 − 50k	☐ 51 − 60k	☐ 61 − 70k	
	☐ 71 − 80k	☐ 81 − 90k	☐ Over 90k	

Appendix 3:   Interview Guide A

1.   Effort Bargain:

Tasks, Content, Activities:

Q.   Can you please talk me through a typical day at work for you? [do you have a 'typical' day]

Q.   What are the duties and responsibilities of your role/work?

- o   what do you create, produce, provide?

Q.   In relation to your daily work, what tasks and activities do you spend your day doing?

Skills, Knowledges, Aptitudes, Capabilities, Attachment:

Q.   Thinking about your job, what do you need to be able to do to get the job done?

Q.   What are the most important [skills / abilities / and knowledges] for your work?

- o   How do you ensure that you have these [skills / abilities / knowledges] and keep them up to date?

Q.   Can you please tell me about your use of technology during and for work?

- o   What is it used for?
- o   How does it impact your work?

Q.   What are the most important things or [resources] that a worker needs to make them successful in this industry?

- o   How do you gain / develop these [resources]?
- o   What role does 'talent' play?

Organisation / Process:

Q.   How much collaboration is there with others in your work? [teamwork, solo, hierarchy]

- o   How do you think this affects the creative process?

Q.   How much do you deal with users or customers/clients?

- o   How do they affect your work? [directly and/or indirectly]

2.   Boundary Bargain:

Working Time:

Q.   What are your typical working hours? Do they vary – how?

- o   What hours are you contracted to work?

Q.   Can you please describe what your working time preferences are?

Q.   How much time do you spend doing menial [routine] tasks throughout the week?

Q.   How does technology effect your work time?

- o   Do you find yourself doing activities related to your work outside of the workplace?

o In this digital age, everything is live 24/7, does this result in increased pressure for you to work or do work related activities [thinking etc] throughout each day? How?

Experience of Time / Space:

o Does all of your work [ideas, concepts, content] originate and take place at work?

Crunch Time, Deadlines:

Q. What happens if the work isn't finished on time?

Q. How do deadlines and 'crunch time' impact your work?

Work-Non-Work Balance:

Q. Do you have some flexibility with your working hours? [start – finish times etc]

Q. Do you experience any conflicts with work and your non-work life?

o Are you able to re-organise your work to better accommodate your non-work life? How would you do that?

3. Employment Bargain:

Q. How do you think the value of your work is judged by your employer [industry]?

Security / Risk (work, job, identity):

Q. How important is job security to you?

o Do you feel secure in your current position? [what type of contract?]
o Is it difficult to get a job in this industry?

Q. Is your work / job important for your identity?

Q. Can you please tell me about the risks associated with working in this industry or occupation?

Rewards (pay, benefits, reputation, exposure, experience, skills, knowledge, career):

Q. What rewards / benefits do you get from the job bar pay?

o Do rewards change based on performance? How

4. Control / Resistance / Consent:

Q. How much freedom do you have in deciding how you do your own work?

o What are the benefits and pitfalls of how work is currently organised in your job? [usually organised in a job]

Q. Can you describe how your work and output [performance] is monitored? [technologically?]

o How is the value of your work measured and evaluated? How would you like your work to be judged?
o What factors impact the pace, quantity and quality of your work?
o Do financial targets and performance measures impact your work?

Q. Do you feel a commitment towards your employer/s? Why?

o How committed do you think your employer is to you?

5. Culture / Network:

Culture:

Q. How important is culture in your work and the wider industry?

    o Can you describe the type of culture there is?

    o What's important and what's not important in this [work / industry] culture?

Network:

Q. How important is networking in your industry? Why?

    o How do you go about building your own networks?

Q. I'm curious about the notion of reputation and exposure, are these important to your work? How so?

    o Why is it important to have / build a reputation? How would you go about doing that?

    o How important are networking tools and services [LinkedIn etc]

6. Expectations / Perceptions:

Expectations:

Q. What were the main drivers influencing your decision to work in this area?

Q. Can you tell me about the career prospects in this industry?

Perceptions:

Q. How secure do you feel about your job and the work that you do?

    o Do you believe that the economy and labour market will continue to provide job opportunities in this area?

Q. Thinking about the products / services that you produce / provide, what makes these commodities good or successful?

    o Why are they valuable?

7. Pressures / Pleasures:

Pressures, Challenges, Demands, Affects:

Q. What challenges do you face in doing your work?

Q. What pressures do you experience in/from your work, be it physical, emotional, or mental?

    o Do these pressures extend to your non-work life, if so how?

Q. Can you describe the demands that come with the work in your industry/area?

    o Does your work ever get too demanding?

    o What strategies do you have to deal with these pressures and demands?

Pleasures, Satisfaction, Enjoyment:

Q.   What personal worth or benefits do you get from your work?

         o Do you find your work fulfilling? can you please tell me why?

Q.   Do you feel a personal commitment to the work that you create?

         o What role does passion play?

8.   Conclusion:

Q.   What are your ambitions and life-course goals in relation to work and your career?

         o And how do you manage reaching those goals?

Q.   What does your work mean to you?

Q.   Do you think that any changes need to be made to work in your industry?

[what / why / how]

Appendix 4:   Interview Guide B

Q.   Can you please tell me about your current job and talk me through a typical day's work?

Q.   How did you get this job?

Content of Work:

Q.   What products and or services do you produce or provide?

Q.   How do you create/provide these products/services?

>   What skills and knowledges are needed? How do you keep these up to date?

Q.   What technologies do you use and what for?

>   Software work is heavily mediated through digital technologies and programmes, how do you think this effects your level of productivity and the experience of the work?

Q.   How are decisions about product/service design made and who makes them?

>   And can you describe how these designs are then translated into software?

Work – Life Boundaries and Experience of Work:

Q.   Do you work from a central workplace or are you working from different locations?

Q.   Do you work a 9-5 or is your work flexible and more dispersed?

>   Do you have much freedom in deciding how you do your own work?

Q.   Can you tell me what this type of work is like?

>   How is it experienced (is it exciting, boring, stressful, easy, demanding etc - why?)

Q.   What are the negatives and positives of working in software/creative sector?

>   Do you experience any work-life balance conflicts?

Q.   Do you find yourself doing work related activities throughout the day (thinking, planning, doing etc)?

>   The work of coders/software is inherently socially and mentally intensive, does this make it difficult to 'switch-off'?

Q.   What impact do you think digital technologies have on when and where you work or engage in work related activities?

>   Because everything is live 24/7 in this digital age, do you feel like there is a pressures, whether real or perceived, to always be connected or available or engaged with work related activities?

Q. How important is networking for your work? and how do you build your personal networks or reputation?

Organisation of Work and Career:

Q. How is your work organised? In other words, when you get a job/project, can you describe to me what that work process looks like?

What problems arise from how the work is typically organised? Or are there any problems

Q. How important is collaboration with others in the work?

Does your work often involve the use of contractors/freelancers, if so how do they impact the organisation or process of work?

Q. Are you a member or do engage with any associations, networks or communities in the industry? If so, how? And what impact do they have on you?

Q. How important is job security to you? Do you feel secure in your current position?

Q. Is your work/occupation important to your identity?

Is it important to build and manage your employability in this industry? How do you go about doing that?

Q. What rewards or benefits do you get from the job bar pay?

Q. What value do these products and services have for consumers or clients/industry?

Q. How is the value of your work judged and evaluated by your employer/client?

How is your work measured and monitored by your employer/client?

How do you manage the value that you provide as a product manager?

Q. Why did you choose to pursue this line of work or career? What aspirations/expectations are driving your decision?

Appendix 5: Interview Guide C

Work-Life Boundaries
The first group of questions explore the boundaries between your work and non-work or private life. To clarify what I mean here, the term 'work' represents everything **you need to do** to be a software worker and the term 'private life' represents everything beyond that (including leisure, family, rest etc.)
Q.   What are your preferences for the boundary between your work and non-work life? (blurred and blended together? Or a separation and clear boundary between the two?)
Q.   Do you or have you experienced conflicts with the boundaries between your work and non-work life?
Q.   What impact does the intellectual/cognitive nature of your work have on your work-life boundary? How does it impact **where** and **when** you engage in work-related activities (directly working, thinking about problems etc.)? Q.   How does the everyday ubiquity of software (we're always interacting with it in some form) effect the **spaces** and **times** that you are engaged with or thinking about work? Q.   Do you have any methods or habits to set boundaries for your work? Do you feel like you can you ever truly 'switch-off' from work? How do you try to switch off?
Q.   What impact does the digital mediation of your work have on your work-life boundary? How does it impact **where** and **when** you engage in work-related activities? Q.   What methods or techniques do you have to deal with that?
Q.   What impact do organisational or market pressures have on your work-life boundary? How do they impact **where** and **when** you engage in work-related activities? Q.   What methods or techniques do you have to deal with them?

Identity & Management of Career & Employability
The second group of questions explore personal attachments to work and the ways in which you manage your employability and career.
Q.   Is work important to your identity? Is being a 'programmer' an important part of your identity? How and Why? Do you want it to be?
Q.   Based on my conversations with developers, the use of online platforms appears to be a prominent feature of their work. There seems to be **three general types of platforms** that are frequently used by developers: (i) **Communities of practice** (StackOverflow/StackExchange, W3 Schools, Reddit, Github, Bitbucket etc.) (ii) **Professional platforms** (LinkedIn, Hack Rank) (iii) **Social media** (Twitter, Slack) Why do you think these are used by software workers? Do you use any these or any other platforms for work-related things? What for? Q.   On the analogue side of that, physical meetups, conferences, seminars and tech talks also feature frequently in how software developers describe their work and careers.

Q.   Is there a real or perceived expectation or pressure to engage with these outlets (online platforms and physical meetups)? If so, why? How do you think those expectations or pressures are experienced for different cohorts? (early-career, mid/senior level, men, women etc.)?
Q.   How do you manage your professional employability and profile? Is there a good deal of effort involved in building and maintaining a professional profile? Following conversations with developers, it seems like there's pressure to always "keep up" and this can lead to extracurricular work**.** Q.   How do you tend to deal with that?

Ambiguity & the Challenges for Control & Autonomy
The third group of questions explore the ambiguity that characterises knowledge work such as software development, and the challenges of managing software work. To clarify what I mean here, knowledge work like software production is highly specialised/complex and its production often involves dealing with uncertainty and ambiguity. Also, these conditions can make it challenging for management to control the work process.
Q.   Based on conversations with developers, software production seems to be a sort of an ambiguous process which involves dealing uncertainty and which needs ingenuity/problem-solving. What challenges arise in relation to this? Do this ever conflict with how your work is managed (deadlines, timescales etc.) How do you tend to deal with it?
Q.   One of the central features of any production process is the management and oversight of the work people are doing, yet it is generally assumed that knowledge work (such as software development) makes managerial control more difficult. How is your work and that of your colleagues managed (coordinated, monitored, measured and evaluated)? What are the pressures that arise based on how your work is managed? Do you have any methods or techniques to deal with those pressures?
Workflow management systems/methods such as Waterfall and Agile management, and project management software such as Jira and Trello are often used to manage software production. Q.   Do you feel like there are any pressures or expectations that arise from their use and implementation? Why do you think they exist? Do you have ways of dealing with those pressures or expectations?